COLLABORATION IN ENGLISH HIGHER EDUCATION ESTATES

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ABSTRACT

Globalisation and changes in public policy act as a catalyst for change in the English Higher Education Sector. Consequently, Institutions place a greater focus on their supply chain to offer services that best fit their requirements, during the construction and refurbishment of physical assets. The construction industry will need to offer innovation, value for money and other benefits that associate with the collaborative procurement movement, which has been gathering pace since the 1990s. The aim of the research is to develop a framework to evaluate collaborative practice in Higher Education Property and Estates' departments in England. The work is practitioner research that relates to a real world problem. The objectives include: construct a suitable framework; develop the framework using a particular institution; and assess the framework in the wider context of England.

The research philosophy has foundations in both constructionism and pragmatism. The work develops the initial framework using literature. A Primary Case Study tests, relates and develops the framework in practice. To an extent, the literature review is able to provide transferability of the maturity model, particularly in relation to the implementation and motivation themes. Where the literature review could not provide transferability, a pragmatic approach is undertaken to improve the transferability of the research findings, which uses data from 44 estate strategies, 6 auxiliary case studies, 11 tender notices and industry sources. Data is generally qualitative and from such sources as interviews and documentation. The work uses thematic content analysis to explore organisations and summative content analysis to improve transferability. The work embraces Robson's strategy for validity including that, which associates with prolonged involvement, triangulation, peer debriefing, member checking and audit trail.

The research deliverable includes a clearly defined framework. The Framework includes three maturity models, namely implementation, motivation and risk. Each model has a particular purpose in relation to clients overall deliverables. The implementation theme relates to working efficiently. The motivation theme relates to exceeding performance requirements. The risk theme relates to achieving performance requirements. The Framework is for use by Directors of Estates and other policy makers that make decisions concerning collaboration in property and estates departments. The particular emphasis is collaboration with supply chains. The purpose of the study is to create the framework. The study does not make generalisations concerning the use of collaborative features. The

framework has been created using cross sectional data form across the English higher education sector. The framework will be of use in other sectors and geographical locations following further research.

SECTION A INTRODUCTION

CHAPTER 1 INTRODUCTION

1.1 CHAPTER INTRODUCTION

The Bank of England (2012) indicates reductions in confidence levels in UK investment between 2007 and 2011. The reductions fuel the UK's Coalition Government to undertake reforms in the way it funds the Higher Education (HE) sector in light of Lord Browne's review. The quality of the overall deliverable of the UK's HE sector has international, economic and social implications. Economic implications include issues relating to job creation, additional tax receipts and development of industry through research (OECD, 2011b). Social implications include issues relating to empowering people through skill development and providing a skilled workforce. The knowledge transfer provided by the Higher Education sector is also significant in the way it makes people feel in themselves, for example, improving life situations through personal development and research. The UK is a world leader in science and research (HM Treasury, 2010, p.6). If the United Kingdom including England is to remain one of the international leaders of higher education provision then its supply chain will need to offer services that best fit overall deliverables relating to the construction and refurbishment of physical assets. This chapter explores the correlation between funding and deliverables; and introduces collaboration to assist Higher Education Institutions meet the challenges of the modern world. In conclusion, the chapter sets out the framework for the DBenv study.

1.2 HIGHER EDUCATION

1.2.1 PART INTRODUCTION

The higher education sector has a cost in relation to the public and private purse as well as gross domestic product. There are limits to investment in higher education. The aim of this part of the DBenv thesis is to explore if improvements in the sector are limited by such things as under investment. This part of the DBenv thesis explores international benchmarking data to ascertain if performance is restricted by under investment. The work then goes on to determine how higher education policy is changing.

1.2.2 COST V BENEFIT

Data from a number of sources demonstrate the impact of Higher Education Institutions in England including the: Higher Education Statistic Agency; Organisation for Economic Co-

operation and Development (OECD); Higher Education Funding Council (HEFCE) and Universities UK. The Organisation for Economic Co-operation and Development provides information to governments to allow them to make decisions. The benefits or incentives of investing in Higher Education for men are quantified by OECD (2011b). The data considers the following nations Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Hungary, Ireland, Italy, Japan, Korea, Netherlands, New Zealand, Norway, Poland, Portugal, Slovenia, Spain, Sweden, Turkey, United Kingdom and United States. Statistics are also available for women. There are both public costs and benefits associating to higher (or tertiary) education.

The costs calculation includes lost income tax and public expenditures. The benefits calculation compares age related earnings between different educational groups. Adjustments are made to include additional tax and savings from social assistance. Amounts are in United States dollars. For the UK, the total cost is $41,176 with total benefit of $138,199. Therefore, the data indicates that investment in education provides a financial return for the public purse. The average across OECD nations total cost is $34,391 and total benefit $129,363. The lowest cost is $8,108 and the highest cost is $82,279. The UK's cost appears above the third quartile of all OECD members; indicating meaningful investment in UK Higher Education in comparison to other OECD members. The lowest benefit incurred is $35,106 and the highest $227,641. The UK benefit appears between the median and the third quartile of all OECD members; therefore, the data indicates cost benefit improvements are available.

The scatter diagram shown in Figure 1 is the distribution of OECD members in relation to total benefit and cost. The countries are represented by data points with the UK being a triangle. The scatter diagram indicates a weak linear relationship between total cost and total benefit. Ruddock (1995, p.91) defines the product moment coefficient of correlation that is referred to as r as values that appear between -1 negative correlation and 1 positive correlation; and where r = 0 there is no correlation between two sets of data. When tested the value of coefficient between direct costs and total benefits r = 0.30; and total costs and total benefits r = 0.33. Therefore, confirms the weak linear relationship between total cost and benefit. In simple terms, the data indicates improvements to financial return are available without further cost to the public purse.

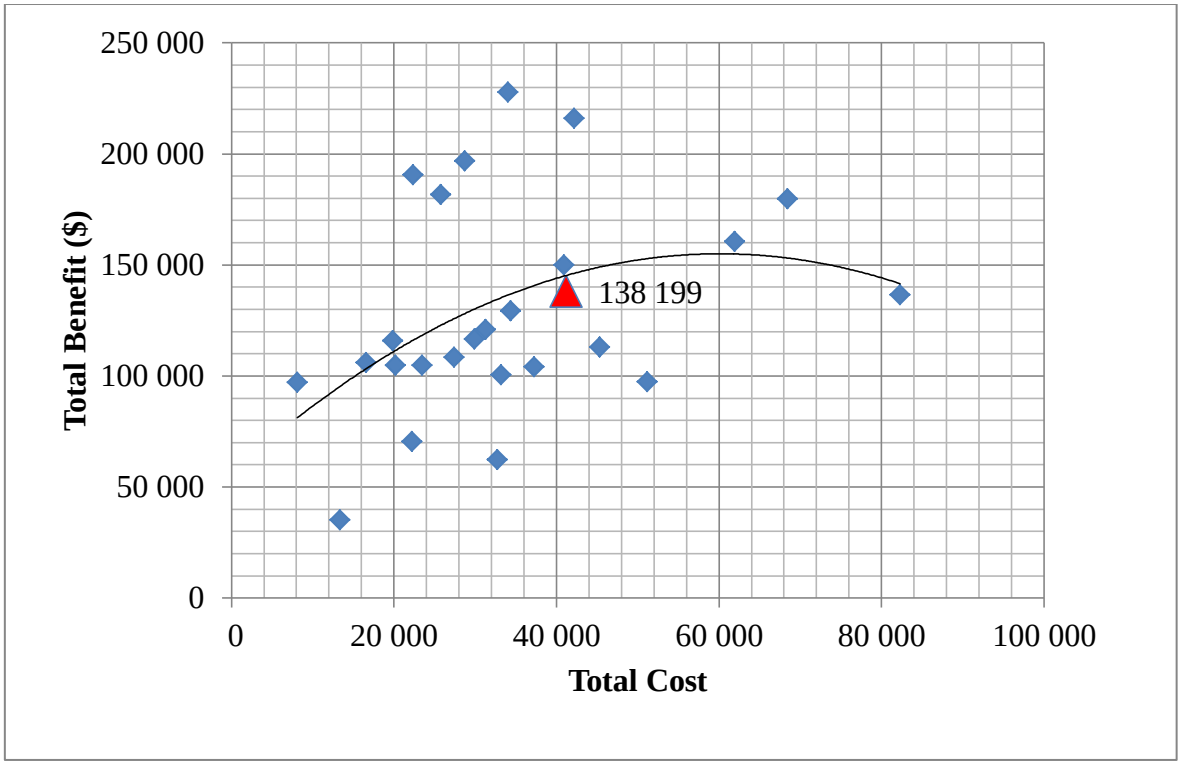

Figure 1: Investment in HE Sector and Benefit Scatter Diagram

The OECD (2011, p.231 indicator B2) provides data concerning expenditure on tertiary educational institutions as a percentage of Gross Domestic Product. OECD provides statistics concerning private and public expenditure in the Higher Education sector (tertiary education). The majority of data is from between 2008 and 2010. Public expenditure is spent both directly and through public subsidies to households. Private expenditure is the total expenditure less public. Investment in Higher Education of the UK's gross domestic product is public 0.6% and private 0.7%; providing 1.3% overall. The OECD's member average is 1.1% public and 0.5% private. In relation to the nations that OECD's (2011b) 'Incentives to Invest in Education' identifies, excluding Turkey, the average is 1.1% public and 0.5% private.

The UK gross product investment sits before the first (0.48<1%) quartile in public expenditure and after the third quartile (0.6<1.93%) in private expenditure; overall, between the first quartile and median (1<1.35%). Therefore, in comparison to other nations, there is less investment of public gross domestic product in higher education. The range for public finance is 0.48% to 1.80% and private 0.05% to 1.93% (1% to 2.6% overall). In summary, benchmarking the UK against other countries: benefits from a high proportion of private

sector finance; and not public sector finance to such an extent it affects the overall figures. Similar levels of funding occur between the private and public sector.

1.2.3 Gross Domestic Product v Benefits

The scatter diagram in Figure 2 is the distribution of OECD members in relation to investment of gross domestic product on higher education and total benefits. The scatter diagram does not indicate a correlation. The red triangle is the United Kingdom. The linear relationships as a percentage of Gross Domestic Product and total benefits are: % Gross Domestic Product of public investment r = 0.12; % Gross Domestic Product of private investment r = -0.02; and % of investment overall r = 0.10. Therefore, there is limited linear relationship between expenditure as a % of Gross Domestic Product and total benefits.

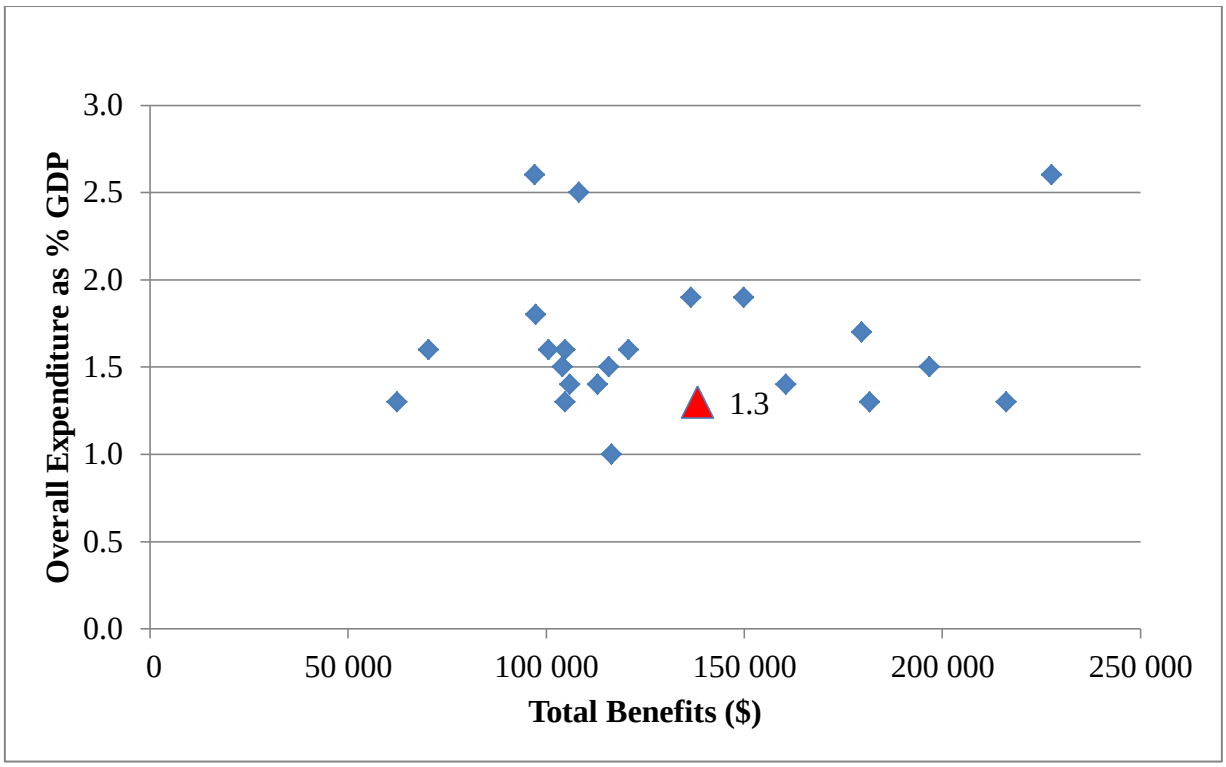

Figure 2: Percentage GDP and Benefit Scatter Diagram

1.2.4 Public Policy and Expenditure on Education

In 2010, the UK Government undertook a spending review as part of a deficit reduction plan (HM Treasury, 2010). HM Treasury's (2010, p.52) statement of future direction includes a 25% reduction in the department of Business Innovation and Skills, with 40% of the savings from the reform of the higher education sector. The Higher Education Funding Council for

England distributes money to the Higher Education Sector through Department of Business Innovation and Skills. The total grant for higher education in 2010/11 is £7.5billion (HEFCE, 2010b, p.6). In 2010-11, Universities in England receive income from funding councils (£7.2billion); overseas fee income (£2.5billion); tuition fees and education contracts (£5.2billion); research grants and contracts (£3.6billion); other operating income (£4.2billion) and endowment income (£0.2billion). Total income for 2010-11 is £22.9billion.

In 2010, Lord Brown chairs 'An Independent Review of Higher Education Funding and Student Finance' (Browne, 2010). The review receives support from a spectrum of members, in 22 groups, representing the interests of students, recruiters, institutions, academics and business. There are 90 responses to a call to evidence along with 65 submissions to a call for proposals; and two sets of public hearings complete with witnesses interviews concerning the state of the current higher education system. Although not a representative sample, the 34 witnesses represent a broad spectrum of organisations. Two out of the thirty-four witnesses identify themselves as being from Oxford University that has approximately 23,000 students, which is approximately 1% of the overall population. The review identifies six key principles that include: (1) more investment should be made available for higher education; (2) increase student choice; (3) everyone who has the potential should be able to benefit from education; (4) no one should have to pay until they start work; (5) when payments are made they should be affordable; and (6) part time students should be treated the same as full time students for the costs of learning.

The Browne (2010) report proposes items that associate to the three elements of: learning; living; and earning & paying. Learning relates to students having the capacity to choose where and what they study. Living relates to support for living costs in the form of loan. Earning and paying relates to students paying for their own education with loans. Following a general election in 2010, the new UK Coalition Government aligns their agenda with the proposals set out in Browne's (2010) report (HM Government, 2010; Department of Business, Innovation & Skills, 2012a). A review by HM Treasury (2010, p.26) indicates the future direction including: the government believes there must be a shift away from public sector towards those that benefit most and can afford to pay to ensure sustainability of public finances; from 2012-13 universities are able to increase the fees chargeable to students; and £150million national scholarship fund will support students with less advantages. In

summary, there is a shift in financing higher education to the private sector and increases in fees for students.

The forecast for overall sector income for Higher Education Institutions in England in 2012-13 is £23.9billion. The forecast is for the income to derive from funding councils (5.4billion); overseas fee income (£2.9billion); tuition fees and education contracts (7billion); research grants and contracts (3.8billion); other operating income (£4.3billion) and endowment income (0.2billion). Funding council grants reduce by 7.1% between 2010-11 to 2011-12 (Higher Education Funding Council for England, 2013a, p.5); with a further 18.9% reduction forecast between 2011-12 to 2012-13 (Higher Education Funding Council for England, 2013a, p.12). There are student reductions following the changes in the way Universities receive funding (Department of Business, Innovation & Skills, 2012a). In summary, student autonomy and reductions in numbers increases competition for funding, which students provide directly.

Reductions in funding from research councils is met with increases in Tuition Fees and Educational Contracts, with an increase of 7.4% for 2010-11 and 2011-12; and 6.8% (forecast) between 2011-12 to 2012-13. The reductions are also to be met in increases in international students. Overseas income (non-European Union) represents £2.7billion of fee income in 2011-12 being a 9.3% increase on the previous year (Higher Education Funding Council for England, 2013a, p.5); forecast in 2012-13 as £2.9billion being 6.8% on the previous year (Higher Education Funding Council for England, 2013a, p.12). Internationally world events, attempts to reduce immigration and the digital revolution are influencing student demographics. Higher education institutions need to adapt to changes to remain operationally efficient and sustainable. As the primary source of funding of higher education institutions moves away from central Government to students, an environment exists where some institutions thrive and others merge to survive (HEFCE, 2011c, p.7). Organisations have the capacity to merge in entirety or parts of organisations to achieve efficiencies.

There is an international educational market place, available to benefit the English Economy. The OECD (2011a) identifies student enrolment worldwide outside their country of citizenship raises from a level of 2.1million in 2000, to 3.7million in 2009. In 2011/12 out of the 2.5million students in Higher Education in the United Kingdom, 0.3million are non-European representing 12% of students overall (Higher Education Statistics Agency, 2012). In addition to International fees to higher education institutions, money is spent in the wider economy by students on such things as accommodation, food, media and entertainment.

International students with a tertiary education, similar to those that are domestic, make an offer to the global economy as well as to wider society. The condition and functional suitability of Higher Education estates, is significant to the product and marketability to international students (HEFCE, 2011c, p.18).

1.2.5 Consequence of Capital Works in Sector

Capital expenditure by Higher Education Institutions on estates is in excess of £0.9billion in 2011/12 (Higher Education Statisitcs Agency, 2013). This compares to UK Government total departmental expenditure limit of £47billion for 2014-15 (HM Treasury, 2013); and total Local Authority Expenditure of £25billion for 2013-14 (Department for Communities and Local Government, 2013). Buildings owned by Higher Education Institutions have in excess of an overall gross internal area of 21.2million m2 in 2011/12 (Higher Education Statisitcs Agency, 2013). Important considerations for institutions include Institutional sustainability (HEFCE, 2011c, p.7); space and student numbers (HEFCE, 2011c, p.5); condition and functional suitability (HEFCE, 2011c, p.18); and environmental performance (HEFCE, 2011c, p.20). The considerations link to operational efficiency, for example reducing energy consumption provides for organisational savings. Total energy consumption by Higher Education Institutions in England is in excess of 5.8billion kWh in 2011/12 (Higher Education Statisitcs Agency, 2013).

The UK Government's commitment to carbon reduction is seen in the Climate Change Act 2008 (UK Parliament, 2008a). In Section 1(1), found in Part 1 of the Act, the secretary of state for Energy and Climate Change is put under a duty to reduce the UK carbon account by 80%, from 1990 levels by the year 2050. For the year of 2020, a reduction of 34% is required. Emissions of Higher Education Institutions in England represent in excess of 1.9billion kg of carbon dioxide in 2011/12 (Higher Education Statisitcs Agency, 2013). Therefore, Higher Education Institutions have a contribution to make to carbon reduction.

There is a carbon trading scheme to encourage larger institutions to reduce emissions. Thirteen larger institutions participate in the European Union Emissions Trading Scheme in 2011/12 (Higher Education Statisitcs Agency, 2013). In addition, a requirement transfers to Universities to reduce carbon, through funding requirements, set by central government (Universities UK; GuildHE; HEFCE, 2010, p. 7). In 2011/12, eighty-one Higher Education Institutions in England do not make use of renewable energy sources (Higher Education

Statisitcs Agency, 2013). On-site generation provides 12.8million kWh of energy. In contrast, total energy consumption, which associates to gas and oil, represents 2.8billion kWh in 2011/12 (Higher Education Statisitcs Agency, 2013). Gas and oil are in many instances non-renewable resources of which there is finite amount available globally. Therefore, there is considerable work to improve the performance of existing estates.

1.2.6 PART SUMMARY

International benchmarking data does not indicate a correlation between return on investment and expenditure from either the public purse or gross domestic product. Therefore, performance of the sector does not correlate directly with investment and improvements are available. The way in which higher education institutions are funded is changing, which place emphasis on research similar to that undertaken as part of the DBenv study to offer improvements to the sector. Further emphasis emerges from the international agenda for carbon reduction. There is a requirement for the DBenv research to establish a connection between construction best practice as defined by governmental strategy and collaborative ways of working.

1.3 COLLABORATION

1.3.1 PART INTRODUCTION

The cabinet office had the Government Construction Strategy published in May 2011. In the strategy is a detailed programme of measures for the UK Government to reduce its costs by up to 20%. The report sets out the aim to replace "adversarial cultures with collaborative ones" and demand for "cost reduction and innovation within the supply chain to maintain market position" (Cabinet Office, 2011, p.3). In addition, there is supply chain interest in collaboration. A commercial manager from a contractor organisation working on a £1.2million school project indicates that "we believe partnering is the way we want to do business", "It may cost more but it reduces risk and creates sustainable business" (McDermott et al., 2005, p.23). The aim of this part of the thesis is to explore if improvements are available to the higher education estates and property sector though collaboration. To achieve the aim collaboration is defined. The work then goes on to establish if there are significant contributions and benefits to collaboration. Finally, the work explores how collaboration is engineered within organisations.

1.3.2 DEFINING COLLABORATION

The Oxford English Dictionary (2013) relates the word collaboration and it variants to a number of literary sources including work as early as 1872 to offer the definition of "To work in conjunction with another or others, to co-operate; esp. in a literary or artistic production, or the like". Hughes et al. (2012), defines collaboration using a mixed method approach that includes 7 interviews and 52 questionnaires which is not a significant proportion of the overall population. In addition, the data collection does not recognise the demographics of the construction industry with a significant number of the respondents (20nr) being quantity surveyors and (10nr) being project managers. The research findings identifies the definition of collaboration differs according to the persons role within construction. A definition from a client's point of view is in Figure 3.

Collaboration within the UK construction industry is a non-adversarial team based environment, where through the early involvement of key members and the use of the correct contract, everyone understands and respects the input of others and their role and responsibilities. The team/project is led and managed by the client and relationships are managed with the help of regular meetings, early warning systems, open dialogue and risk sharing to produce an atmosphere of mutual trust where, information is shared, open book accounting is used, problems can be solved together, claims are reduced and everyone contributes towards a common aim motivated by a fair method of pain share gain share to produce a win-win outcome.

Figure 3: Clients' Definition of Collaboration

Source: Hughes et al. (2012)

The definition in Figure 3 is open to interpretation, for example, reference is made to the use of the "correct contract". In addition, the work provides a definition in terms contractors and independent people. The definition for contractors is in Figure 4. There are similarities and differences between the clients and contractors definitions. In the first sentence deviation exists in the statement of "through the early involvement of key members", which is in clients definition but not contractors. In addition, the statement of "long term relationship" is in the contractor's definition, however, not the clients. A number of similarities can be seen in the

two viewpoints, for example ‘non- adversarial’, ‘correct contract’, ‘respect input’ and ‘problems solved together’.

Collaboration within the UK construction industry is a non-adversarial team based environment, where through the use of the correct contract, there is early involvement of key members and everyone understands and respects the input of others and their role and responsibilities. The relationships are managed with the help of regular meetings, early warning systems, open dialogue and risk sharing to produce an atmosphere of mutual trust, where information is shared, problems can be solved together with everyone contributing towards a common aim and value engineering can be used to ensure that everyone is a “winner” motivated by a fair method of pain share gain share within a long term relationship.

Figure 4: Contractors’ Definition of Collaboration

Source: Hughes et al. (2012)

1.3.3 CONTRIBUTIONS TO COLLABORATION

There is a significant amount of literature which explores collaboration and its associates including partnering. Chan et al., (2003) identify 29 sources from between 1990 and 2002. More recently, Bemelmans (2012) when undertaking systematic literature review, exploring collaboration between suppliers and prime contractors, identifies a significant amount of literature from 2000 to 2009 with a focus on collaboration. The study explores both construction and non-construction journals. Construction journals including: Building Research & Information; Construction Innovation; Construction Management and Economics; Engineering, Construction and Architectural Management; and the Journal of Construction Engineering and Management. Non-construction (specific) journals include: Industrial Marketing Management; Journal of Supply Chain Management; Journal of Business and Industrial Marketing; Journal of Operations Management; Journal of Marketing; California Management Review; and Journal of Purchasing and Supply Management. The fact that study does not explore more journals suggests there is even more work available in the field.

Bemelmans et al. (2012) select 106 articles from the journals which refer to ‘collaboration (or similar terminology) between organisations’ in the title, keywords or abstracts. 91 are from

construction and 15 from non-construction journals. The similar terminology includes: buyer-supplier relation(ship) (management), partner(ship), co-operation, co-ordination, outsourcing, managing suppliers, supplier integration and supplier development. Under a further review by the three authors, the overall final sample size is 51 articles. The results demonstrate significant discourse concerning collaboration in publications with peer review.

1.3.4 Benefits of Collaboration

Chan et al. (2003) explores the benefits of collaborative procurement. The research reviews 29 sources of literature between 1990 and 2002 to identify a series of benefits to partnering. There is a description of the benefits in detail, which include: reduced litigation, better cost control, better time control, better quality product, efficient problem solving, closer relationship, enhanced communication, continuous improvement, potential for innovation, lower administrative cost, better safety performance, increased satisfaction and improved culture. Data collection is undertaken early 2001 in Hong Kong. Questionnaires identify benefits against a five point likert scale against a particular partnering project. At one end of the scale is strongly disagree (1) and at the other strongly agree (5). The data is from 78 sources that include: 18 from clients organisations; 37 from main contractors; 17 from consultants; 3 from sub-contractors; and 3 from organisations without allocation. The benefits expanding to 24 rank in accordance with all respondents, clients, contractors and consultants. The mean scores fell between 2.81 and 4.09, suggesting that the responses go a way to confirming the benefits.

Beach et al,'s (2005) diagram of the United Kingdom construction industry is in Figure 5. In the diagram, the supply chain allocates to different tiers. The client is tier 0. Main contractors tier 1. Main sub-contractors and sub-contractors tier 2. Two main contractors (tier 1) from the Ng et al.'s (2002, p.445) study indicate benefits that associate to including sub-contractors (tier 2) in the partnering process. Beach et al. (2005) uses questionnaires to collect data using a five point likert scale to measure respondents' views. As well as main contractors, participants are customers of a particular sub-contractor (tier 2), operating in the United Kingdom. The study's data is from 35 complete questionnaires. The data indicates that partnering improves communication (3.82), leads to mutual learning (3.82) and improves understanding of mutual problems (3.74). Table 1 relates Beach et al.'s to Chan et al.'s (2003) work, indicating there are benefits to collaboration. Similarly, Simatupang & Sridharan (2005, p.53) find a correlation between collaboration and performance.

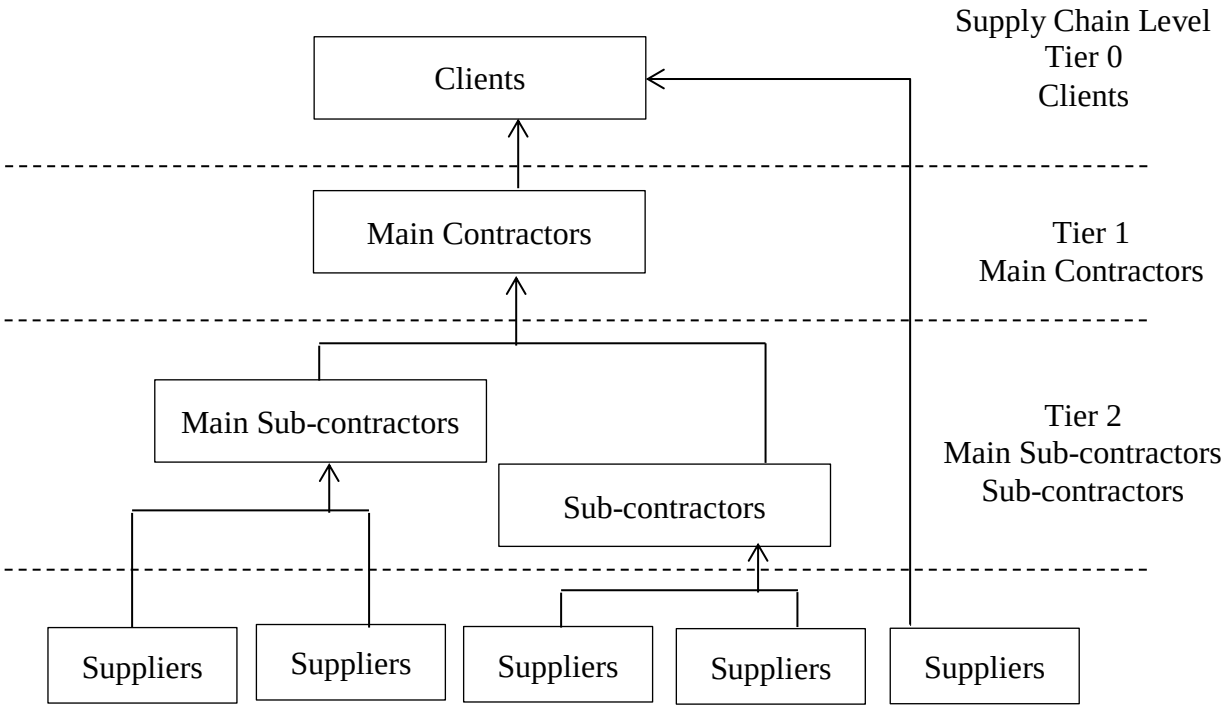

Figure 5: Construction Industry Supply Chain

Source: Beach et al,'s (2005)

Table 1: Benefits of Collaboration

Benefit	Citation
better cost control	Chan et al. 2003
better time control	Chan et al. 2003
better quality product	Chan et al. 2003
efficient problem solving; understanding of mutual problems	Beach et al. 2005; Chan et al. 2003
closer relationship	Chan et al. 2003
enhanced communication	Beach et al. 2005; Chan et al. 2003
continuous improvement; mutual learning	Beach et al. 2005; Chan et al. 2003
potential for innovation	Chan et al. 2003
lower administrative cost	Chan et al. 2003
better safety performance	Chan et al. 2003
increased satisfaction	Chan et al. 2003
improved culture	Chan et al. 2003

1.3.5 ENGINEERING COLLABORATION

Eriksson & Westerberg (2011) use a literature review to explore the effects of cooperative procurement procedures on construction project performance. A literature review generates the proposition, that cooperative procurement procedures generally have a positive influence on project performance. This supports the DBenv's proposal for the use of collaborative features to improve practice. Bresnan and Marshall (2000) identify that research in partnering investigates the use of tools and techniques to engineer collaboration. The research explores nine case studies in relation to informal and formal aspects of collaboration, namely, selection process; continuity of relationships, teambuilding processes, design-construction integration, breadth and depth of collaboration; and performance. Similarly, Eriksson & Westerberg (2011) provide a list of co-operative procurement procedures that include joint specification, selected tendering, soft parameters in bid evaluation, joint subcontractor selection, incentive-based payment, collaborative tools, and contractor self-control. Therefore, the research indicates it is possible for the DBenv deliverable to engineer collaboration.

Cicmil and Marshall (2005) explore two-stage tendering to find that collaborative procedures can be insufficient to ensure team integration and further research should be undertaken on the procedure as a social object. Supporting this Winstead et al., (2009) identifies that in business management there is not only a requirement for technical explicit knowledge, but also for the soft skills more related to tacit knowledge and associated with communication, teambuilding and leadership. There is clear evidence that the need for soft skills exist in construction contracts, to align behaviour in practitioners to achieve clients' deliverables. Therefore, in relation to collaboration the DBenv study will need to consider both explicit and cognitive processes.

Collaboration occurs between client organisations (Tier 0, see Figure 5 p.13). Bakker, Walker, Schotanus, & Harland (2008) relate collaborative procurement to different organisational forms, when triangulating 33 explorative interviews that collect empirical data. The data triangulates itself with literature and government agency reports published in the UK. The reports include that by the 'Office of the Deputy Prime Minister', 'Beecham', the 'Audit Commission', and the 'NHS Purchasing and Supply Agency'. The forms of collaboration between client organisations include professional networks, lead buying, shared services, piggy backing, third party advisory, third party purchasing and third party

outsourcing. Therefore, there are benefits that associate to engineering inter-client collaboration of supply chain resources that the DBenv framework will need to consider.

Simatupang & Sridharan (2005) propose a collaboration index as a measure for supply chain collaboration (see Figure 6: Concept of the Collaboration Index). The research is undertaken in four steps, namely conceptualisation, development of the measurement instrument; data collection; and statistical analysis (Simatupang & Sridharan, p.46). Practitioners and academics with knowledge of the research topic develop dimensions of collaboration at the conceptualisation and development stages. Survey data from companies in New Zealand validates the index and provides further generalisation. However, there is limited attempt to offer international generalisation such as to the location of the DBenv study. Simatupang & Sridharan's (2005) potential respondents are from 200 retail and 200 supplier organisations. The final usable sample includes 76 complete questionnaires. The respondents are from six categories: clothing and footwear (22.37%); food and beverage (21.05%); home improvement, building supplies, tools and furniture (19.74%), electronics and appliances (18.42%); stationery and toys (10.53%) and health products (7.89%). Therefore, the survey collects data from different sectors than the DBenv study. Following the survey there is limited attempt to support the findings with empirical evidence, for example organisational performance data.

Similar to the DBenv study, Simatupang & Sridharan's (2005, p.46) study aims to measure collaboration across three themes. All the themes are different. Simatupang & Sridharan's (2005, p.46) include information sharing, decision synchronisation and incentive alignment (see Figure 6: Concept of the Collaboration Index). Each theme has between six and ten sub items, which relate more readily to the retail industry than the construction industry. A five point likert scale assesses each item, therefore the results relate to perceptions. The first axis decision synchronisation is the degree of supply chain involvement in joint decision making, at planning and operational levels (Simatupang & Sridharan, 2005, p.51). The second axis incentive alignment is the degree to which supply chain members share costs, benefits, and risks of collaboration (Simatupang & Sridharan, 2005, p.51). Therefore, both these themes (axes) relate to the ability of collaborative methods to extend through the supply chain.

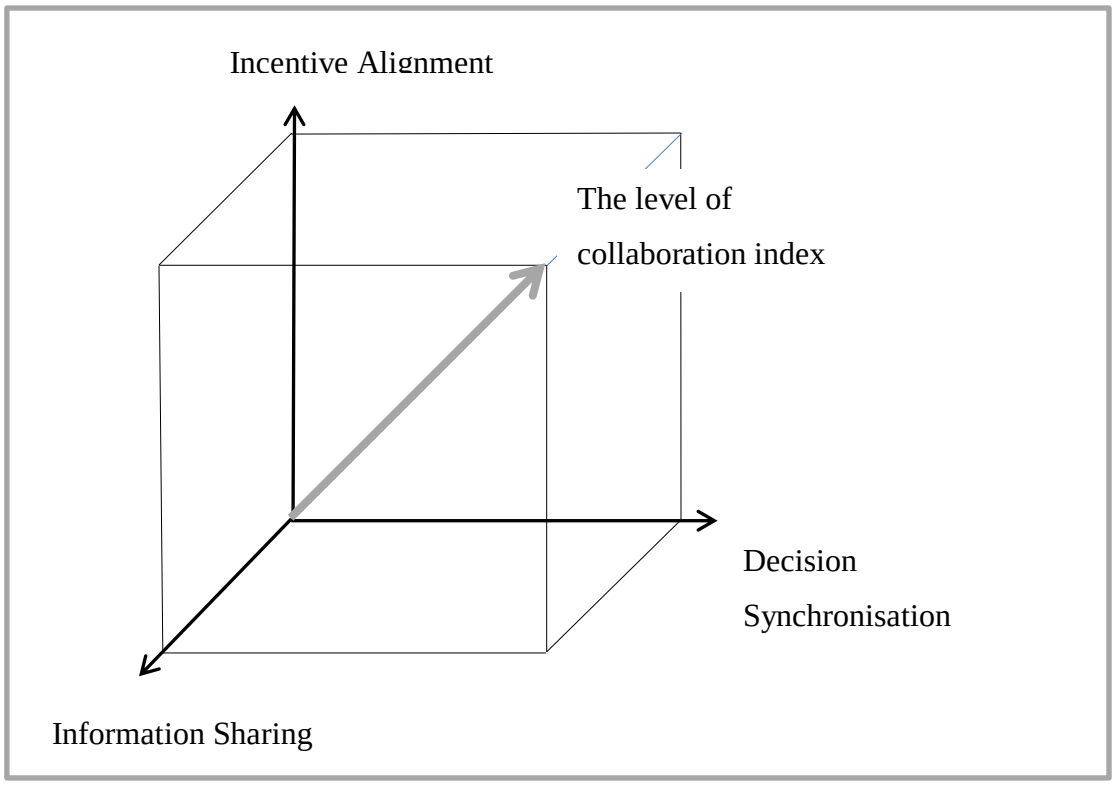

Figure 6: Concept of the Collaboration Index

Source: Simatupang & Sridharan (2005)

"Fulfilment measures the extent to which the collaborative practice affects the ability of the chain members to satisfy consumer delivery date" (Simatupang & Sridharan, 2005, p.51). The data indicates a correlation between fulfilment and the sources of variance of information sharing ($p<0.001$), decision synchronisation ($p<0.001$) and incentive alignment ($p<0.10$). Similarly, data indicates a correlation between operational performance inventory and the sources of variance: information sharing ($p<0.10$), decision synchronisation ($p<0.05$) and incentive alignment ($p<0.05$) (Simatupang & Sridharan, 2005, p.58). Therefore, although the data in relation to incentivisation is in contrast to other work that the DBenv thesis explores, the study indicates the importance of ensuring that collaboration extends throughout the supply chain. In similar findings, Aarseth et al. (2012, pp.276-78) identify from a case study negative implications of a main contractor not sharing gains with sub-contractors.

1.3.6 MOTIVATION

In 2000 when looking at cooperative group behaviour Tyler and Blader (2000, p.35) identify two types of motivation leading people to act collaboratively, namely, (1) instrumental and (2)

internally driven motivation. Instrumental motivation is collaboration, which originates from the expectation of rewards and punishments. In the case of construction, such motivation relates to financial incentivisation. Rose and Manley (2010) explore client recommendations for financial incentives on construction projects. The work explores four large building projects that Australian government clients' commission under management contracts, complete between 2001 and 2005. The findings of the research are practical recommendations that base themselves on the assumption that financial incentive mechanisms motivate people. The recommendations also indicate scientific generalisations the research data is unable to support, for example, "the recommendations would seem to apply equally to private-sector clients and to non-building projects". The conclusion states financial incentives "exert a positive influence on project success", with an ability to align the contractors and client objectives.

There is misalignment between employers and employees understanding of employees' motivation (DeVoe & Iyengar, 2004). With Darrignton and Howell (2011, p.42) identifying on a number of construction projects, "contracts and compensation structures" frequently ignore or mistake what motivates the people that undertake the work. There are limited details concerning the construction projects and the work appears to be conceptual in nature with limited reference to primary source data. Similar scepticism is found when Darrignton and Howell (2011) relate incentivisation back to psychology; they identify two forms of incentivisation, namely, economic and non-economic. The work suggests that economic or financial incentives impose standards, which, may lead to an "impaired sense of self-determination or perceived loss of autonomy" (Darrington & Howell, 2011, p.44). This statement has an implication not only on economic, but also non-economic incentivisation, for example, standards used for the purpose of performance management. This principle is fundamental to the work, in that it would suggest that tools with a purpose of promoting collaboration might have an adverse effect on motivation. Motivation of practitioners being a main objective of the collaborate movement in construction.

The concept is however supported by that of Maslow (1970), which identifies a basic need hierarchy that starts at 'physiological' and works its way through levels to 'safety', 'belongingness and love' and 'esteem' and finally ending up at 'self-actualisation'. Movement is one of progression (or regression) within the hierarchy, once there is a degree of satisfaction at one level, the organism (or person) focuses (or is motivated) to achieve the next

level (Maslow, 1970, p.17). Contractual mechanisms can result in practitioners achieving different degrees of satisfaction and as such position them at different levels within the hierarchy. For example, contractual mechanisms that promote conflict can inhibit needs associated with esteem, in relation to confidence and respect. Restricting practitioners from providing the benefits through self-actualisation, including those associated with morality, spontaneity and acceptance of facts. Failure to accept facts causes disputes. More seriously, contract mechanisms can cause practitioners not to achieve safety and physiological needs. For example, the allocation of risk items that are outside the control of the practitioner may cause the failure to achieve safety needs in relation to employment. Should items locate even lower in the needs hierarchy, then the risk occurs of failure to achieve physiological needs, in respect of health.

1.3.7 PART SUMMARY

Collaboration has a well-established base within literature. This part of the DBenv thesis establishes that there are benefits achievable through collaboration during the procurement of construction related activities by estates departments. Estates departments may implement collaborative ways of working with their supply chain along with similar service providers, for example with a neighbouring university. It is important for an estates strategy to consider collaboration throughout the supply chain. Collaborative procedures may promote instrumental and internally driven motivation. However, this is not a consensus concerning the relationship between instrumental methods such as financial incentivisation and motivation. There is a requirement for the DBenv research to investigate motivation in relation to procurement under taken by higher education estates and property sectors.

1.4 PERFORMANCE

1.4.1 PART INTRODUCTION

The construction industry is made up of a multitude of organisations that employ a workforce to undertake activities. Each organisation and by logic supply chain's performance is dependent on its workforce's performance. The aim of this part of the DBenv thesis is to gain understanding of what is worker performance.

1.4.2 TASK PERFORMANCE

The Motowidlo & Scooter (1994) use data from 421 number (372 men) US Air Force aircraft mechanics. The purpose of the study is to explore the potential of distinguishing task performance from contextual performance. The study includes data from mechanics, raters (quality of work over >90 days), organisational data (training, ability), and supervisors (performance). Data from the mechanics is from questionnaires containing demographic variables; and an assessment of background and life experience. The assessment of background and life experiences questionnaire contained 133 questions relating to social desirability, non-random response, physical condition, personality variables. The personality variable includes work orientation, dominance, dependability, adjustment, cooperativeness and internal control. The supervisors measure the mechanics' task, contextual and overall performance.

Motowidlo & Scooter's (1994) results indicate that task and contextual performance has an independent contribution to overall performance. Task performance refers to "the core technical behaviours and activities involved in the job" (Griffin, Neal, & Neale, 2000, p. 518). Examples of task performance include product and management (time, organisation) knowledge (Borman & Motowidlo, 1997). Whetten, Cameron, & Woods (1996, p. 8) identify task performance achievement as a combination of ability and motivation; ability being through a combination of aptitude, training and resources. Aptitude relates to inherent skills and abilities a person brings to a job (Whetten, Cameron, & Woods, 1996, p. 8), which partially develops through experience. Motowidlo & Scooter's (1994, p. 479) work supports this relationship and indicates a significant correlation with task performance to both experience ($p < .01$) and training ($p < .05$). Stroh, Northcraft, & Neale (2008, p. 64) indicate that managers use their knowledge of sub-ordinates needs and desires to motivate learning and performance.

1.4.3 CONTEXTUAL PERFORMANCE

In addition to task performance there is contextual performance, which refers to "behaviours that support the environment in which the technical core operates" (Griffin, Neal, & Neale, 2000, p. 518). Examples of contextual activities include "volunteering to carry out task activities that are not formally part of the job and helping and cooperating with others in the organization to get tasks accomplished". Therefore, in relation to the DBenv study the

importance of two types of performance emerge. Task performance relating to achieving a particular task such as completing a project on time and contextual performance that considers wider organisational objectives, such as equality and sustainability. Motowidlo & Scooter's (1994, p. 479) work also indicates significant correlations ($p < .01$) between contextual performance and ability with both experience and training. Therefore, in relation to the DBenv study a requirement to form long-term relationships emerges in order to achieve contextual performance.

Griffin, Neal, & Neale (2000) explore the contribution of contextual and task performance to effectiveness in highly technical occupations, in particular air traffic control. In relation to the construction industry there are different professional and trade related disciplines that have different requirements in relation to contextual and task performance. Task performance is defined as "the core technical behaviours and activities involved in a job" (Griffin, Neal, & Neale, 2000, p. 518). Contextual performance is under the motivational control of individuals and emerges of areas of research such as prosocial organisational behaviour, extra role behaviour, organisation citizenship behaviour, organisational spontaneity and personal initiative (Griffin, Neal, & Neale, 2000).

Griffin, Neal, & Neale's (2000) data is from 56 currently rated and endorsed Australian Air Traffic Controllers. The controllers experience ranges from six months to twenty years. Seven supervisors conduct performance ratings (using a likert scale) of participants after a six month period of observation. The task performance measure has four dimensions and ten sub dimensions. The four dimensions include maintaining situation awareness, executing control actions, communication, and operating facilities. There is a seven point likert scale with '1' representing the worst possible performance, '4' the minimal level of performance to maintain an endorsement and '7' best performance possible for the task. Contextual performance is measured using one dimension and seven sub-dimensions. The sub dimensions are teamwork, professionalism and support for organisational objectives. Similar to task performance a seven-point likert scale is employed. The effectiveness measure has three levels, specifically low medium and high difficulty.

Griffin, Neal, & Neale (2000) research relates effectiveness of a technical occupation to task and contextual performance. This is significant to the DBenv research due to the multidisciplinary nature of construction that includes technical as well as professional individuals. The data indicates for technical staff that the link between contextual

performance and effectiveness is stronger in easy conditions in contrast to hard conditions; further in contrast task performance does not differ significantly; suggesting that for technical staff "contextual performance does not contribute to effectiveness" (Griffin, Neal, & Neale, 2000, p. 532). In the case of construction contextual performance relates to helping other professionals and site workers; volunteering for work including business development; and defending the operations of an organisation. Griffin, Neal, & Neale's (2000) work suggests that within the construction industry, there is a requirement in order to achieve effectiveness, for different focuses of improvement between contextual and task performance.

1.4.4 Performance and Risk

Performance is linked to other industry standard terminology, for example supply chain management, life cycle costing, value engineering/management and lean construction. Eriksson (2010, p.400) identifies lean construction to include waste reduction, process focus, end customer focus, continuous improvements, cooperative relationships and system perspective. Therefore, there are benefits to the implementation of lean construction methodologies. Failure to achieve the benefits of other industry processes, is a risk challenge and therefore relates to performance.

1.4.5 Part Summary

Task performance relates to particular requirements of a task in hand. It is easy to understand how the same principle applies to individuals and organisational members of a supply chain. In relation to construction, it relates to completion of a project on time or to cost. Higher education institutions have wider requirements in relation to performance, for example as established earlier in this chapter sustainability. Contextual performance relates to going beyond simply performing a task to offer such things as innovation. There is a requirement for the DBenv research to establish a connection between supply chain management and the two types of performance that this part identifies.

1.5 Origins of Research

The research relates to a real world problem, that the researcher develops from practice. The Researching Practitioner's experience includes that with: a contracting organisation as a site operative (1995-1996); a National Developer 1999-2002 in its head office; and from 2003 to

present in private practice. Private practice experience relates to professional services on in excess of 35 projects, with a value in excess of £350million. Services undertaken include Quantity Surveying, Building Surveying, Project Management and Due Diligence. Projects include hotels, further education, higher education, residential, sport facilities and offices. The research interest came from a desire to improve practice and to gain a further understanding of collaboration in construction procurement. There was a requirement to understand how different ways of working deliver performance.

In addition to working in professional practice the researching practitioner works for a University, delivering two modules on a popular part time Master's course that explores construction contracts and contemporary procurement. The modules provide a forum to reconcile and develop thoughts using reflective practice techniques with practitioners in industry. During the early stages of the Professional Doctorate, the researcher was a member of an action learning set.

1.6 RESEARCH AIM AND OBJECTIVES

Aim of the research	Develop a framework to evaluate collaborative practice in Higher Education Property and Estates' departments in England
Objectives of the research	Construct a suitable framework; Develop the framework using a particular institution; and Assess the framework in the wider context of England.

1.7 FORMAT & LIMITATIONS

1.7.1 PART INTRODUCTION

The aim of this Part of the thesis is to establish the format of the thesis in line with the overall research aim and objectives. The DBenv study will make use of the existing knowledge base and collect new data.

1.7.2 LITERATURE

The aim of the Section B Literature is to provide a Framework for testing in later stages of the research. The Framework has three Maturity Models that relate to chapters, specifically, Chapter 3 Implementation, Chapter 4 Motivation and Chapter 5 Risk (see Chapter 2 Literature

Section Introduction). The work explores literature from the international community, which provides a view from different philosophical perspectives. Chapter 3 Implementation explores collaboration in line with contemporary work in construction procurement, including recent publications of the United Kingdom Government. The Government publications include a number of recommendations to achieve efficiency in construction. Section B Literature does not consider in any detail wider Governmental Policy outside the United Kingdom, or departments in other sectors that do not relate to Higher Education; for example, the work does not consider procurement in any detail by the Department of Defence.

Chapter 4 Motivation and Chapter 5 Risk take a worldview, which includes international literature sources. Chapter 4 Motivation explores psychology to gain an understanding human motivation. The focus is on psychology and not construction literature. The chapter gains an understanding of what makes people perform, in particular outside requirements. The chapter develops a maturity model to engender environments of motivation. The research relies on earlier studies in human motivation and does not actively experiment on participants to understand what motivates them. Chapter 5 Risk explores work in construction literature to gain an understanding of risk challenges that practitioners experience during the construction and refurbishment of assets. The work establishes risk challenges including risk sources, mitigation or consequences from literature.

1.7.3 DATA

The aim of Section D Primary Data is to test and develop the Framework from Section B Literature. The Section aligns with Section B Literature having Chapter 9 Implementation, Chapter 10 Motivation and Chapter 11 Risk. The three chapters relate the Framework and Maturity Models from Section B Literature to insider research at a particular organisational case study. The three chapters develop and trial the three maturity calibrations from the literature chapters. The work explores the organisational case study at various levels of focus (see Chapter 8 Primary Data Section Introduction); including a number of projects. The projects fit the retrofit agenda, which associate to the improvement of sustainability of existing estates. In these three chapters, the focus is on gaining an insider understanding of a phenomenon to test the framework on a particular organisation.

1.7.4 TRANSFERABILITY

The aim Section E Transferability is to provide the Framework with Transferability to other Higher Education Institutions in England. There is limited attempt to offer generalisation outside of England. Similarly, the work only identifies collaborative features, which are methods of working, for the purposes of testing and developing the Framework. The transferability section confirms that the collaborative features are not unique to the Primary case study. The work recognises autonomy in the fragmented higher education sector and there is no attempt to generalise use of the collaborative features over the population.

1.7.5 PART SUMMARY

The dissertation is the document that contains the thesis. Table 2 sets out the rational for the Sections of the thesis. Sections may include one or more Chapters. Where a Section has more than one Chapter there is a Section Introduction and Summary to bring the different Chapters together. In each case, the Section summaries provide a succinct summary suitable for the next stage of the research.

Table 2: Thesis' Sections

Thesis Section	Reason for Section
A Introduction	Introduces context and limitations of research
B Literature	Establishes the work within the existing knowledge base and provides basis of the framework.
C Research Design	Sets out the foundations of the thesis in relation to existing theory in philosophy and research methods.
D Primary Data	Tests and develops the framework in relation to a primary case study.
E Transferability	Tests transferability of the work, where not established in earlier Sections.
F Conclusions	Summarises earlier sections of the theses to provide a Framework suitable for use in professional practice

1.8 CHAPTER SUMMARY

The English Higher Education sector has undergone change that means that their estates departments and supply chains will need to perform efficiently in relation to contextual and

task performance. This part of the thesis sets out the basis of a research to create a framework for use by Directors of Estates in the English Higher Education Sector to improve the performance of construction supply chains. The framework will be of particular use to larger estates with aging buildings to suit the retrofit agenda.

SECTION B LITERATURE

CHAPTER 2 LITERATURE SECTION INTRODUCTION

2.1 CHAPTER INTRODUCTION

The aim of this part is to establish an approach to analyse and synthesis literature for the purpose of the DBenv study. In order to achieve the aim work will: establish the emergence of themes from earlier research that form part of the DBenv study; relate the themes to chapters within the thesis; and establish a basis of headings to allocate sub themes.

2.2 EARLIER RESEARCH

During early stages of research, conference papers facilitate peer review and de-briefing relating to the findings of the DBenv study. The first paper presented at the RICS's 2010 COBRA conference in Paris identifies the presence of collaborative features. The second paper presented at ARCOM's 2012 conference in Edinburgh provides a conceptual framework for practitioners to classify collaborative features. The framework, in Figure 7 includes three incremental axes (or gauges).

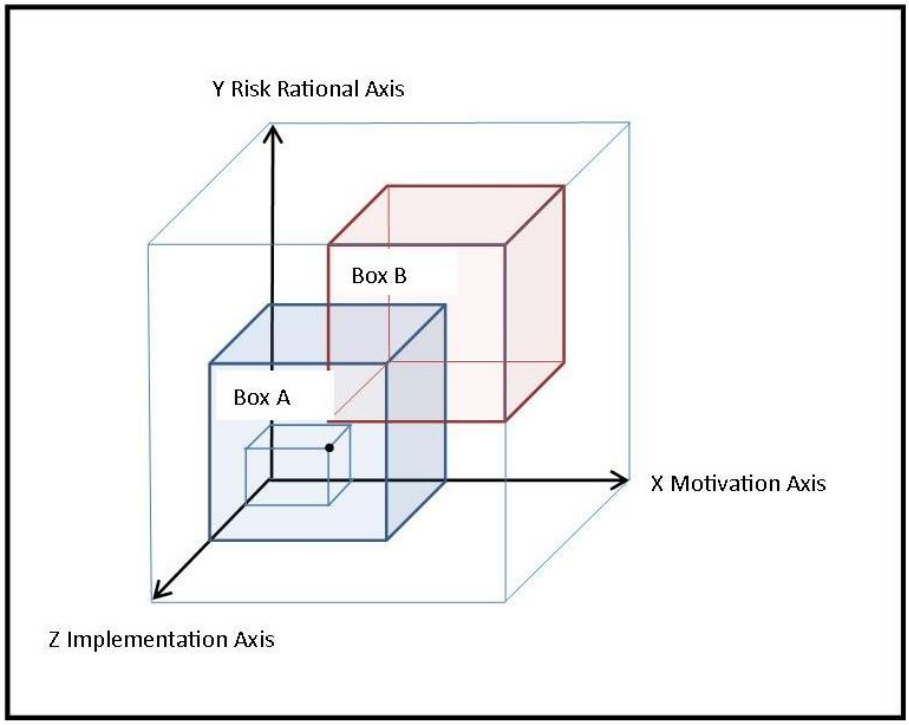

Figure 7: Rationalised Selection of Collaborative Features Initial Model

Source: Crowe & Fortune (2012)

The conference proceedings describe the framework as a model. The idea of the conceptual model is to present data on a 3D scatter plot. The model contains two boxes. Box B represents high levels of scoring against risk, motivation and implementation, which is the desirable location within the scatter diagram. Box A represents low levels of scoring against the same and is undesirable. The black dot represents an undesirable collaborative feature siting within the scatter diagram. The purpose of the model is to demonstrate the operation of the mechanism and interrelationship of the axes.

2.3 FORMAT

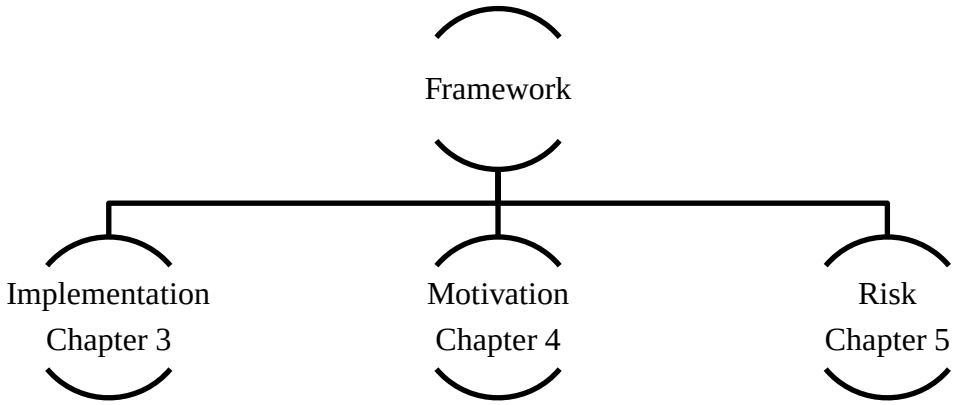

Figure 8: Thematic Approach ~~to Lit~~erature

The three axes from Crowe & Fortune (2012) form the three themes of the literature review. Figure 8 summarises the Chapters in the Literature Section of the DBenv study. Section B Literature calibrates the three themes and therefore has sub-themes that relate to each of the calibrations. Table 3 sets out the headings along with their purpose. In addition to establishing calibrations, the Section identifies collaborative features for the purposes of creating the hierarchy. There is limited attempt to make an exhaustive list of collaborative features as this has been done in previous studies.

Table 3: Literature Section Heading Format

Heading Level	Example	Purpose
I	3 CH….	Indicates chapter within the thesis. Chapters differentiate literature between the three themes of the DBenv study.
II	3.1 CH…	Indicates a Part within a chapter of the thesis. Used for chapter introductions, summaries and sub themes. Sub themes relate to the calibrations of the maturity models.
III	3.2.2 P…	The sub-sub-heading divides parts of the chapters and is used for part introductions, contents and summaries. Part contents relate to collaborative features.

2.4 ANALYSIS OF LITERATURE

The literature review is undertaken in three themes (see Figure 8). Each theme has a different theoretical basis. The aim of the first theme (Implementation) explores how organisations can achieve efficiency through collaboration. As part of its efficiency agenda the UK Government has significant contribution to make through its publications. The second theme (Motivation) explores how organisations can motivate practitioners to exceed performance requirements. There are significant contributions concerning Motivation in psychology, available for application to the construction industry, which digs down into what motivates people as organisms. The third theme (risk) requires an understanding of client risk. There are significant contributions in built environment journals concerning risk and performance expectations. Performance is a consequence of risk.

2.5 CHAPTER SUMMARY

This chapter of the thesis sets out a process to explore literature in three themes. The themes along with their deliverables are set out in Figure 9. The deliverables relate to efficiency along with exceeding and achieving performance requirements.

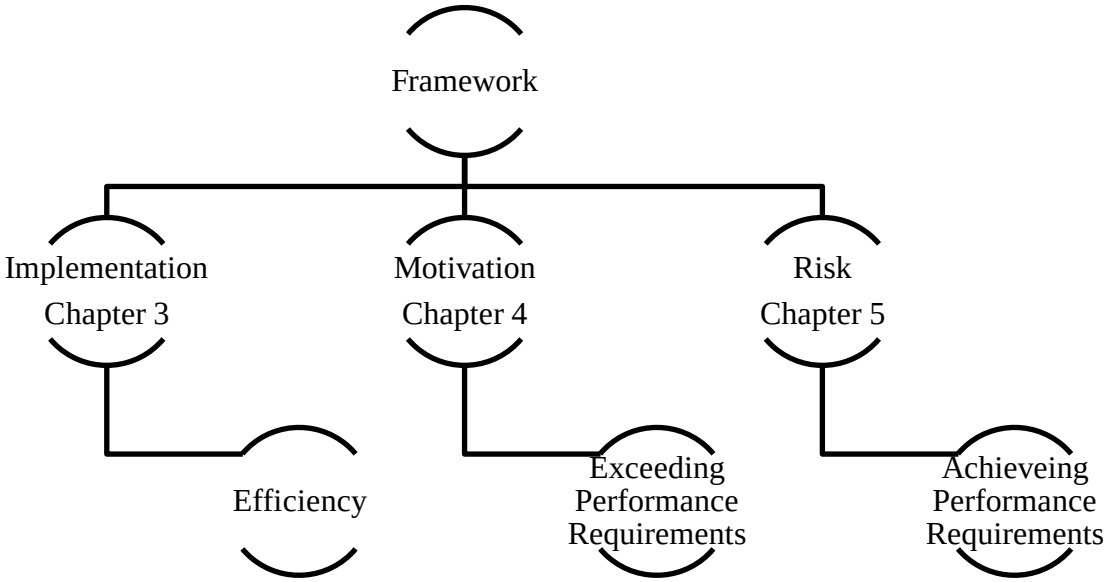

Figure 9: Literature Chapters and Deliverable

CHAPTER 3 IMPLEMENTATION

3.1 CHAPTER INTRODUCTION

The movement for collaboration is seen in reports such as 'Constructing the Team' (Latham, 1994), 'Rethinking Construction' (Egan, 1998) and 'Accelerating Change' (Egan, 2002); which 'Never Waste a Good Crisis' (Wolstenholme, 2009) reviews. In the executive summary of 'Constructing the Team', (Latham 1994: vii) there are recommendations for change in the UK Construction industry, relating among other things to collaboration, which have achieved mixed perceptions of success over the last two decades. Universities require their supply chains to collaborate, in order to implement carbon savings in a time of austerity. Collaboration with the supply chain is undertaken at project and organisational level. In addition, Universities collaborate amongst each other, at inter-organisational level. High levels of collaboration associate with the amalgamation of business activities between organisations, to reduce repetition and receive economies of scale. Third party organisations, such as the Cabinet Office facilitate the amalgamation of services. Chapter 3 Implementation thematically synthesises literature to calibrate one axis of Crowe and Fortune's' (2012) maturity model. The work develops a hierarchical basis associating to the UK Governments Construction Strategy; relates the UK Government Strategy to practice and literature; and aligns collaborative features to different levels to assist with future stages of the research.

3.2 MATURITY LEVEL I PROJECT COLLABORATION

3.2.1 PART INTRODUCTION

Section A Introduction, defines and establishes Collaboration as a desirable characteristic in construction. Work by Hughes et al (2012) defines collaboration at project level. Supporting this Bresnan and Marshall (2000) explore nine case studies relating to informal and formal aspects of collaboration, namely, selection process; continuity of relationships; teambuilding processes; design-construction integration; breadth and depth of collaboration; and performance. This part of the DBenv thesis seeks to support the understanding that collaboration occurs at project level. In addition, compares Bresnan and Marshall's (2000) aspects of collaboration to other sources in the field of construction management; at the same time as identifying collaborative features.

3.2.2 PROJECT COLLABORATION

This part of the thesis explores if collaboration occurs at project level and if so how. Crowe and Fortune (2012) explores the implementation of collaboration at project level in the higher education sector. The data is from interviews from three directors of supplier organisations, providing services to the higher education sector. During the interviews, the participants explore their understanding of collaboration, while reflecting on practice. Project level collaborative features that emerge in the work includes integration of supply chain knowledge into design; integration of other stakeholders; lessons learned meetings; procurement route; contractor selection; and incentivisation. Procurement includes the pre and post contract integration of the contractor's knowledge into design. The work establishes that collaboration does occur at project level; however, the inductive nature of the study offers limited transferability.

Work by Eriksson (2010) explores the improvement of collaboration and performance in construction supply chains. In the literature review, there are five core elements with lean construction, namely, waste reduction; process focus in production planning and control; end customer focus, continuous improvements, cooperative relationships; and systems perspective. The research method adopted is one of action research that explores the case study of a lean construction pilot project. The action researcher's role is as a Partnering Facilitator. The article makes some statements that the research method cannot support, for example, in the abstract it states that reasonable generalisations can be made from the single case study. The reason for selecting the project appears to be one more of exemplar in contrast to something that offers generalisations across the population. In other words, a test-site used for the purposes of theory testing as described by Denscombe (2003, p.33). The findings, however, allow the DBenv research to test the transferability of Crowe and Fortune's (2012) work.

Eriksson's (2010) case study is a construction project in the manufacturing sector with a value of €7million. The client associates waste to adversarial relationships and efficiencies to cooperation (Eriksson, 2010, p.397). Data collection is in the form of surveys, workshops, interviews and document analysis. The longitudinal approach comprises of surveys and workshops undertaken at the start, midpoint and end of the construction phase. The surveys collect data from between 26 and 32 project participants that rank statements of 11 aspects on a 5-point likert scale. The semi-structured interviews collect data from 12 project

participants. The breadth of data collection restricts the articles ability to present analysis detail and discussion. Seven collaborative tools used on the project, include joint objectives in the form of performance indicators, overarching collaborative agreement, joint project offices, partnering workshops and a team-building event. The joint project offices are on site for contractors and off site for consultants. The article confirms the presence of project level collaboration linking it to lean construction.

3.2.3 Performance Based Contracting

In a similar inductive study, Hartmann & Bresnen (2011, p.41) explore collaborative arrangements subsumed under the term 'partnering'. The aim of Hartmann & Bresnen's research is to explore the emergence of partnering in construction; and to develop a theoretical basis for partnering. The research adopts an activity theory perspective with its origins in Russian psychology. The DBenv thesis has a similar emphasis on psychology in Chapter 4 Motivation. The focus of Hartmann & Bresnen's study is the social constructed process of sense making and learning. The conceptual deliverable of the research develops from reflections of eight-month ethnographic case study that involves thirty-one observations, ten interviews and one intervention session. Observations are undertaken during meetings of which the attendees include representatives from the client and the contractor. The intervention session addresses specific issues that relate to different positions in the team. In a similar fashion to the DBenv research, during data collection, descriptive findings are coded into categories and concepts.

Hartmann & Bresnen's (2011, p.41) study explores an introduced performance based contract for maintenance work on roads for the client, namely the Dutch Highways and Waterways Agency. The new contract was introduced to increase the engagement of the private sector into design, construction and maintenance of infrastructure; and to reduce the adversarial separation of roles experienced between the client and the contractor in traditional contracts. Therefore a link is made between performance based contracts and collaboration in a different jurisdiction than the DBenv study. Performance based contracts receive support from UK Government Publications. A number of the UK Government's Cabinet Office (2012a, p.21; 2012, p.4; 2011, p.3) and Treasury reports (HM Treasury & Infrastructure UK, 2011, p.3; HM Treasury, 2011a, p.116) along with individual government agencies (Highways Agency, 2009a, p.10) set out a requirement for clients to produce a brief that concentrates on

performance and outcome. Therefore, there is governmental support for project level collaboration in the jurisdiction of the DBenv study.

The contract in Hartmann & Bresnen's (2011) study consolidates existing fourteen contracts into one; transforms to performance from technically descriptive in relation to components; and had a greater focus on quality in particular during contractor selection. Although there is a collaborative contract, behavioural patterns during the study include reverting to earlier behaviour and rules; mistrust; and interpretation; and expectation differences, in different and the same organisation. In an attempt to reduce conflicts, the team during an intervention session consider alternating the chairing of meetings; shared office spaces; training; change control and risk management. The study identifies partnering as less of a prescriptive process and more of a process led by sense making, perception forming and learning.

In an earlier study Bresnen and Marshall (2000) explore case studies of client-contractor collaboration in the UK Construction Industry. The research builds from an earlier review of literature by the authors (Bresnen & Marshall, 2000a) and explores 9 project case studies with a cost range of £9m to £400m. Viewpoints of collaboration are from clients, contractors, designers and subcontractors. The data is from 158 interviews. The projects are from across industry and include: (a) a gas-fired power station; (b) an airfield civil engineering work; (c) a hotel building; (d) a water treatment works; (e) an industrial gases plant; (f) an oil refinery plant upgrade; (g) a gas production plantroom; (h) corporate headquarters; and (i) an office building. There is no attempt in the work to take a representative sample from across industry. None of the projects are from the higher education sector. Since the completion of the projects in the late 1990's, Contracts in Use Surveys indicate there has been movement in contractual patterns (RICS & Davis Langdon, 2007; RICS & Davis Langdon, 2012; nbs, 2012).

Bresnen and Marshall (2000) identify the types of contract as: (a) turnkey project, negotiated fixed price; (b) NECC Contract under framework agreement, negotiated target cost with risk/reward; (c) design and build under long term partnering agreement, negotiated fixed price contract with risk reward element; (d) modified IChemE green book under long term partnering agreement, competitive tender target cost with risk reward; (e) conventional project 5 year alliance with services contractor, risk reward for alliance partner; (f) project alliance standard ICE 6 works contract, serial contracting with risk reward; (g) project alliance memorandum of understanding, competitive tender; (h) construction management,

competitive tender lump sum package contracts; and (i) conventional JCT 80, competitive tender fixed price. Detailed information surrounding the type of contract is missing from the research and in instances, the form of contract is not entirely clear; for example, one is a conventional JCT80 contract. There are various options and revisions to the JCT80 suite of contracts. The research has a focus on collaborative arrangements and does not explore all forms of contracts or associated variants. Each project adopts a team building process. The research identifies when exploring 'building collaboration: the use of tools and techniques' frameworks, contracts and incentives; contractor selection; team building, charters and facilitation.

Similar to Bresnen and Marshall's (2000) work a number a number of other authors explore incentivisation. Section A Introduction explores work by Rose and Manley (2010) that indicates that incentivisation has a positive role to play during the procurement of construction services. In addition, the role of incentivisation receives support from British Standards in relation to target procurement, socio-economic objectives, employment and key performance indicators (BSI, 2010b, pp.11, 87, 92). In contrast, Darrignton and Howell's (2011) work that Section A Introduction explores has a more critical understanding of the role of incentivisation.

3.2.4 Performance Management and Interpersonal Contract

Similar to the performance based way of working evident in Hartmann & Bresnen's (2011) study 'Rethinking Construction' (Egan, 1998) in print after 'Constructing the Team' (Latham, 1994), advocates a move away from contractual behaviour towards a paradigm more similar to that found in the car industry of partnering and performance management. In response to 'Rethinking Construction', the Joint Contracts Tribunal released Practice Note 4 as its first document to refer to partnering (JCT, 2001, p.1). The document includes three arrangements to promote collaborative behaviour and develop soft sills. Garrett (2005, p.15) refers to soft skills as including integrity/trust, verbal and non-verbal communication and leadership interpersonal relations. This is in-line with Hartmann & Bresnen's (2011) study indicates a process of sense making and perception forming and learning.

The Joint Contracts Tribunal's (JCT, 2001, p.4) first and preferred arrangement (at least in 2001) involves the use of a non-binding charter separate from the main contract. The non-binding charter includes a series of statements to promote collaborative behaviour including

acting: in good faith; in an open and trusting manner; in a cooperative manner and in a way to avoid disputes by adopting a no blame culture; fairly towards each other; and in a way that values skills while respecting each other's responsibilities. The non-binding charter signifies limited integration of collaborative contractual mechanisms within binding contracts; however, in accordance with recommendations from 'Rethinking Construction' the document includes a series of performance indicators. Performance management is established in literature (Ferreira et al., 2012; Chan & Chan, 2004; KPI Working Group, 2000), where it relates to: public private partnerships (Yuan et al., 2009); and large-scale public sector development projects (Toor & Ogunlana, 2009).

3.2.5 Legal and Tendering Framework

In a third collaborative arrangement the Joint Contracts Tribunal identifies is a specifically drafted agreement/contract (JCT, 2001, p.4), (the second arrangement is explored later in this chapter). 'Constructing the Team' recommends the use of the NEC contract (Latham, 1994, p.viii). NEC contracts contain mechanisms to promote proactive collaborative behaviour in line with industry recommendations (Latham, 1994, p.37), for example, use of easily comprehensible language and express provisions for payment. The fair payment agenda is also considered in later reports published by the UK Government (OGC, 2007; Cabinet Office, 2011, p.13), UK Legislation (UK Parliament, 1996; 2009), British Standards (BSi, 2011c, p.44), charters (University of the West of England, 2013; Highways Agency, 2013) and UK Government standards (Cabinet Office, 2012b). Although not mandatory the Strategy (Cabinet Office, 2011) and Standards (Cabinet Office, 2012b, p.7) also refer to project bank accounts. There are industry standard forms to implement project bank accounts (JCT, 2011m). In addition, there are public sector supplements for use with standard forms of contract that relate to fair payment, transparency and building Information modelling (JCT, 2011i).

Table 4: Collaborative Contracts in UK

% Contracts by Value	1985	1989	1991	1993	1995	1998	2001	2004	2007	2010
Lump Sum – Firm BQ	59.3	52.3	48.3	41.6	43.7	28.4	20.3	23.2	13.2	18.8
Lump Sum – Spec & Drawings	10.2	10.2	7.0	8.3	12.2	10.0	20.2	10.7	18.2	22.6
Lump Sum – Design & Build	8.0	10.9	14.8	35.7	30.1	41.4	42.7	43.2	32.6	39.2
Target Contracts	-	-	-	-	-	-	-	11.6	7.6	17.1
Remeasurement – Approx. BQ	5.4	3.6	2.5	4.1	2.4	1.7	2.8	2.9	2.0	0.7
Prime Cost Plus Fixed Fee	2.7	1.1	0.1	0.2	0.5	0.3	0.3	<0.1	0.2	0.6
Management Contract	14.4	15.0	7.9	6.2	6.9	10.4	2.3	0.8	1.1	0.0
Construction Management	-	6.9	19.4	3.9	4.2	7.7	9.6	0.9	9.6	0.1
Partnering Agreements	-	-	-	-	-	-	1.7	6.6	15.6	0.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

The NEC contract does not comply with all the recommendations (Latham, 1994, p.37), for example decisions concerning risk allocation at project level and the separation of the roles 'contract administrator', 'project or lead manager' and 'adjudicator'. With Lloyd, a former judge of the UK Technology and Construction Court identifying NEC's project manager as having a primary appointment to look after the employer's interest (NEC User Group, 2009). The NEC project manager also administers the contract. There is an evident paradigm shift in construction procurement, towards collaborative behaviour in binding agreements. For example, the RICS' surveys (RICS & Davis Langdon, 2007; RICS & Davis Langdon, 2012), in Table 4 indicates increases in procurement systems that promote supply chain design integration; and the emergence of target contracts which associate with collaborative behaviour. There is a further move towards contractual collaboration by the Joint Contracts Tribunal: in 2005, with the simplification in format of contracts (Davison, 2006); in 2006, the publication of the Constructing Excellence Contract; and 2009 in incorporation of collaborative tools as supplemental provisions in the Standard Form of Contract.

Greenwood's (2001) work uses a longitudinal survey to explore procurement characteristics through the perspective of suppliers and contractors. The work has an inter-organisation unit of analysis, which relates to the communication between in contrast to within organisations. The work focuses on contractors' relationships with suppliers. The survey is sent to 700 firms, through the trade associations of the Constructors Liaison Group, and data is returned concerning approximately 700 sub-contract tenders. The Constructors Liaison Group (representing specialist contractors) discontinued in 2002. The research finds sub-contract relationships to be cost driven and potentially adversarial. Adversarial relationships are the opposite of collaborative relationships. This is significant to the DBenv research, suggesting a lack of collaboration in the main contractor to sub-contractor relationship. Similarly, Crowe & Fortune (2012) identify competitive tendering as an inhibitor to collaboration.

Ross & Goulding (2007) explore integration of the supply chain into design in "Supply Chain Transactional Barriers to Design Cost Management". Data is from a postal survey returned by 310 respondents; which included senior estimators (53%), estimating directors (28%) and estimators (7%). The survey design includes 21 questions with the aim to establish the maturity of (inter-organisational) relationships between contractors and sub-contractors. The results of the data indicate that the adoption of tendering procedures by clients deviate depending on the contracting organisational size, however, the overall distribution was found

to be competition (66%); negotiated partnered (27%); negotiation (26%); and competitive tender, partnered (22%). The data indicates a preference to procurement methods associating to competition in contrast to collaboration. Furthermore, indicates that collaborative procurement is not equally enjoyed between 'small to medium enterprises' and 'larger organisations'.

3.2.6 Design and Project Integration

Greenwood's (2001) work is undertaken some years before the DBenv study, however highlights the extent of collaboration through a supply chain. Doran and Giamakis (2011) use a case study approach to explore collaboration in a 'modular supply chain'. The research has an inter-organisational perspective that includes the manufacturer and employer. The research findings invite supply chain integration to facilitate modular construction. A requirement for early engagement of key members of supply chains, is set out in a number of UK Government Cabinet Office (2012a, p.13; 2012, p.4; 2011, pp.3, 12) and Treasury reports (HM Treasury, 2012, p.35; HM Treasury & Infrastructure UK, 2011, p.18; HM Treasury, 2011a, p.115); and by individual government agencies (Highways Agency, 2009a, p.24).

The requirement for designers and contractors to work together in an integrated solution is set out in a number of UK Government Cabinet Office (2012a, p.21; 2012, p.3; 2011, p.3) and Treasury reports (HM Treasury & Infrastructure UK, 2011, p.10); and individual government agencies (Highways Agency, 2009a, p.28). All clients in receipt of government funding are to adopt the UK Government's Cabinet Office Standards (Cabinet Office, 2012b; Cabinet Office, 2011, p.8). The Standards set a requirement for the integration of supply chain and stakeholders knowledge into design (Cabinet Office, 2012b, pp.4-5). With stakeholder integration achieved through such structured mechanisms as Design Quality Indicators (Cabinet Office, 2012b, p.12). Types of procurement listed, include those associated to the Private Finance Initiative; Design and Build; and Prime Contracting (Cabinet Office, 2012b, pp.4-5). Further clarity in relation to procurement routes is provided in Cabinet Office's Construction Trial Project report (Cabinet Office, 2012). The methods identified by the report include Cost Led Procurement, Integrated Project Insurance, Two Stage Open Book and centralised procurement.

The Construction Trial Projects report (Cabinet Office, 2012) identifies the procurement model of 'Integrated Project Insurance', which relates to where a client invites suppliers to

compete, for the delivery of a project. There is a step away from competitive tendering, towards a two-stage approach. The team works up the scheme in line with a budget, checking is against benchmarks. Integrated project Insurance finances cost overruns. During a presentation at the CUBE in Manchester in March 2012, the Construction Category Head of the Cabinet Office's Efficiency & Reform Group relates the form of procurement to the PPC 2000 (ACA, 2008) form of contract. PPC stands for Project Partnering Contract. The multi-party contract represents a paradigm shift in contractual relationships. Constructors and consultants enter into a joint agreement, with the employer.

3.2.7 VALUE MANAGEMENT AND ENGINEERING

The Construction Standards (Cabinet Office, 2012b, p.6) set out mechanisms, which associate to project management, which include value management, value engineering and whole life cycle costing. Both the Joint Contracts Tribunal and NEC contracts include provisions for value engineering. Section 2.4 of the standards (Cabinet Office, 2012b) sets out that value management should be undertaken to consider economic, environmental and social costs. This is in line with recent Legislation for Contracting Authorities, namely the Public Services (Social Value) Act 2012 (UK Parliament, 2012). This act applies to all Universities that receive more than 50% of their funding from public sources, as provided in Section 3(1)(W) of the Public Contracts Regulations 2006 (UK Parliament, 2006). Under Section 1(3), an authority must consider "how what is proposed to be procured might improve the economic, social and environmental well-being of the relevant area". The Act legislates against contractor selection on lowest price only.

3.2.8 INITIATIVES

Section 3.5 of the Cabinet Office's (2012b, p.10) standards sets out that clauses are to be included in contracts, providing that regular visitors to site should demonstrate their health and safety competence through such a scheme as CSCS. In addition, the standards provide contractors undertaking construction are to register with a site management and/or good neighbour scheme, such as the Considerate Constructors Scheme. Legislation that promotes collaboration is the Health and Safety at Work Act 1974 (UK Parliament, 1974). The CDM Regulations are made under the umbrella of this act. Section 5 and 6 of the regulations specifically require cooperation (UK Parliament, 2007). The Standards refer to The Approved Code of Practice, which supports the CDM Regulations (Cabinet Office, 2012b,

p.7). The Approved Code of Practice, (HSE, 2007, p.16) provides that "clients should seek to appoint those who can assist with design considerations (including contracting organisation) at the earliest opportunity so that they can make a full contribution to risk reduction during planning stages". Therefore, it can be seen that collaborative behaviour is required in order to be compliant, with the ethos emerging from legislation. In the case of health and safety, there is a requirement for early contractor involvement in design. Put simply legislation supports the case for project level collaboration.

3.2.9 Information Technology

Puschmann and Alt (2005) explore the implementation of communication processes during organisational procurement, and identify advantages to electronic communication through computer and internet technology. Bidgoli (2012) identifies that e-collaboration systems include electronic meeting systems, web 2.0-based collaboration technologies and telepresence. The 'Higher Education in a Web 2.0 World' report is authored by a number of key organisations in the higher education sector (Becta, Department for Employment and Learning, Higher Education Funding Council for England, Higher Education Funding Council for Wales, JISC, Learning Skills Council, Lifelong Learning UK, Scottish Funding Council & Universities UK, 2009). The report identifies Web 2.0 to include: blogging; conversing (chat messaging); media sharing; online gaming and virtual worlds; social bookmarking; social networking; syndication; trading and wikis. Therefore, there is a clear understanding in practice of the benefits of Web 2.0 technology as an enabler of collaboration. There is a field of research that explores Building Information Modelling, which is more construction specific (see 3.3.2 Building Information Modelling, Practice and Procedures).

3.2.10 Part Summary

There are significant contributions in literature to demonstrate the occurrence and desirability of project level collaboration. Table 5 relates literature to collaborative features available for implementation at project level. The collaborative features have characteristics.

Table 5: Literature Confirming Project Level Collaboration

Category	Collaborative Feature	Literature
Performance Based Contracting; Performance Management	incentivisation; performance; performance based contract; performance management; performance indicators; procurement route; and target contracts.	ACA, 2008; Bresnen and Marshall 2000; BSI, 2010b; Chan & Chan, 2004; Egan, 1998; Eriksson 2010; Ferreira et al., 2012; Crowe and Fortune, 2012; Cabinet Office, 2012a, 2012, 2011; Darrignton and Howell, 2011; FIDIC, 1999b; Hartmann & Bresnen, 2011; Highways Agency, 2009a; HM Treasury & Infrastructure UK, 2011; HM Treasury, 2011a; JCT, 2011a, 2011e, 2011k; JCT, 2011a, 2011e, 2011k; KPI Working Group, 2000; NEC, 2006b; RICS & Davis Langdon, 2007, 2012; Rose and Manley 2010; Toor & Ogunlana, 2009; Yuan et al., 2009
Interpersonal Contract	acting in good faith; in an open and trusting manner; in a cooperative manner; continuity of relationships; integration of other stakeholders; lessons learned meetings; shared office spaces; soft skills; teambuilding processes; and training.	ACA, 2008; Bresnan and Marshall, 2000; Crowe and Fortune 2012; Eriksson 2010; FIDIC, 1999b; Hartmann & Bresnen, 2011; JCT, 2001, 2011a, 2011e, 2011k; NEC, 2006b
Legal Framework & Tendering	fair payment; simplification of contracts; legislative compliance; overarching collaborative agreement; charters; facilitation; contractor selection; non-competitive tendering; and sub-contractor relationships.	Bresnan and Marshall, 2000; BSi, 2011c; Cabinet Office, 2011, 2012b; Crowe and Fortune, 2012; Davison, 2006; Eriksson 2010; Greenwood's, 2001; Highways Agency, 2013; JCT, 2001, 2011a, 2011e, 2011i, 2011k; OGC, 2007; Ross & Goulding, 2007; UK Parliament, 1996, 2009; University of the West of England, 2013
Design and Project Integration	design-construction integration; design and build; engagement of the private sector into design, construction and maintenance; integrated project insurance; private finance initiative; prime contracting; project partnering contract; and two stage open book.	ACA, 2008; Bresnan and Marshall, 2000; Cabinet Office, 2012b, 2012a, 2012, 2011; Crowe and Fortune, 2012; Doran and Giamakis, 2011; Hartmann & Bresnen, 2011; Highways Agency, 2009a; HM Treasury, 2011a, 2012; HM Treasury & Infrastructure UK, 2011; HSE, 2007; JCT, 2011h; RICS & Davis Langdon, 2007, 2012

Category	Collaborative Feature	Literature
Value Management and Engineering	change control; risk management; value engineering; value management; and whole life cycle costing.	ACA, 2008; Cabinet Office, 2012b; FIDIC, 1999; Hartmann & Bresnen, 2011; JCT, 2011a, 2011e, 2011k; NEC, 2006b
Initiatives	Considerate Constructors Scheme; CSCS; and health and safety co-operation and risk reduction.	Cabinet Office, 2012b; UK Parliament, 1974, 2007; HSE, 2007
Information Technology	BIM; electronic meeting systems, web 2.0-based collaboration technologies; and telepresence.	Becta, et al., 2009; JCT, 2011i; Puschmann and Alt, 2005; Bidgoli 2012

3.3 MATURITY LEVEL II ORGANISATIONAL COLLABORATION

3.3.1 PART INTRODUCTION

The previous part of the DBenv thesis identifies that collaboration is desirable on a project-by-project basis. Where an organisation undertakes the construction and refurbishment of more than one strategy, such as the case with many HE institutions, the logical progression is for an organisational approach to collaboration. This part of the DBenv thesis seeks to support the premise that it is desirable to make decisions concerning collaboration at organisational level. During the discussion, the work expands collaborative features to suit organisational level collaboration.

3.3.2 BUILDING INFORMATION MODELLING, PRACTICE AND PROCEDURES

The UK Government sets out its overall objective, for the implementation of BIM, in the Construction Strategy (Cabinet Office, 2011). In section 2.32 of the strategy, there is a requirement for data (project and asset information) to be in an electronic 3D format by 2016. The adoption of BIM on a project-by-project basis is seen in the adoption process that includes pilot schemes (Cabinet Office, 2012). The Building Information Modelling Working Party Strategy Paper includes a draft Building Information Modelling and Management Protocol (Constructing Excellence, UKCG & Construction Industry Council, 2011). The Protocol is for inclusion with a NEC3 type contract, in the Works Information Section. The protocol includes contents for project implementation including an introduction; definitions; model content development; user authorisation of the building information model in each project phase; model ownership; and applicable standards.

The Protocol clearly relates BIM to the life cycle of an asset (Constructing Excellence, UKCG & Construction Industry Council, 2011, p.100). The protocol sets out that overall model

development, coordination and integration is the responsibility of the Model Manager. During a life cycle of an asset, which could be as long as forty years, there will be a requirement for the model manager to change; therefore, there is a requirement for an inter-organisational approach to BIM. In addition, to make best use of the data model ownership along with intellectual property rights over the lifecycle of the asset are also a consideration, during the drafting of individual appointments and contracts, often let on a project-by-project basis. The way to achieve the organisational approach is through organisational practice and procedures.

For use with the JCT contracts, there is the 'Public Sector Supplement for Fair Payment, Transparency and Building Information Modelling' (JCT, 2011i). In the document, it includes modifications for the JCT's 2011 suite of contracts, to deal with Fair Payment, Transparency and the BIM Protocol. The document indicates conditions in JCT's existing suite of contracts "appear adequate"; with BIM, contractually implementing through other contract documents including preliminaries and employer's requirements. Contractual documents requiring harmonisation include design submission procedures, information release schedules and communication protocols. The JCT relate implementation of BIM to collaborative working (JCT, 2011i, p.2), supporting the main thrust of this DBenv thesis. In addition suggests that such collaboration is achievable though project level and organisational level documents which supports the thrust of this part of the thesis (JCT, 2011i, p.2). The documents include the Pre-construction Services Agreement (JCT, 2011h), Framework Agreement (JCT, 2011e), Consultancy Agreement (JCT, 2011c), JCT Constructing Excellence Contract (JCT, 2011a) and the preliminary phase of the Management Contract (JCT, 2011f).

McAdam (2010, p.254) identifies two specific contract initiatives, developed in America, namely, the ConsensusDOCS' 301 – Building Information Modelling Addendum (ConsensusDOCS, 2008), and American Institute of Architects' Document E202 – Building Information Modelling Protocol Exhibit (AIA, 2008). Document E202 is similar in many ways to the Protocol, in the Building Information Modelling Working Party Strategy Paper (Constructing Excellence, UKCG & Construction Industry Council, 2011). The organisation responsible for management of the model is set out in the "Model Management" section (AIA, 2008, p.3). The level of development for each model element, at the end of each phase, is set out in a table towards the end of the Protocol.

Standard procedures may set out how different systems inter-operate, to provide an overall deliverable. Inter-operation of systems, however, brings with it an element of risk (McAdam, 2010, p.3). Data transfers between systems manually create work for practitioners and bring risks that associate to human error. The logical way to overcome this risk is with a single consolidated electronic system, to manage the required deliverable, for the purposes of funding, governance and management of the organisation. The consolidated system also needs to manage the procurement process including contract administration. Bew and Underwood (2009) and Bew and Richards (2008) explore a similar system for use at project level. The suggestion in the DBenv thesis is to extend the idea, from use at project to organisational or even inter-organisational level.

3.3.3 Operation Integration

Operation integration involves aligning the interest between those that design, construct and operate buildings. A desire to integrate different parts of the life cycle of an asset brings with it a requirement for organisational collaboration, in contrast to a consideration on a project-by-project basis. A requirement for operation integration including that in relation to building information modelling (BIM) and soft landings is set out in a number of the UK Government's Cabinet Office (2012a, pp.4,16; 2012, p.3; 2011, pp.13-14) and Treasury (HM Treasury & Infrastructure UK, 2011, p.16) reports. Operation integration requires an organisational viewpoint and supports the DBenv's argument for this level of the maturity model.

The Infrastructure and Construction Pipeline (HM Treasury, 2012) identifies a major part of planned expenditure for the UK Government as Transportation. Within transportation, there are the sub sectors of LA (Local Authority) Majors, HA (Highways Agency) Majors and HA Renewals. The Highways Agency is responsible for the management and development of England's motorway and trunk road network. The diverse nature of constructing the country's infrastructure results in an equally diverse range of methods of procurement. Low value projects are procured through frameworks (Highways Agency, 2009a). This indicates a, organisational approach to procurement in a different sector than the focus of this DBenv thesis.

The Highways Agency procures high value and high-risk projects using the Finance Initiative, Management Agent Contracting, Early Contractor Involvement and Design and Build

procurement (Highways Agency, 2009a). Management Agent Contracting is typically five years in length and is the contractual vehicle for maintaining, operating and improving the network (Highways Agency 2009 p. 36). The Management Agent Contractors are responsible for the roads within a given geographical area. Decision for procurement including early contractor involvement and design and build is made at organisational level. In line with the 'operation integration' theme from the Strategy (Cabinet Office, 2011) a number of the procurement methods on the highways integrate contractors into the design, construction and operation of projects. The highway's agency legal powers and obligations are formed under the New Roads and Street Works Act 1991 (UK Parliament, 1991) and Highways Act 1980 (UK Parliament, 1980a) and devolve to contractors including Management Agents where contracts involve the operation of the facility. This is significant to the DBenv research in that it demonstrates the capacity of legislation to mould around procurement.

The private finance initiative operates in other sectors than transportation. Perceptions of success do not associate with the Private Finance Initiative in all sectors. The 2012 budget indicates financial reductions for education sector. The policy change signifies a move away from the Building Schools for the Future (BSF) Programme of the previous government. The James 2011 (James, 2011) report identifies three distinct streams of capital expenditure namely, devolved programmes (£2.5billion), building schools for the future (£1.4billion) and targeted programmes (£2.0billion). The devolved programmes provide money directly to Local Authorities. The BSF programme involves bringing the public and private sector together through the establishment of Local Education Partnerships, joint ventures between the public and private sectors. The significance of the BSF Scheme is in the scale of its programme, launched in 2003 with an aim to rebuild and refurbish every secondary school in England by 2020 through a ratio of 50% new build, 35 major upgrade 15% minor upgrade at a cost of £55billion (James 2011 p. 12). In 2011, the scheme had spent £3.5billion through conventional funding and £5.15billion of PFI credits (James 2011 p. 12).

Following the general election in 2010 radical changes were a foot to capital investment in the England's Schools and the BSF programme is in the process of being replaced. The Partnerships for Schools ceases to exist and with its responsibilities transferred to the Education Funding Agency (EFA), with approximately 700 schools to have their projects cancelled. The Department for Education' replaces 'Department for Children, Schools and Families'. The replacement scheme is the Priority School Building Programme, which is a

Public Private Partnership Programme with two strands, namely private finance and capital funding. The programme focuses on reduced levels of funding to improve the worst school estates. Experiences from the higher education sector are significant to the DBenv thesis in that they indicate that achieving organisational collaboration is not as simple as implementing PFI procurement.

3.3.4 ESTATES STRATEGY

Universities have an organisational viewpoint, which becomes evident when they apply for funding from the Higher Education Funding Council for England (HEFCE). In the submission form for HEFCE's Investment Framework (HEFCE, 2012), there is a requirement for an organisational (institutional) viewpoint. The strategic viewpoint includes for the condition of the estate; space efficiency; carbon reduction; environmental performance; affordability; and institutional sustainability. A strategic approach to sustainability is also a requirement set out in legislation (UK Parliament, 2008a) and the UK Government's Standards (Cabinet Office, 2011, p.13). To achieve the organisational viewpoint on these matters, there is a requirement to have an element of collaboration, between those that procure and construct building works. Organisational collaboration may be set out in a practice and procedures manual.

3.3.5 FRAMEWORKS AND PROCEDURES

Standardised procedures implement as part of a framework agreement. A framework agreement relates to the second collaborative arrangement that the Joint Contracts Tribunal identifies as a "binding partnering agreement for single project or strategic partnering", for use with a form of contract (JCT, 2001, p.4). Crowe and Fortune (2012) identify that frameworks facilitate inter-organisation communication between supply chain partners, which provide similar services, in relation to health, safety and cost. In addition, competition is an inhibitor to the transfer of cost knowledge. In a third collaborative arrangement the Joint Contracts Tribunal (2001, p.4) involves the use of a binding charter adapting agreements at project or at strategic level, for example a framework. The Joint Contracts Tribunal's 2011 suite contracts includes a framework agreement (JCT, 2011e) with such collaborative features as a communication protocol, sustainable development, value engineering, change control, early warning and a team approach to problem solving. Therefore, an organisational approach is available to implement project level collaborative features.

The Cabinet Offices (2011) strategy sets out procurement models that are further developed in the 'Construction Trial Projects' report (Cabinet Office, 2012). The strategy proposes a move away from "wastefulness of teams completing and costing a series of alternative designs for a single project" with only one being built. Two models of procurement are set out in the strategy (Cabinet Office, 2011, p.16): one that uses a combination of frameworks with benchmarked data; and one that uses a guaranteed maximum price underwritten by insurance. A requirement for effective price benchmarking and cost targeting is set out in a number of the UK Government's Cabinet Office (2012a, p.10; 2012, p.4; 2011, p.11) and Treasury (HM Treasury, 2012, p.39; HM Treasury & Infrastructure UK, 2011, p.18; HM Treasury, 2011a, p.116) reports; along with individual government agencies (Highways Agency, 2009a, p.13). Benchmarking requires organisational and inter-organisational ways of working and supports Maturity Level II Organisational Collaboration and Maturity Level III Inter-organisation Collaboration.

Two models in the Construction Trial Projects report are 'integrated project insurance' and 'two-stage open book' (Cabinet Office, 2012, p.5). Other models include 'cost led' and 'centralised' procurement (Cabinet Office, 2012, pp.5-6). The 'two stage open book', 'cost led' and 'centralised' procurement models involve the use of a framework. The 'cost led' procurement approach, involves a client putting in place a team as an integrated supply chain, which includes constructors and consultants. This integrated approach is similar to that implemented as Management Agent Contracts (on the Highways) and the NHS's Procure21+. Under the cost led procurement approach, the basis of selection is by scoring contractors able to deliver the scheme within the cost ceiling. The score derives by examining the tendering organisation and staff. The use of scoring represents deviation from traditional methods of competitive tendering. The two-stage open book approach selects contractors in a similar fashion to the cost led approach, with the formation of the contract sum using open book methods. The implementation of standard ways to procure works and frameworks supports Maturity Level II Organisational Collaboration and Maturity Level III Inter-organisation Collaboration.

3.3.6 PART SUMMARY

This part of the thesis identifies organisational approaches to collaboration. There is a logical progression from project to organisational level consideration. Further emphasis on organisational approaches emerges through recommendations from government reports; and

changes in technology including that relating to BIM and soft landings. Table 6 relates literature from this part of the DBenv thesis to collaborative features.

Table 6: Literature Confirming Organisational Collaboration

Category	Collaborative Feature	Literature
Building Information Modelling, Practice and Procedures	BIM; organisational level documents; and inter-operability of systems.	Bew and Underwood, 2009; Bew and Richards, 2008; Cabinet Office, 2011, 2012, 2012a; Constructing Excellence, UKCG & Construction Industry Council, 2011; McAdam 2010; Treasury & Infrastructure UK, 2011
Operation Integration	soft landings; frameworks; finance initiative; management agent contracting; and organisational standard procurement.	Bresnen and Marshall (2000); Cabinet Office 2012a, 2012, 2011; Highways Agency, 2009a; HM Treasury & Infrastructure UK, 2011; James, 2011;
Estates Strategy	condition of the estate; space efficiency; carbon reduction; environmental performance; affordability; and institutional sustainability.	Cabinet Office, 2011; HEFCE, 2012; UK Parliament, 2008a
Frameworks and Procedures	framework agreement; and integrated supply chain	Bresnen and Marshall 2000; Cabinet Office, 2012; Crowe and Fortune (2012); JCT, 2001, 2011e

3.4 MATURITY LEVEL III INTER-ORGANISATION COLLABORATION

3.4.1 PART INTRODUCTION

The previous part of this DBenv thesis considers collaboration at organisational level. In Section A Introduction, work by Bakker, Walker, Schotanus, & Harland (2008) explores inter-client organisation collaboration. Inter- organisational collaboration relates to where organisations work together to share knowledge in such areas as best practice. This part of the thesis establishes further inter-organisational collaboration and collaborative features.

3.4.2 INTER-ORGANISATIONAL KNOWLEDGE

A requirement to develop the supply chain through the provision of a forward programming of information is identified in the UK Government's Cabinet Office (2012a, p.8; 2012, p.4; 2011, pp.3, 8), Treasury (HM Treasury, 2012, p.19; HM Treasury & Infrastructure UK, 2011, p.15; HM Treasury, 2011a, p.115) and individual government agencies (Highways Agency,

2009a, p.16) reports. For example, methods to share data include benchmarking and the 'Construction Pipeline' (HM Treasury, 2012a). The sharing of data allows inter-department approach by central government, when managing supplier relationships. Public sector funding is provided to universities, through the Department for Business Innovation and Skills, which sets the grant that is awarded to The Higher Education Funding Council for England (HEFCE). HEFCE in turn provides capital expenditure to the institutions, through the Capital Investment Fund 2 (HEFCE, 2011a). Capital funding relates to learning and teaching (£49million); and research (£549million). As part of the funding requirements, Universities provide inter-organisational data to HEFCE. Therefore, it is clear inter-organisational collaboration already occurs to an extent in the HE sector.

The UK Government perceives data incentivises long term research and development, as indicated in Cabinet Office (2012a, p.21; 2012, p.4; 2011, p.3), Treasury (HM Treasury, 2012, p.35; HM Treasury & Infrastructure UK, 2011, p.19; HM Treasury, 2011a, p.115) and individual government agencies (Highways Agency, 2009a, p.34) reports. The Cabinet Office's (Cabinet Office, 2011, p.8) Strategy provides for supply chain development using forward programmes. The Cabinet Office provides data in the Construction Pipeline for larger projects, a small number of which relate to University buildings in comparison to overall sector population. Indicating HE organisations are not currently sharing information inter-organisationally in accordance with government policy. A more accurate assessment of procurement in the HE sector is available using data from HEFCE. There is a clear indication of the inter-organisational sharing of knowledge supporting Maturity Level III Inter-organisation Collaboration.

The Cabinet Office's new models for construction procurement require the inter-organisational sharing of benchmark data. The Cabinet Office has started to collect this data from governmental departments (Cabinet Office, 2012d). If universities are to use the new models of procurement, they will also need to share data on an inter-organisational basis. For example a University may only construct one student accommodation building every 10 years, as such would not have the internal benchmark data, within their organisation. The requirement to implement the new models of procurement places emphasis for Universities to achieve Maturity Level III Inter-organisation Collaboration.

3.4.3 STANDARDISED LEGAL FRAMEWORK

Cabinet Office's (2011, pp.13-15) Strategy identifies shared practice in relation to the standardisation of contracts and frameworks. Contracts in use surveys indicate JCT and NEC suites of contracts as being the most popular in the UK (RICS & Davis Langdon, 2007; 2012; nbs, 2012). The Joint Contracts Tribunal (JCT) has standard forms of contracts and guidance in production since formation in 1931 (JCT, 2007a). Members of the JCT include British Property Federation Limited, Contractors Legal Group Limited, Local Government Association, National Specialist Contractors Council Limited, Royal Institute of British Architects, The Royal Institution of Chartered Surveyors and Scottish Building Contract Committee Limited (JCT, 2011l). The broad spectrum of members represents support towards Maturity Level III Inter-organisation Collaboration, across the supply chain, to provide and implement standard terms.

There are 1998, 2005 and 2011 JCT suites of contracts; with amendments to the contracts between the dates. The JCT's move towards simplifying contracts is seen in the publication of the Major Project Form (JCT, 2003a); with a short and simple approach to contract documentation (JCT, 2011g) for experienced clients that undertake major projects (JCT, 2003b, p.2). The Major Project Form (JCT, 2003a) is 45 pages in length in comparison to the 127 pages of the Standard Building Contract (JCT, 2003c). Davison (2006) reconciles four forms of the JCT's 2005 contracts with the 1998 equivalent. The purpose of the reconciliation is to assist practitioners with the change in contract style. The contracts are suitable for the procurement of main contractor works. Davison's (2006) work summarises in the introduction critical changes and two general trends. The critical changes relate to form (or style) and substance. The two general trends are a higher standard of contract administration and greater clarity at the outset due to contract being more complete.

Amendments are made to the 2005 suite of contracts in 2007 (JCT, 2007) incorporating the CDM Regulations (UK Parliament, 2007). The CDM regulations promote contractor collaboration in the design phase of construction. Other amendments associate with assignment, third party rights and collateral warranties (JCT, 2007). In 2009, JCT's 2005 suite receives amendments to incorporate collaborative principles adopted by the Office of Government Commerce in its Achieving Excellence in Construction initiative (JCT, 2009b). The significance of the 2009 revision to the DBenv research is seen in Standard Building Contract with Quantities Revision 2:2009 (JCT, 2009e); which incorporates a collaborative

eighth recital and schedule 8 which is not in the earlier version (JCT, 2007). The supplemental provisions relate to collaborative working; health and safety; cost savings and value improvements; sustainable development and environmental considerations; performance indicators and monitoring; and notification and negotiation of disputes. Therefore, inter-organisational contracts are evolving to promote collaboration. This supports the use of the maturity model for evaluation of collaborative features as well as Maturity Level III Inter-organisation Collaboration.

A number of collaborative mechanisms emerge in the JCT's 2005 suite of contracts including the Partnering Charter (JCT, 2005d); Framework Agreement (JCT, 2005a); and Framework Agreement Non-binding (JCT, 2005b). The Framework Agreement (JCT, 2005a) is for use with an underlying form of contract (issued for each project). The charter and agreements continue to feature in the JCT's current 2011 suit. The JCT 2011 edition revisions allow for the coming into force of amendments to the Housing Grants, Construction and Regeneration Act 1996 by the Local Democracy, Economic Development and Construction Act 2009 (JCT, 2011j, p.1). The Act includes provisions that relate to fair payment, which demonstrates collaboration to achieve a win-win relationship. Therefore, there are inter-organisational standard forms of contract to promote Maturity Level III Inter-organisation Collaboration.

There are collaborative options in the eighth recital and schedule eight of the Standard Building Contract with Quantities (JCT, 2011k); similar options exist within the Schedule 2 of the Design and Build Contract (JCT, 2011d). The 'Standard' and 'Design and Build' contract are the most popular contracts in the suite (RICS & Davis Langdon, 2012, p.14). The inclusion of the tools in the contracts signifies a movement towards soft skills and performance management; with contracts moving away from hard contractual, to soft management methods of working. Prior to the incorporation of the tools, a practitioner would use a separate agreement to implement contractual collaborative ways of working, with a standard form of contract.

Table 7 (p.54) uses thematic analysis to compare the collaborative characteristics of different contractual forms. Enhanced sharing information and expertise includes sharing (with exclusions) information over and above the contractual requirements that would be assistance to other project participants. Enhanced health and safety provision includes: comply with all approved codes of practice produced or promulgated by the health and safety executive and/or the health and safety commission; membership of Construction Skills Certificate Scheme;

personnel to receive site specific induction; supply chain access to health and safety advice; and health and safety consultation with all personnel. The Table indicates collaborative features in inter-organisational documents supporting Maturity Level III Inter-organisation Collaboration.

The JCT's Constructing Excellence Contract represents a move towards collaborative procurement. The document is approximately 69 pages in comparison to the 127 pages of Standard Building Contract. Table 7 compares the collaborative characteristics of the JCT's Constructing Excellence Contract (JCT, 2011a) with Standard Building Contract with Quantities (JCT, 2011k). Both contracts identify with most collaborative features in the Table. One difference between the two is that collaborative procurement is the default position of the Constructing Excellence Contract (JCT, 2011a) and an option in Standard Building Contract with Quantities (JCT, 2011k). The Constructing excellence contract has both target cost and lump sum options.

Table 7 (p.54) compares the collaborative characteristics of the Constructing Excellence Contract with the Framework Agreement (JCT, 2011e). The contract includes an element of nearly all of the collaborative themes. One key difference between the contract (JCT, 2011a) and the standard forms (JCT, 2005c; JCT, 2011k) is a greater focus on risk assessment/allocation. The contract is designed with collaborative tools in mind however also includes contractual mechanisms such as liquidated damages. The contract does not include the provision of change control however does include for incentivisation with a target cost option. Many collaborative characteristics of the Framework Agreement (JCT, 2011e) are not in the Standard Form of Contract (JCT, 2005c). The 2005 contract makes limited reference to such characteristics as value engineering, sustainability, incentivisation and performance indicators. Another document available for use alongside a main contract is the Pre-Construction Services Agreement (JCT, 2011h) for use with a two stage tendering procedure. The agreement is intended for use prior to the execution of the JCT Standard Building Contract; Design and Build Contract; Major Project Construction Contract; Intermediate Building Contract; or Intermediate Construction Contract with Contractors Design (JCT, 2011h).

Table 7: Thematic Analysis of Collaborative Characteristics in Contracts

Collaborative Characteristics	Framework (JCT, 2011e)	SBC/Q (JCT, 2005c)	CE (JCT, 2011a)	SBC/Q (JCT, 2011k)	ECC Opt A (NEC, 2006b)	PPC (ACA, 2008)	Yellow Book (FIDIC, 1999b)
Collaborative working	Yes cl.5, 9	Limited	Yes cl.2.1	Yes s.8	Yes cl.X12.3	Yes cl.1.3	Yes cl.4.6
Ditto supply chain	Yes cl.10	Limited	Yes cl.4.16	Limited	Limited	Yes cl.1.3	Limited
Enhanced sharing information	Yes cl.8, 11	Limited	Yes cl.4.1	Limited	Yes cl.X12.3	Yes cl.3	Limited
Communications protocol	Yes cl.12	Yes cl.1.7-8	Yes cl.1.7	Yes cl.1.7	Yes cl.13 X12.2-3	Yes cl.3	Yes cl.1.3
Risk assessment/allocation	Yes cl.14	Limited	Yes cl.4.16, 5.1-2	Limited	Yes, cl.16	Yes cl.12.9,18.1	Allocation cl 17
Enhanced Health and safety	Yes cl.15	CSCS cl.2.3	Yes cl.12.1	Yes s.8	Limited	Yes s.7	Yes cl.4.8
Environment and sustainability	Yes cl.16	Limited	Yes cl.12.2	Yes s.8	Limited	Yes cl.18	Yes cl.4.18
Value engineering	Yes cl.17	Limited	Yes cl.4.16	Yes s.8	Yes cl. X12.2-3	Yes s.17	Yes cl.13.2
Financial Incentivisation	Yes cl.17	Limited	Yes cl.7.30	Yes s.8	Yes cl.X6, X12.4, X20	Yes cl.13	Yes cl.14.7
Change control/Quotation	Yes cl.18	Yes cl.5.3	Limited	Yes s.2	Yes s.6	Yes s.17	Limited cl.13.3
Performance indicators	Yes cl.21	Limited	Yes s.6	Yes s.8	Yes, cl.X20	Yes s.23 ap 8	Limited cl.5.4
Dispute ladder/negotiation between senior executives	Limited	Limited	Yes cl.11.2	Yes s.8	Adjudicator role cl.W1	Partnering advisor s.5	Adjudication board cl.20.2
Mediation	Yes p.9	Yes	Yes	Yes	Limited	Conciliation app.5	Amicable settlement cl.20.5

The NEC3 Engineering and Construction Contracts (ECC) are suitable where a contractor has full or no design responsibility in the UK and other countries (NEC, 2006, p.1). The contract is written in ordinary language for people not familiar to formal contracts, the exception being where the words have legal meaning (NEC, 2006, p.2). The contract includes core, main option, dispute resolution and secondary option clauses. Core clauses are common for use with all main options (NEC, 2006a). The main option clauses include: (A) priced contract with activity schedule (NEC, 2006b); (B) priced contract with bill of quantities (NEC, 2006c); (C) target contract with activity schedule; (D) target contract with bill of quantities; (E) cost reimbursable contract; and (F) management contract. The clauses for dispute resolution include: (W1) unless the United Kingdom Housing Grants, Construction and Regeneration Act Applies; (W2) where the act does apply. The clauses for secondary options include (X1) price adjustments for inflation; (X2) changes in law; (X3) multiple currencies; (X4) parent company guarantee; (X5) sectional completion; (X6) bonus for early completion; (X7) delay damages; (X12) partnering; (X13) performance bond; (X14) advanced payment to the contractor; (X15) limitation of the Contractor's liability for his design to reasonable skill and care; (X16) retention; (X17) low performance damages; (X18) limitation of liability; (X20) and key performance indicators. Unlike main option and dispute resolution clauses, it is possible to selection for more than one secondary option. The ECC includes a schedule of cost components and contract data formats. Depending on the choice of main option, the documents may include bills of quantities or activity schedule. Therefore, similar to the JCT suite there are options available for selection in the contract that align with collaborative features.

The NEC (2006, p.12) recommends not to consider adjudication as a form of litigation, instead as a method of dealing with honest disputes, for this reason it as a collaborative tool. The NEC is a pioneer of the adjudication process, with 'Constructing the Team' (Latham, 1994, p.87) recommending the incorporation of the procedure in all construction contracts (Latham, 1994, p.87); including that from the Joint Contracts Tribunal. The Housing Grants, Construction and Regeneration Act 1996 (UK Parliament, 1996) incorporates adjudication into all written UK construction contracts. The Local Democracy, Economic Development and Construction Act 2009 (UK Parliament, 2009) amends the 1996 Act. One amendment provides for adjudication in contracts other than in writing. UK Legislation incorporates adjudication into all UK construction contracts. Therefore, the collaborative feature of adjudication is not a distinctive feature of any particular UK construction contract.

Table 7 (p.54) compares the Standard Form of Contract (JCT, 2005c) with the ECC (NEC, 2006b). The Table associates more collaborative characteristics to the ECC than the JCT's 2005 suite of contracts; in relation to collaborative communication, performance measurement and risk assessment. A 2009 amendment to the Joint Contracts Tribunal's 2005 suite of contracts incorporates the principles adopted by the Office of Government Commerce in its Achieving Excellence in Construction initiative (JCT, 2009b, p.1). In Table 7 (p.54) the Standard Building Contract (JCT, 2011k) also compares with the ECC. The table associates more collaborative characteristics to the Standard Building Contract (JCT, 2011k) than the ECC; in particular, in relation to: the environment; dispute resolution; and health and safety.

The Association of Consultant Architects (ACA) suite of contracts authored by Towers & Hamlins includes PPC2000, TPC2005 and SPC2000 (ACA, 2010). The contract is relatively new in comparison to the JCT and NEC suites. The RICS Contracts in Use Survey 2010 (RICS & Davis Langdon, 2012, p.22) indicates low usage of the PPC2000 contract in the UK Market; with particular low usage on projects over £5million; however, on the PPC website there are a number of case studies, indicating the contracts use. PPC is an acronym of Project Partnering Contract and the current edition includes 2008 amendments. The contract is different from others this chapter explores, in that it is a multi-party contract. All members of the team sign up to one contract. Key members of the team sign up initially, to the partnering agreement. For members needing to join later, there is a joining agreement. A standard form of joining agreement is in Appendix 2 of the contract. Also in the Appendices to the contract are a pre-construction agreement and a form of commencement agreement.

FIDIC suite of contracts is international. Unlike the JCT's and to some extent the NEC's suite of contracts, there is no specific reference to UK legislation. The acronym used to refer to the organisation is FIDIC, which derives from the French pronunciation of Fédération Internationale Des Ingénieurs-Conseils. The International Federation of Consulting Engineer's publishes a spectrum of contracts that are very different from one another. One that is different from that in the Joint Contracts Tribunal's and NEC's suites is the Design Build Operate (DBO) contract. The 'Conditions of Contract for Design, Build and Operate (DBO) Projects' (FIDIC, 2008) is the 'Gold Book'. The content of the contract differs significantly from others in the FIDIC suite. For example, the 'Conditions for Contract for Construction' (FIDIC, 1999) is the 'Red Book', which does not include operation clauses. When exploring the DBO contract it is easy to identify section 9 for the 'Design and Build'

phase of the project. In addition, there is section 10 for the 'Operation Service'. The contract is aligned with the operation integration agenda that this chapter establishes. Use of the contract supports both Maturity Level II Organisational Collaboration and Maturity Level III Inter-organisation Collaboration.

HM Treasury provides standardised documents for the use of public sector bodies and their advisors to use when drafting contracts. 'Standardisation of PFI Contracts (SoPC) (Version 4, March 2007) provides standard wording and guidance for PFI contracts. (HM Treasury, 2007). Standard methods of working across organisations are a form of collaborative working. Constructing the Team (Latham, 1994, p.25) makes the recommendation for greater use of co-ordinated project information. Co-ordinated Project Information (CPI) is in construction contracts (JCT, 2011k) through standard methods of measurement (RICS, 2000). Where frameworks employ bespoke forms of qualification, Standards (Cabinet Office, 2012b) identify that the supply chain can incur nugatory costs. To overcome the issue there is a standard form of pre-qualification (BSi, 2010). The standard form of questionnaire in the document provides clients with the health and safety performance information, as required by the Standards (Cabinet Office, 2012b, p.8). Therefore, there is a clear agenda in industry for Maturity Level III Inter-organisation Collaboration.

3.4.4 PART SUMMARY

The UK Government promotes the inter-organisational sharing of information for the purposes of benchmarking and supply chain development. There is also an established inter-organisational approach to standard legal frameworks including contracts. Therefore, the next logical progression in the maturity model after organisational level collaboration is inter-organisational collaboration. Table 8 summarises inter-organisational collaboration that this part explores, for the purposes of later phases of the DBenv research. There are characteristics that relate to inter-organisational knowledge and standardised legal frameworks. Some of the standardised legal characteristics appear in earlier part summaries of this chapter (Chapter 3 Implementation).

Table 8: Literature Confirming Inter-organisational Collaboration

Category	Collaborative Feature	Literature
Inter-organisational Knowledge	benchmarking; forward programme; research and development; professional networks	Bakker, et al., 2008; Cabinet Office 2012a, 2012, 2012d; 2011; Highways Agency, 2009a; HM Treasury, 2012, 2011a; HM Treasury & Infrastructure UK, 2011
Standardised Legal Framework	adjudication; change control; contract simplification; contract completeness; enhanced health and safety conditions; CSCS, collaborative working clauses, collaborative supply chain; communications protocol; design, build, operate contract; dispute ladder; enhanced sharing information; environment and sustainability; incentivisation; fair payment; risk assessment and allocation; financial incentivisation; performance indicators; multi part contracts; pre-construction services agreement; standardisation of contracts and frameworks; standard methods; standard pre-qualification; mediation; and value engineering.	ACA, 2008, 2010; BSi, 2010; Cabinet Office, 2011, 2012b; Davison 2006; HM Treasury, 2007; JCT, 2003a, 2005a, 2003b, 2005c, 2005d, 2007; 2007a, 2009b; 2011a, 2011d; 2011e, 2011g, 2011k, 2011l; FIDIC, 1999; Latham, 1994; NEC, 2006, 2006b, 2006c; RICS & Davis Langdon, 2007, 2012; nbs, 2012; UK Parliament, 1996, 2009

3.5 MATURITY LEVEL IV INTEGRATED COLLABORATION

3.5.1 PART INTRODUCTION

The previous section establishes that improvements are available through the inter-organisational sharing of data. There are higher education institutions that provide similar services in the same locality. The ability to come together to provide services has efficiency benefits. Integrated procurement is different from inter-organisational procurement, in that it steps beyond the simple sharing of information. Instead, the focus is on sharing services. This part of the DBenv thesis establishes integrated collaboration and the associated collaborative features.

3.5.2 SHARED SERVICES

In the executive summary of 'Constructing the Team', (Latham 1994: vii) there are recommendations for change in the UK Construction industry, which have achieve mixed levels of perceived success over the last 18 years. One recommendation is that best practice should start with clients that come together in forums. Bakker, et al., (2008) explores collaboration at a strategic client level when triangulating 33 explorative interviews that collect empirical data. The data triangulates itself with literature and government agency reports published in the UK. The reports include that by the 'Office of the Deputy Prime Minister', 'Beecham', the 'Audit Commission', and the 'NHS Purchasing and Supply Agency'. The forms of collaboration between client organisations include professional networks, lead buying, shared services, piggy backing, third party advisory, third party purchasing, and third party outsourcing. There is limited attempt to link the data back to practitioners' perceptions of their lived experience, and as such, it is difficult to ascertain the perceived success of the forums. Universities' sharing practice is evident in the form of professional networks (AUDE, 2013a).

The possibility of efficiencies through sharing services also receives support from the UK Government. With the Cabinet Office's strategy promoting a review of frameworks to reduce duplication (Cabinet Office, 2011, p.15). Organisations fully integrate procurement to share services in order to reduce duplication and enjoy economies in scale. Centralised procurement is a model in the Construction Trail Projects report (Cabinet Office, 2012). Central frameworks in the report include that for Modular Buildings; Building Materials; Project Management and Full Design Team Services; Estates Professional Services; and Environmental Sustainability. A Local Authority example is the Greater Manchester Combined Authority.

Similar to the HE sector the democratic nature of Government in the UK causes political diversity in local authorities. Different local authorities have different procurement strategies, in a similar way to the higher education sector. Manchester City Council has a number of frameworks to procure consultants and construction works (Manchester City Council, 2013). Frameworks include 'Framework One 2009' and 'North West Construction Hub's (NWCH) Low Value Framework'. Table 9 includes the three lots of 'Framework One 2009'. The North West Construction Hub Low Value Framework is for project values between £0-500k, includes approximately 17 contractors on the list and is a service available to a number of

authorities and universities (NWCH, 2012). In contrast to that indicated on its web site (Manchester City Council, 2013), Manchester City Council in 2010 procure a 90million library refurbishment project through the North West Construction Hub. The project is a project featured in Cabinet Office's (2012) Government Construction Trial Projects Report. The report sets out approximately 32 projects trailing new models for procurement, Building Information Modelling, Soft Landings and Lean procurement as part of the 2011 Construction Strategy agenda (Cabinet Office, 2011). Therefore, indicating possibilities for an inter-organisational approach to procurement, supporting the case for Maturity Level IV Integrated Collaboration.

Table 9: Manchester City Council's Framework One 2009

Lot	Contractor
(Lot 1) £500k - £4m	F. Parkinson Ltd
(Lot 2) £4m - £10m+	Willmott Dixon Construction Limited
(Lot 3) £500k - £10m+	Bramall Construction Ltd
	Cruden Group Ltd
	GB Building Solutions Limited

A truly integrated system would be similar in nature to that described by 'Bew and Underwood (2009)', 'Bew and Richards (2008)' in the form of iBIM; with all data storage remotely. Under a fully integrated system, different institutions would have full and open access to each other's data from a shared server, for the purposes of procurement, design and estates management. Professionals working for different Universities would be able to access designs for similar buildings, and supply chains through a shared system.

3.5.3 GRANTS

The Housing and Regeneration Act 2008 (UK Parliament, 2008) sets out the regulatory framework for the Homes and Communities Agency (HCA) responsible for funding and regeneration work. Within the Department for Communities and Local Governments Annual Report and Accounts for 2011-12 it sets out along with others Departmental Expenditure Limits for 2011-12 of £1.6billion for HCA's Affordable Housing Programme and £0.45billion for the HCA's Property and Regeneration. The HCA's Affordable Housing Programme delivers the funding through six operating areas in England. The Framework Delivery Agreement sets out the calculation of the grant using a formula (Homes and Communities Agency, 2013). Learning from the approach undertaken in housing, the use of

grants is a way the Higher Education institutions can shape procurement, without the risk and complexity of undertaken the procurement directly.

3.5.4 PART SUMMARY

The higher education sector is currently fragmented. The UK Government strategies set out a clear requirement for integrated procurement. There are methods available for Universities to work as part of an integrated solution. In addition to direct involvement in procurement, there is potential, as found in other sectors, for integrated working through use of grant funding. Grant funding represents an arm's length approach to integrated procurement.

Table 10: Literature Confirming Integrated Collaboration

Category	Collaborative Feature	Literature
Shared Services	iBIM; lead buying; piggy backing; shared services; third party advisory; third party outsourcing; shared frameworks; third party purchasing	AUDE, 2013a; Bew and Underwood, 2009; Cabinet Office, 2011, 2012; Bakker, et al., 2008; Manchester City Council, 2013;
Grants	Grants	Homes and Communities Agency, 2013; UK Parliament, 2008

3.6 CHAPTER SUMMARY

Collaboration occurs at project, organisational, inter-organisational and integrated levels. Collaboration is a way to achieve a number of themes emerging from the UK Government (Cabinet Office, 2011) including design integration, deliverable focus, operation integration and long-term development. Collaboration occurs at project level through interpersonal contact, for example through reflective meetings (Crowe & Fortune, 2012), the sharing of joint project offices, team building events and partnering workshops (Eriksson, 2010). There are electronic methods to enable collaboration that include the use of Web 2.0 (Bidgoli, 2012; Puschmann & Alt, 2005) and consolidated software. One example is building information modelling software, which is available to implement at all levels of the maturity model. Inter-organisational collaboration (including electronic communication) occurs through professional networks (Bakker et al., 2008; AUDE, 2013a), for example, in the form of benchmark data.

CHAPTER 4 MOTIVATION

4.1 CHAPTER INTRODUCTION

Chapter 3 Implementation explores collaborative features. Cicmil and Marshall (2005) relate motivation to the construction industry, when exploring two-stage tendering, finding that collaborative features can be insufficient to ensure team integration and encourages further research to be undertaken on the procedure as a social object. Section A Introduction establishes that Darrignton and Howell (2011) have similar misgivings to Cicmil and Marshall (2005). One misgiving of Darrington and Howell (2011) relates to capacity of traditional compensation systems in property and construction to achieve project-optimised behaviour. The aim of this (Chapter 4) is to provide a maturity model for the Motivation theme of the research, calibrating one axis of Crowe and Fortune's' (2012) maturity model. In order to achieve the aim the work synthesises a maturity model; and validates the maturity model using peer-reviewed literature. Chapter 4 Motivation explores work in psychology to establish what motivates people at an organismic level; providing transferability to the construction industry.

4.2 HIERARCHY SYNTHESIS

4.2.1 PART INTRODUCTION

The aim of this part of the DBenv thesis is to synthesis a maturity model. The model will need to offer transferability to people working in higher education sector in England. People in many ways are different. For example, one construction client will use one from of contract, and a different client will use a different form, for the same purpose. Therefore, in order to understand similarities this part of the DBenv thesis will first explore the differences and the inter-disciplinary nature of construction.

Regardless of the sector or the organisation people work in, as humans, there are organismic tendencies. For example, if a group of construction professionals were in a building on fire, there would be a desire to leave the building, by most, if not all the people in the group. Similarly, a group of teaching professionals would have the same desire to save their own life. The instinct of self-preservation is fundamental human behaviour. There are other fundamental behaviours for example a desire to eat. Ryan (1995) undertakes a thorough exploration of literature concerning the characteristics of living systems to extend themselves,

as organisms; and identifies two strands organismic viewpoints, specifically cognitive development and personality development (see Table 11).

Table 11: Theories in Psychology

Theory Category	Theory	Principle
Cognitive development	Werner	Orthogenetic principle
	Piaget	Organisation
	Loevinger	Ego development
Personality Development	Psychoanalytic ego (Freud, Nunberg, Hartmann, White)	Ego as an organisation
	Analytical psychology (Jung)	Individuation
	Humanistic psychology (Rogers, Maslow, Goldstein, others)	Actualisation tendency
	Holistic psychology (Angyal)	Actualisation

Source: based on Ryan (1995)

4.2.2 PERSONALITY TYPES IN CONSTRUCTION

Chynoweth (2008; 2009) explores the interdisciplinary nature of the construction industry through the development of work by Biglan (1973). Biglan employs data from 178 faculty members at the University of Illinois. In addition, 70 faculty members from a small liberal art college are participants of the study. Therefore, the participants are academics. The research does not make clear if participants are also industry practitioners. The study does not have a built environment or construction focus. The 'small college' participants receive cards, which they group together into different piles. The participants then rate each group on bipolar adjectives (a) pure-applied, (b) physical-nonphysical; (c) biological-nonbiological [sic]; (d) of interest to me personally-of little or no interest to me personally; (e) traditional-nontraditional [sic], and (f) life science-nonlife science. The work plots the data on axes of a series of two-dimensional diagrams.

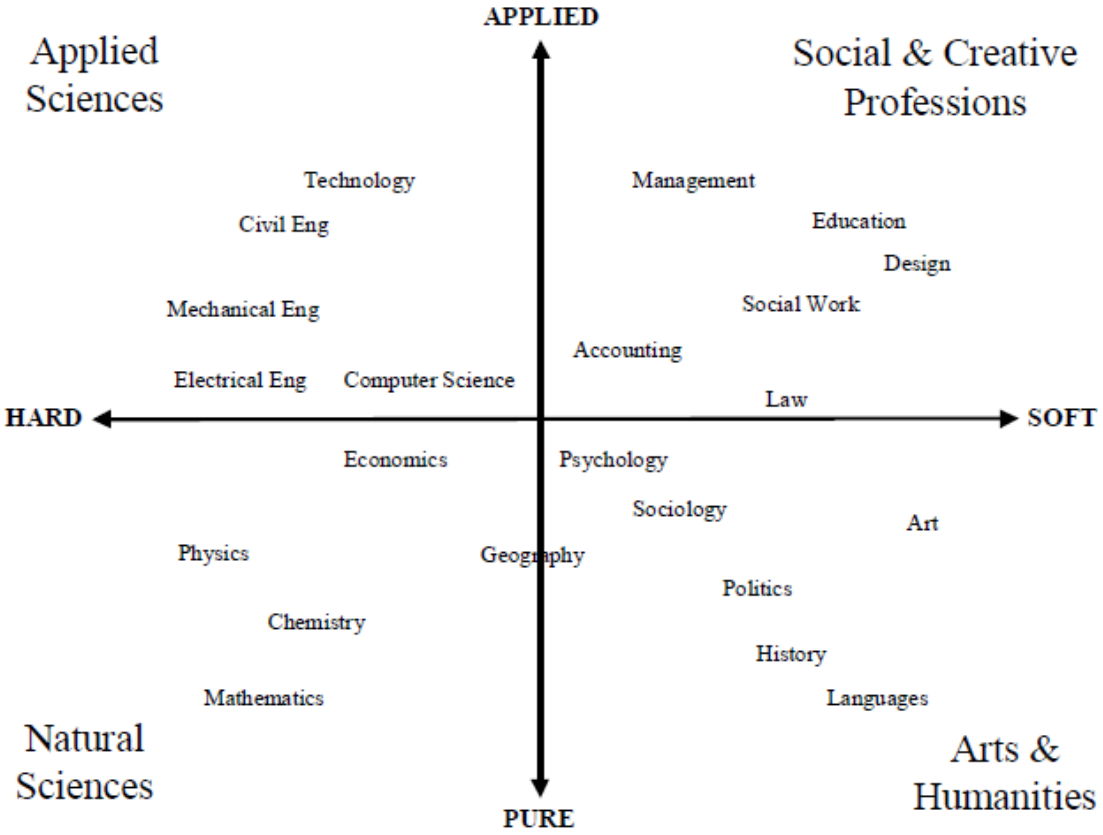

Figure 10: The Biglan Disciplinary Model

Source: Chynoweth (2009)

Chynoweth (2008; 2009) employs one of Biglan's (1973) two-dimensional diagrams to identify the interdisciplinary nature of the construction industry (see Figure 10). The two dimensional diagram identifies hard and soft on the horizontal axis. Biglan (1973, p. 198) identifies hard with science-orientation and soft with the humanities. Social Sciences locate in the middle. The two-dimensional model identifies 'applied' and 'pure' on the vertical axis. Biglan (1973, p. 198) identifies accountancy and engineering on the positive (applied) side of the axis. Physical sciences, social sciences are on the negative (pure) side of the axis. Adaptions to the diagram in Chynoweth's (2008; 2009) work are made without a clear audit trail. However, the work demonstrates an interdisciplinary paradigm for the construction and the built environment. Biglan's work collects data from educators; the construction industry also includes individuals without an education. The fact the research does not collect data from uneducated individuals suggests there is more depth to the interdisciplinary nature of the sector (construction industry). The interdisciplinary nature of the construction brings with it

different requirements in respect of contextual and task related motivation (see Section A, Introduction, p. 18).

4.2.3 Cognitive Development

Ryan (1995, p. 401) examines the work of psychological theorists to identify three principles in cognitive development namely orthogenetic (Werner), organisation (Piaget) and ego development (Loevinger). Werner's work orthogenetic principle sets out that "whenever development occurs it proceeds from a state of relative globality [sic] and a lack of differentiation to a state of increased differentiation, articulation and hierarchic integration" (Lerner, 2001, p.117). Piaget's work has a principle of organisation and process of assimilation, accommodation, reciprocal assimilation. Loevinger's work has a principle of ego development and process of synthesis and mastery. These theories relate to the development of construction professionals minds. In straightforward terms, the theories relate to minds developing in their environment over time from simple to more complex structures.

4.2.4 Personality Development

Ryan (1995, p. 401) categorises the work of theorists to identify four variants of personality development psychology, namely, psychoanalytic ego, analytical, humanistic and holistic. In simple terms, the branch of psychology relates to how humans personality develops. Ryan relates Work by Freud, Nunberg, Hartmann and White to psychoanalytic ego psychology, with the principle of ego as organisation and the process of synthetic function and insight (Ryan, 1995, p.401). Therefore, personality develops through internal forces known as ego. In the case of the construction industry, a construction manager would make decisions based on libidinal and aggressive impulses. Freud characterises work as an opportunity for workers to sublimate sexual and aggressive impulses, binding themselves closer to reality (Vroom, 1995), therefore there is a connection with instincts. Instincts do not explain all human motivations, for example learning. For this reason, the DBenv thesis explores other motivational theories.

The DBenv study has previously established the interdisciplinary nature of construction (see p. 63). The existence of different personality types relates to analytical psychology. Ryan relates work by Jung to analytical psychology with the principle of individuation and processes of self-archetype, transcendent function and consciousness. The generalisation of

one hierarchy to all people, for the purpose of the DBenv study, appears to over simplify or generalise the phenomena of motivation. Jung's theory of cognitive dynamics developed by Myers establishes there are different types of people with different characteristics. The work identifies sixteen different personality types, which form judgements and opinions in very different ways, although there are different ways to group the personality types (Keirsey, 1998).

McPhail (2002) establishes the existence of the personality types in the nursing profession. The same principle of personality types is applicable to construction. Berens & Nardi (2004) identify that the different personality types have different perspectives in relation to: preferred worldview or attitude; mental process, perception access/collect data; mental process, organising evaluating and concluding; and orientation to the outer world. Borman & Motowildo's (1997) supports this view when indicating a correlation between personality types and performance. Therefore, there is a requirement for the DBenv framework to be flexible to deal with different personality types at the same of accepting the more global approach of human organismic behaviour and a maturity model.

Ryan (1995, p. 401) classifies work by Rogers, Maslow and Goldstein as humanistic psychology with an actualisation tendency. Maslow's (1943) work causes a shift from economic theories of motivation towards a hierarchical theory (Stroh, Northcraft, & Neale, 2008, p. 64). In simple terms, moving away from an understanding human motivation comes through money. This supports an earlier discussion in the DBenv thesis that identifies motivation is wider than financial incentivisation in construction. Maslow's theories are well recognised in literature (Scheuer, 2000; Strafford, 1994; Stroh, Northcraft, & Neale, 2008; Walker, 2011; Whetten, Cameron, & Woods, 1996) and are a drive reduction theory. In other words, assumes a link between human needs and motivation (see Figure 11). Maslow's (1970) needs hierarchy starts at 'physiological' and works its way through the levels of 'safety', 'belongingness and love' and 'esteem' and finally ending up at 'self-actualisation'. Movement in the hierarchy is one of progression or regression (Maslow, 1970, p.17). Where there is a degree of satisfaction at one level, the organism (or person) focuses (or is motivated) to achieve the next level (Maslow, 1970, p.17). With Betz (1984, p. 206) stating the higher the positioning of a person in the hierarchy the greater the life satisfaction.

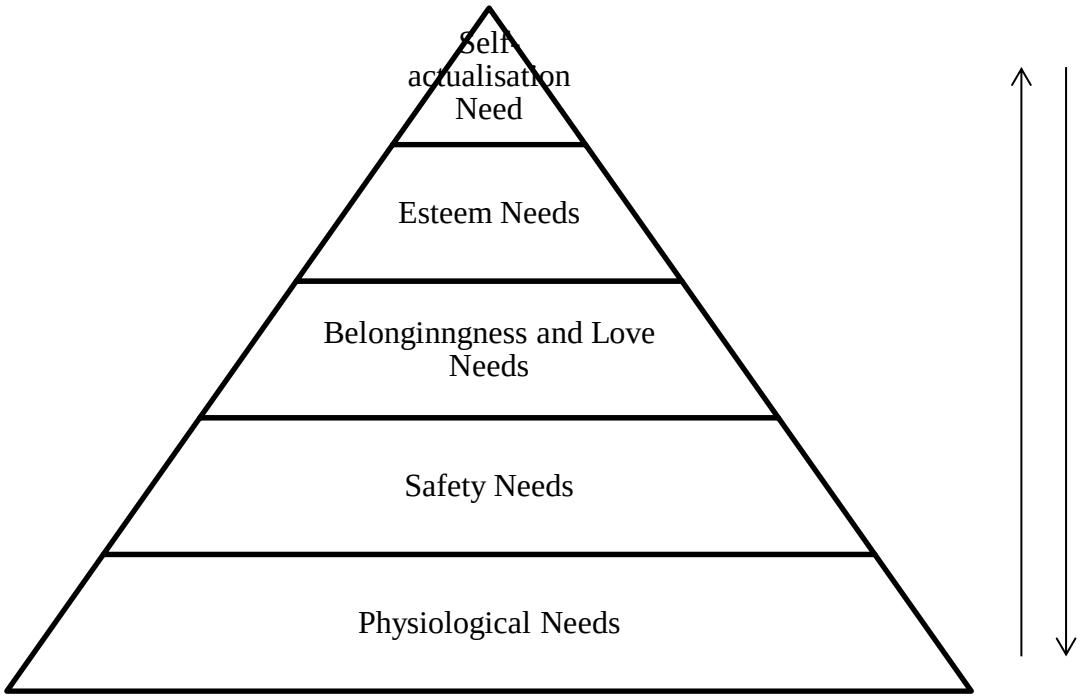

Figure 11: Needs Hierarchy

Source: based on Maslow (1970)

Theories with an actualisation tendency not in Ryan's table (see Table 11, p.63) include that of Hertzberg (Scheuer, 2000, pp. 99-109; Strafford, 1994, p. 108; Stroh, Northcraft, & Neale, 2008, p. 68; Walker, 2011, pp. 110-115); and Alderfer and McCelland (Stroh, Northcraft, & Neale, 2008, p. 68; Walker, 2011, p. 115). Alderfer's (1969, p. 142) theory is "concerned with developing and testing an alternative to Maslow's theory". One contrast is that unlike Maslow's theory, Alderfer's (1969, p. 142) does not assume low-level satisfaction as a prerequisite to higher needs. Self-determination theory in contrast identifies itself with three needs, specifically: autonomy, competence and relatedness (Ryan & Deci, 2000). Although theories of needs hierarchies deviate, the fundamental similarity in the work is a requirement for need satisfaction.

Collaborative features result in practitioners achieving different degrees of satisfaction and as such position at different levels within the hierarchy. For example, collaborative features that promote conflict can inhibit needs associated with esteem, in relation to confidence and respect. This restricts the practitioner from providing the benefits through self-actualisation, including those, which associate with morality, spontaneity and acceptance of facts. Failure to accept facts will cause disputes. More seriously, contract mechanisms can cause

practitioners not to achieve safety and physiological needs. For example, the allocation of risk items that are outside the control of the practitioner may cause failure to achieve safety needs in relation to employment. Where such risk items locate lower in the needs hierarchy, then risk emerges of failure to achieve needs in respect of health.

Ryan (1995, p. 401) identifies the work of Angyal to holistic psychology. Angyal conceives the Science of Personality as an interdependent system which arises "between the person and the environment, which is controlled by homonomy and autonomy processes" (Roeckelein, 1998, p. 34). With people subject, as part of a biological total process, to the (autonomous) self-determination and heteronomous determinates (Wehmeyer & Mithaug, 2006, p.35). Heteronomous determinates are the opposite of self-determination and relate to an action influenced outside an individual's control (amotivation). The nature of practice in the construction industry brings with it an element of autonomy. The question emerges in organisations hoping to have a motivated workforce and supply chain concerning what extent to facilitate autonomy. Organisations employ prescriptive processes to reduce autonomy. Such prescriptive processes in the construction industry include British Standards.

4.2.5 MOTIVATIONAL HIERARCHY

Ryan (1995, p. 401) employs well-established theories in psychology, including self-determination theory to create 'schematic of regularity' styles. Later work refers to the 'schematic of regularity' as "a taxonomy of human motivation" (Ryan & Deci, 2000a, p.61). Figure 12 merges the schematic with the taxonomy to summarise the theory. The diagram contains three regularity styles of motivation namely amotivation [sic], extrinsic motivation and intrinsic motivation. Extrinsic motivation is further sub-divided into external regulation, introjection, identification and integration. Each of which have associated processes, perceived locus of causality and relative autonomy.

REGULARITY PROCESS	AMOTIVATION	EXTRINSIC MOTIVATION				INTRINSIC MOTIVATION
		External Regulation	Introjection	Identification	Integration	
ASSOCIATED PROCESSES	Passivity Distress Low perceived competence Non-relevance	Compliance/reactance Salience of extrinsic rewards or punishments Punishment avoidance	Guilt Anxiety avoidance Self-Esteem maintenance Ego involvement Focus on approval from self or others	Conscious valuing of activity Self-endorsement of goals	Awareness Hierarchical synthesis of goals Congruence	Interest enjoyment Inherent satisfaction
PERCEIVED LOCUS OF CAUSALITY	Impersonal	External	Somewhat External	Somewhat Internal	Internal	Internal
RELATIVE AUTONOMY	-2	-2	-1	+1	+2	+2

Figure 12: Taxonomy of Human Motivation

Source: Based on Ryan (1995) and Ryan & Deci (2000a).

The diagram presents different levels of autonomy (or self-determination). Amotivation is on the left of the diagram and is the least autonomous. On the Right side of the diagram is intrinsic motivation, which is the most autonomous. External motivation sits in the middle having the sub categories of external regulation, introjection, identification and integration; with external regulation being the least autonomous moving to integration being the most autonomous. The diagram also indicates perceptions of locus of causality that also shift between regularity styles; with external regulation being external; and intrinsic motivation being internal. Deci (1973, p. 30) identifies the shift from being intrinsically to extrinsically motivated causes a change in locus of causality. Locus of causality relates to the perception that people have concerning control of events. With an internal locus, a person feels they are in control of a situation. In contrast with an external locus, people feel they do not have control.

4.2.6 SUPPORT FOR THE MOTIVATIONAL HIERARCHY

Ryan's work brings together existing theories on organismic behaviour, providing a taxonomy of human motivation that forms the structure of self-determination theory (see Figure 12, p.69). The Taxonomy is the basis of the DBenv thesis' motivation maturity model. Flynn (2011) uses the maturity model in a similar context to the DBenv study in relation to the motivation of employees. The DBenv thesis explores the motivation of employees working for supply chain organisations. Similar to the DBenv study Flynn (2011) identifies four levels of organisational motivation maturity, namely (1) compliance management, (2) process management, (3) capability management and (4) strategic (culture) management. With each maturity level signifying a different way in which organisations can motivate learning and performance of their employees. This Chapter of the DBenv study further assesses and develops a maturity model of regulatory styles; and assesses the impact on human motivation of different styles.

Stone et al. (2008) outline six steps to implement a self-determination theory intervention. The steps include: "ask open question and invite problem solving participation; actively listen and acknowledge employee perspectives; offer choices within the structure including the clarification of responsibilities; provide sincere, positive feedback that acknowledges initiative, and, factual non-judgemental feedback about problems; minimise coercive controls such as rewards and comparisons of others; and develop talent and share knowledge to enhance competence and autonomy" (Stone et al., 2008, p.27). The work lacks academic

rigour of other work co-authored by Deci, for example, not being from a journal that receives peer review. However, the work is significant for the research undertaken as part of the DBenv study, with Deci being a co-author and setting out principles of self-determination theory in an easy to read format. In addition, the work similar to Flynn's (2011) reinforces the DBenv thesis use of the theory, as it demonstrates use of the theory in other domains.

4.2.7 PART SUMMARY

This part of the DBenv thesis offers a maturity model to relate collaborative features to different regularity styles (see Figure 12, p.69). The maturity model is flexible enough to allow for different personality types while offering classifications to consider different collaborative features. Work relating to the maturity model and employee motivation already exists. The DBenv work expands the concept to the motivation of supply chain employees.

4.3 MATURITY LEVEL I EXTERNAL REGULATION

4.3.1 PART INTRODUCTION

At Flynn's (2011, p. 13) maturity model's Level 1 (compliance management), there is almost total reliance on extrinsic motivation. Kasser & Ryan (1996) identify that extrinsic motivation is achieved through external approval and rewards including financial success (money), social recognition (fame) and an appealing appearance (image). The DBenv study explores how these extrinsic motivators relate to human behaviour in the construction industry. The use of extrinsic motivators is seen in construction contracts in the form of penalties and incentivisation. In Section A Introduction scientism emerges towards the link between external regulation and motivation. This section of the DBenv thesis assesses external regulation's capacity to achieve motivation using peer-reviewed literature. Within the framework of self-determination theory there is a sub-theory of cognitive evaluation, which investigates the conditions to facilitate and undermine intrinsic motivation (Ryan, Williams, Patrick, & Deci, 2009, p. 110). Intrinsic motivation involves the undertaking of a task or activity as it interesting, enjoyable or offers inherent satisfaction (Ryan & Deci, 2000a, p.61).

4.3.2 CONSTRUCTION MOTIVATION

The work of Parkin, Tutesigensi, & Büyükalp (2009) explores motivation among construction workers in Turkey. The work relates motivation to needs hierarchies, such as Maslow's work and assumes generalisation, which means that there is no cluster analysis evident in the work. The paper touches on intrinsic and extrinsic motivation in a small amount of detail, however, does not consider self-determination theory in any particular depth.; for example, there is limited reference to the work of Deci or Ryan. The study's data is from 370 participants working on four tunnel projects, six building projects, four transportation projects and one bridge project. Data is from interviews with a semi-structure from workers (on site) during their lunch break from 15 random organisations. The work does not make clear the profession or trade of the workers. Thematic analysis makes sense of the data from the interviews. The results identify a number of motivating factors. The main motivating factor emerging from the data is money evident in 67% of the responses. Less than 7% of responses identify (individually) with the remaining factors, for example 2% of respondents recognise food. Food and money as a reward fit the regularity style of external regulation. More weight applies to other factors (than money) by percentage, when the workers consider what de-motivates them. Thus, the study indicates a perception among the workers that money is a key motivator, while ineffective management of other factors are a de-motivator.

4.3.3 CONTINGENT INCENTIVISATION REDUCES INTRINSIC MOTIVATION

The paper "Paying People Doesn't Always Work the Way You Expect it To" explores the effect of payment on motivation (Deci, 1973). In 1973, Deci was an assistant professor in the Department of Psychology and in the Management Research Center [sic] at the University of Rochester. The paper is written at an early stage in his career, which is seen in the writing style and the way arguments receive support and citation. Deci's 1973 (p. 29) paper outlines an experiment, where participants receive extrinsic rewards for working on intrinsically interesting activities. The exact number of participants is not clear; however, the paper indicates hundreds of college students. The location of the students is also not clear; one assumption would be that they are at his workplace in the United States of America. A test assesses the intrinsic motivation of four activities that are puzzles. After the puzzles are complete, the students are left in the room to do whatever activity they wish, including completing more puzzles. In addition to the puzzles, students have other things to do

including reading magazines. The test of intrinsic motivation is if students work on (or not) the puzzles during the time they are given to do as they wish.

Ryan (1995, p. 406) relates money to extrinsic motivation and external regulation with an external perceived locus of causality (see Figure 12, p. 69). Similarly, Deci's (1973, p. 30) experiment's extrinsic motivator is money, which some participants receive depending on performance. Deci (1973, p. 30) also tests the effect of money, promotions and fringe benefits on intrinsic motivation. Certain participants do not receive the extrinsic motivator. The basis for selection is not clear. The experiment concludes that "students who had been paid spent significantly less time working on the puzzles when they were alone in the room than did those who had worked on the same puzzles for no pay". Therefore, the experiment identifies the negative effect of the extrinsic motivator, money, on intrinsic motivation.

Deci, Ryan, & Koestner's (1999a) explore the effects of extrinsic rewards on intrinsic motivation to other studies using a meta-analytic review of 128 studies. The studies are from PsycINFO and ERIC databases between 1971 and 1997. The search terms included intrinsic motivation, rewards, reinforcement, free time and free choice. The measure of intrinsic motivation (as Deci 1973) is the degree in which participants return to a task during a free choice period. Study inclusion is on the basis there is a non-reward control group. The work confirms Deci's previous study, finding engagement and completion contingent rewards undermine self-reported interest, as did all tangible and expected rewards. Deci, Koestner, & Ryan's (2001, pp.9-10) work does not identify a significant correlation between intrinsic motivation for unexpected tangible rewards.

Deci (1973, p. 31) identifies that if money is a motivator, there is a requirement for it to be administered contingently. In other words liable to occur but not a certainty. In consideration of Cameron & Pierce's (1994) contrasting results to Deci, Ryan, & Koestner's (1999a) work, Deci, Koestner, & Ryan (2001) undertook further analysis of the data. Similar to earlier findings a negative correlation ($p < .05$) identifies between free choice behaviour and expectations of tangible rewards including engagement contingent ($d = -0.40$), completion contingent ($d = -0.44$) and performance contingent ($d = -0.28$). A negative correlation ($p < .05$) also occurs between self-reported interest and expected tangible rewards including expected engagement (-0.15) and completion (-0.17) contingent. In simple terms, tangible rewards contingent on performance reduce intrinsic motivation. Relating the theory to construction, incentivisation contingent on such things as completion reduces workers interest

to undertake activities without a reward. For example, interest may be lost relating to contextual performance where the basis of incentivisation is task performance (see 1.4 Performance).

4.3.4 Extrinsic Motivation's Negative Effect on Vitality, Depression and Physical Symptoms

Kasser & Ryan (1996) in the first of two studies explore the negative effects of extrinsic motivators on adults' health. The first study's participants are 100 adults (24 male) residing in an urban neighbourhood of Rochdale, New York. Most of the participants were Caucasian (93%) between the ages of eighteen to seventy-nine years. Money is the intrinsic motivator to encourage participants to return the questionnaire. The incomes of the participants are 'under $20,000 (31%)', '$20-50,000 (49%)' and 'over $50,000 (20%)'. Income is significant as many other studies in self-determination theory have participants that are in education. The questionnaire explores an aspiration index, guiding principles, self-actualisation, vitality, depression inventory, anxiety and physical symptoms. The data indicates that having high importance on intrinsic aspirations associates with "more self-actualisation and vitality and with less depression and physical symptoms" (Kasser & Ryan, 1996, p. 283). The participants of the second study are 192 undergraduates on a psychology course. The findings of the second study are similar to the first study.

Ryan, et al. (1999) explores negative effect on well-being of extrinsic motivators cross culturally, specifically America and Russia. The participants of the study are 299 university students; 183 of which are from Russia, the remaining being from the United States. Of the 299 participants, 183 are male. The data is from questionnaires with the measures of demographic variables, aspiration index, current perceived goal attainment, rank order assessment of life goals, and wellbeing (mental health). The aspirations measure is an adaptation from Kasser & Ryan's (1996) work and includes intrinsic and extrinsic categories. Intrinsic categories include personal, growth, relatedness, community service, intellectual aesthetic growth. The extrinsic categories include financial success, attractiveness, fame and power. Responses are in the form of a five-point scale. Current perceived attainment also relates to intrinsic and extrinsic paradigm. Well-being uses a number of measures that receive validation from earlier studies. The scales include satisfaction with life scale, short index of actualisation, self-esteem scale and depression inventory. Therefore, the approach rigorously explores the effects that associate to external regulation.

Ryan, et al.'s (1999) data, similar to Kasser & Ryan's (1996), indicates that individuals that place more importance on extrinsic (opposed to intrinsic) goals are more likely to report lower well-being; with no positive link between a strong extrinsic orientation and wellbeing being found. Attainment relates to goals that have already been achieved. The data further indicates that perceived "intrinsic goal attainment contributed to greater life satisfaction, self-esteem, self-actualisation and lack of depression" (Ryan, et al., 1999). In relation to construction, it is easy to see the benefits to the organisation of having healthy and happy directly employed and contracted staff.

4.3.5 INCENTIVISATION IN CONSTRUCTION

Eriksson & Westerberg (2011) use a literature review to explore the effects of cooperative procurement procedures on construction project performance. The proposition generated from the literature review is that cooperative procurement procedures generally have a positive influence on project performance. The procedure list includes joint specification, selected tendering, soft parameters in bid evaluation, joint subcontractor selection, incentive-based payment, collaborative tools, and contractor self-control. Therefore, the work indicates that incentivisation along with other cooperative procedures have a positive effect on performance.

Similarly, Rose and Manley (2010) are positive in relation to the benefits of incentivisation, when exploring client recommendations for financial incentives on construction projects. The work explores four large Australian building projects commissioned by government clients under management contracts complete between 2001 and 2005. The findings of the research are practical recommendations that base themselves on the assumption that people are motivated by financial incentive mechanisms; there is limited attempt in the work to support this assumption. The recommendations also suggest scientific generalisations that the research data cannot empirically offer. For example, where the work makes the statement, "the recommendations would seem to apply equally to private-sector clients and to non-building projects"; such generalisations could only be made with a much larger sample size. In the conclusion of the work it is states that financial incentives are present as a mechanism to "exert a positive influence on project success", having an ability to align the contractors and client objectives.

Hughes, Williams and Ren (2009) also explore incentivisation, however with a little more scepticism. The research data is from interviews and questionnaires from two infrastructure case studies located in South Wales. The aim of the research is met by testing a series of hypotheses, which emerge from reflection on a statement made by Sir John Egan in 2008. The hypothesis includes: should incentives be used on every project; should the target cost and incentive be set as early as possible; should the incentives be set at 15%; and what factors are important in an incentive scheme. The final hypothesis is not so much tested deductively but investigated inductively. Similar to the DBenv study the philosophical foundation of the research appears to be pragmatic. The first case study (project A) involves the letting of term contracts using the NEC3 contract with Option C. Agreement of target costs occurs on individual projects as the programme progresses. The client allocates each project with a strategic partnering charter and a business plan cost. The contractor then provides a target cost. The basis of incentive is whether the contractors cost is above or below the business plan cost (task performance).

Hughes, Williams and Ren (2009) second case study utilises tactical partnering. The project is let using a target cost contract NEC2 Option 2. The project for a reason not made clear in the research, changed to NEC3 Option A without a partnering arrangement. Option A is a priced contract with an activity schedule and is not a target contract. At the time the research is undertaken the pain and gain percentage were both set at 20%. The work does not make clear how the pain gain mechanism was implemented with NEC3 Option A. In summary, the work relates incentivisation to target contracts.

Hughes, Williams and Ren (2009, p. 528) state participant selection is on "level of understanding to make judgements on aspects of factors affecting partnering". How the work determines participants' level of understanding is not made clear. The work does however set out that the majority of participants are cost and contract managers, with direct involvement in the setting and monitoring of incentivisation processes. Twenty-seven questionnaires return from contract managers, cost managers, clients' representatives and project managers. Twenty questionnaires return from project A, the remaining from project B. The hypothesis "should incentives be used on every project" was agreed to by twelve out of twenty-five respondents, representing 48%. The work is unclear why there are only 25 responses to the question; after-all there are 26 responses to the other questions. The work cannot offer scientific generalisations in relation to this or other hypothesis the work explores. However,

there is nearly an even distribution of participants, which believe incentives should and should not be used on every project. The abstract and conclusion of the work suggest that incentivisation can have a detrimental effect on performance requirements including programme and quality; however, there is limited auditability shown in the work to support the statement. Again, this reinforces the earlier suggestion surrounding the negative effect incentivisation on performance.

Darrignton and Howell's (2011) study relates incentivisation back to psychology, similar to the DBenv study, two forms of incentivisation are identified, namely, economic and non-economic. Darrignton and Howell (2011, p. 42) identify following observations on a number of construction projects that "contracts and compensation structures" frequently ignore or mistake what motivates the people that undertake the work. There are no details about the construction projects and the work appears to be conceptual in nature with limited reference to primary source data. Darrington & Howell's (2011, p.44) work suggests that economic or financial incentives impose standards, which, may lead to an "impaired sense of self-determination or perceived loss of autonomy". Autonomy relates to regulation by the self (Ryan & Deci, 2006). Darrington & Howell's (2011) understanding of the negative effects of incentivisation on autonomy has an implication not only on economic, but also non-economic incentivisation, for example, standards for the purpose of performance management. This principle is fundamental to the work in collaboration, in that it would suggest that features to promote collaboration might have an adverse effect on motivation. Motivation of practitioners relates to performance, which is a main objective of the collaborative movement in construction.

Bresnen & Marshall (2000) explore motivation, commitment and the use of incentives in partnerships and alliances. The study explores six case studies, specifically airfield civil engineering (B, £20m), hotel building (C, £27m), water treatment works (D, £9m), industrial gases plant (E, £80m), oil refinery plant upgrade (F, £25m) and gas production platform (G, £400m). All the contracts have provision for incentives over and above the normal contract terms. However, the incentivisation varies in relation to the parties benefiting from the incentivisation and risk reward rationale. In case C incentives were found to have an "impact on the drive to reduce costs and increase value, especially through early cost planning and value engineering" (Bresnen & Marshall, 2000, p. 595). Bresnan and Marshall (2000, p. 595) identify that incentivisation in the form of further work is found to be more important than

financial incentivisation; with risk reward having more impact at company, in contrast to project level.

Zhang & Ng (2012) explore attitude toward knowledge sharing in construction teams by exploring social psychology. The work creates a series of hypothesis from literature. Data collection is in two stages. The first stage employs semi-structured interviews. The second stage employs a questionnaire survey in Hong Kong. Invitations to participate are sent out to 430 individuals from 172 organisations. Data from 231 questionnaires and 97 key contact persons form the basis of analysis. Sampling is undertaken from the HKSAR Government List of Approved Contractors for Public Works (Zhang & Ng, 2012; The Government for Hong Kong Special Administrative Region, 2013). Zhang & Ng's (2012) respondents are from professional disciplines and include: project managers (30%); site agents (7.4%); engineers (29%); quantity surveyors (12.1%); and safety managers (1.7%). The job position of other participants is generally missing from the data. Respondents generally have an education to the level of: certificate or associate degree (14.3%); bachelor degree (61.5%) and post graduate (21.2%). Respondents are from contracting organisations. Zhang & Ng's (2012) hypothesis two explores "Individuals' attitude toward knowledge sharing has a positive effect on their intention to share knowledge in construction teams" (2012, p.1330). The data indicates a relationship exists between attitude and behaviour ($p \leq 0.001$) (2012, p.1340). In simple terms, a positive mental attitude will result in positive behaviour. Hypothesis four explores "perceived economic reward has a positive effect on individuals' attitude toward knowledge sharing in construction teams" (2012, p.1331). The data does not indicate there is a link between economic reward and attitude (2012, p.1340).

4.3.6 PART SUMMARY

Level one includes, as Flynn's (2011, p. 13) maturity model, extrinsic motivators. The level relates to Ryan and Deci's (2000a, p.61) regularity style external regulation with the type of motivators employed: having a salience of extrinsic rewards or punishment; and relies on compliance and reactance. A number of authors relate financial incentivisation to the construction industry. A number of studies identify the negative effect of financial incentivisation on motivation and vitality (Deci, 1973; Deci, Koestner, & Ryan, 2001). Vitality is the energy that is available to oneself that is both exhilarating and empowering "that allows people to act autonomously and persist more at important activities" (Deci & Ryan, 2008). With a focus on intrinsic (in contrast to extrinsic) aspirations having positive

effects on vitality (Kasser & Ryan, 1996; Deci et al., 1999a) and health (Kasser & Ryan, 1996; Ryan, et al., 1999). In summary, compensation structures in the construction industry often ignore what motivates people (Darrington & Howell, 2011, p. 42).

4.4 MATURITY LEVEL II INTROJECTION

4.4.1 PART INTRODUCTION

At Level 2 of Flynn's (2011, p. 13) maturity model, named compliance management, there are personal appraisals managed by objectives. The maturity level relates to the regularity style of introjection as described by Ryan & Deci, (2000a, p.61), which relates to ego involvement and the focus of approval from self and others. Behaviour relating to the regularity style of introjection is present in the construction industry. This part of the DBenv thesis explores the effect of the regularity style of introjection on motivation.

4.4.2 PUNISHMENT REDUCES INTRINSIC MOTIVATION

In Parkin, Tutesigensi, & Büyükalp's (2009) work motivators of relationships, responsibility and recognition identify to introjection. As part of the appraisals process, in a bid to improve performance, people may receive positive or negative feedback. External feedback may be in the form of a verbal punishment, for example in construction, a site manager verbally abusing a supplier following perceptions of poor performance. Deci's 1973 paper explores the effect of punishment with a buzzer as an extrinsic motivator (Deci, p.30). The participants are told to complete a puzzle within a certain time, failure to do so results in a noxious noise. The results of the experiment indicate that participants with the threat of punishment are "less intrinsically motivated than subjects who had received no threats" (1973, p. 30). Therefore, instead of participants having intrinsic motivation there is extrinsic motivation to avoid punishment.

4.4.3 FEELINGS OF INCOMPETENCE REDUCE INTRINSIC MOTIVATION

Feedback may also be in such a way to make people feel incompetent. Deci's (1973, p. 31) paper outlines an experiment where participants are given difficult puzzles (or activities), of which some participants fail. The participants were "less intrinsically motivated than subjects who had worked on somewhat easier puzzles with a higher success rate". Therefore, negative feelings that associate to failure have a negative effect on intrinsic motivation. This relates to

construction in the form of training. Where a site manager has not received adequate training and is undertaking something that is too difficult for their competence, there will be a negative effect on intrinsic motivation.

Nix et al.'s (1999, p. 276) second experiment examines whether there is a difference if a task is undertaken with evaluative pressure. The experiment has 64 participants from psychology courses, which are given credit for participating. In the activity, the participants undertake an observation task. One set of participants are told that the task forms part of an intelligence test (ego involved), the other set were not and as such there is limited ego involvement. In contrast to the first experiment, a questionnaire is not undertaken before and after the activity, instead a disguise measure of affect is the pre measure, which is a computer subliminal perception task. In the experiment, Thayer's adjective checklist method assesses vitality. Thayer's method involves the use of "a mood test that assesses transitory levels of energy" and "tension" (Thayer, et al., 2003). An analysis of variance between the two groups (ego and non-ego involved) indicates that participants not told the activity was intelligence task (non-ego involvement) experience more self-determined and less controlled motivation. The analysis shows a greater increase on vitality where participants do not believe there is intelligence test. Similar to Nix et al.'s (1999) second experiment, Ryan (1982) finds participants with ego-involvement have significantly less intrinsically motivation than those task-involved (also see 4.4.5 Controlling Feedback Reduces Intrinsic Motivation).

4.4.4 Positive Reinforcement Increases Intrinsic Motivation

In contrast, feedback may offer positive reinforcement. In another experiment outlined in Deci's (1973, p. 30) paper male participants receive positive feedback on completion of activities, which are puzzles. The experiment found a positive effect on intrinsic motivation. The participants found enjoyment and spent more free time working on the activity, than participants without rewards. Deci (1973, p. 31) relates improvements in intrinsic motivation, due to positive feedback, to people having internal feelings of competence and self-determination; which relates to Maturity Level IV Integration.

Deci, Ryan, & Koestner's (1999a) Meta-Analytical Review (see 4.3.3 Contingent Incentivisation Reduces Intrinsic Motivation) identifies positive feedback enhances free choice behaviour and self-reported interest. As does Deci, Koestner, & Ryan's (2001, p.8) further study, which confirms a positive correlation ($p < .05$) for verbal rewards to free-choice

behaviour (d = 0.33) and self-reported interested (d = 0.31). Therefore, where a construction manager provides staff with positive reinforcement, particularly in a male dominated industry, there will be improvements in motivation.

Deci (1973) repeats the positive reinforcement experiment with both male and female participants. Once again, the experiment's results are that positive verbal feedback increases intrinsic motivation in males. In contrast, the study finds positive verbal feedback decreases the intrinsic motivation in females. Therefore, the study identifies a difference between male and female genders. In contrast, later studies (Nix et al., 1999, p.275; Ryan, 1982) do not indicate significant differences between genders. The lack of deviation between the genders could be a result of the time difference between the two studies. Since Deci's (1973) study culture has moved on and changes are evident for example as seen in the post-feminist movement. Authors such as Modleski (1991) explore the post-feminist movement generally believing feminism has achieved its goal. In other words, culture has changed and moved on.

4.4.5 Controlling Feedback Reduces Intrinsic Motivation

Ryan (1982) undertook a similar study to that of Nix et al.'s (1999) second experiment including the engagement Al Hirschfield drawings. The participants of Ryan's (1982, p. 454) study include 128 introductory psychology students, that participate as part of course requirements. Students receive positive, slightly positive and negative feedback regarding their performance. The study investigates an initial interest measure; treatment effects on intrinsic motivation; performance; and supplemental analysis. The initial interest measure is undertaken to ascertain whether subjects would find the study interesting. The participants rate on a seven-point likert scale two types of puzzles depending on interest and enjoyment. The data indicates that both the puzzles that form the basis of the study are interesting. The study similar to Deci et al. (1989) study identifies that the type of feedback has an effect on intrinsic motivation, with less motivation for participants in receipt of controlling, opposed to informal feedback. Similarly, Deci et al. (2001, p.9) identify verbal rewards can "have a negative effect on intrinsic motivation if the interpersonal context within which they are administered is controlling rather than informational". Therefore, in relation to construction the way in which a site agent or performance measurement system delivers feedback has an effect on motivation.

4.4.6 SELF-AWARENESS REDUCES MOTIVATION

Plant & Ryan's (1985) work explores intrinsic motivation and the effects of self-consciousness, self-awareness and ego involvement. The participants are 96 psychology students. In the study, the participants complete a self-consciousness scale, followed by an ego-involving task, and finally three interesting puzzles. During the puzzle solving period the participants are in the presence of a mirror, video camera or had no manipulation of self-awareness. Following the tasks, the participants move to a cubicle with puzzles for six minutes with no request to undertake them. After which they complete a questionnaire to assess their interests and attitudes. Thus, there are three stages of the research, namely pre investigation of participants, activities undertaken by the participants and finally a post investigation of participants. The work does not indicate any significant differences for involvement, awareness, treatment or sex. The study found that the higher the level of public self-consciousness the lower the level of intrinsic motivation exhibited.

Dispositional self-consciousness relates to an individual's natural or emotional outlook. Plant & Ryan's (1985) research indicates that there is a negative effect on intrinsic motivation with personality types with high levels of public consciousness and social anxiety. This signifies the recognition by the research of different personality types (see 4.2.2 Personality Types in Construction). Plant & Ryan's (1985) research also indicates similar to Ryan (1982) that participants with ego-involvement spend less time on the activity during free choice than the task involved participants. Therefore, introjection has a negative effect on intrinsic motivation. The data also indicates that self-awareness has a negative effect on intrinsic motivation, with the negative effect being greater for participants with ego-involvement. Therefore, there is a negative effect where ego involvement occurs due to observing oneself or being observed, with being observed by others having the greater effect.

4.4.7 PART SUMMARY

Level two relates to Ryan and Deci's (2000a, p.61) regularity style of introjection relating to ego involvement and the focus of approval from self and others. Parkin, Tutesigensi, & Büyükalp (2009) identify relationships, responsibility and recognition as areas of motivation that relate to introjection. Methods of working that relate to introjection have a negative effect on motivation including punishments, feelings of incompetence, controlling feedback and feelings of being observed. For females, early research identifies positive verbal

feedback reduces intrinsic motivation. Later research does not show a difference between males and females. A number of meta-analyses that examine over 120 experiments confirm that overall extrinsic motivation strategies have a negative effect on intrinsic motivation.

A negative effect on vitality is found were feedback is provided in such a manner to be: ego related (Nix, Ryan, Manly, & Deci, 1999, p. 276; Ryan R. M., 1982; Plant & Ryan, 1985); or controlling (Ryan R. M., 1982; Deci, Koestner, & Ryan, 2001; Nix, Ryan, Manly, & Deci, 1999; Ryan & Deci, 2006). Following the work in psychology it is not surprising Hughes, Williams, & Ren (2009, p. 528) found performance measurement to have a negative effect on other requirements. For example, where the measures relate to task performance, fail to consider contextual performance.

4.5 MATURITY LEVEL III IDENTIFICATION

4.5.1 PART INTRODUCTION

Williams and Deci's (1996, p. 768) 'identification' is partial internalisation where external regulatory pressures are taken on by an individual, however, with no acceptance as being their own. Maturity Level III relates to the regularity style of 'identification' as characterised by Ryan & Deci (2000a) to be the conscious valuing of activity through self-endorsed goals along with its associated autonomy. At level 3, Flynn (2011) identifies that continuous improvements enable through performance management systems. Performance measurement systems are available in the construction industry for use as informational and/or controlling purposes. Where goals are not self-endorsed, such as the case with controlling performance management systems, the potential for the regularity style of introjection emerges.

4.5.2 INTRINSIC MOTIVATION INCREASES PERSISTENCE AND PERFORMANCE

Grant (2008) explores prosocial motivation, which relates to a person's willingness to benefit others. The work is undertaken in two studies. The first study investigates if there is a link between intrinsic motivation and overtime working, of 58 fire fighters in mid-west America. Measures are undertaken relating to: prosocial and intrinsic motivation; and persistence. Prosocial and intrinsic motivation measure uses a questionnaire adapted from the work of Ryan & Connell (1989). The persistence measure data is from the training chief concerning the number of overtime hours worked. The data indicates a link exists between intrinsic motivation and increased overtime working.

Grant's (2008) second study investigates if intrinsic motivation strengthens the relationship between prosocial motivation and performance of fundraising telemarketers (71 women and 69 men) in mid-western America. The study measures 'prosocial and intrinsic motivations', 'job satisfaction and performance' and 'productivity'. Prosocial and intrinsic motivation measure is similar to the first study. Job satisfaction measure uses a four-item scale from a previous study. Managers in the call centre provide objective data on performance and productivity. Productivity correlates ($p<.05$) with intrinsic motivation and job satisfaction. Therefore, this work (study 1 & 2) indicates a positive relationship between intrinsic motivation and the qualities associated with performance.

4.5.3 Interpersonal Contact Increases Performance

Grant, et al., (2007) undertake three experiments to explore the effects of contact with beneficiaries on persistence behaviour. In experiment one, there are three groups; the first group interacts with the beneficiary; the second and third group read and discuss a letter from the beneficiary and alternatively had no contact with the beneficiary. The experiment measures persistence behaviour and objective job performance (longitudinally) over the three groups. Persistence behaviour measure is the number of minutes on the telephone. The job performance measure is the amount of donation money secured. The data indicates a significant improvement in persistence and performance where there is interpersonal contact (171% more money). The least amount of improvement is found in participants that read and discuss the letter. Therefore, a link is found between direct contact with beneficiaries and motivation.

Grant, et al.'s, (2007) second experiment tests the effect of respectful contact with beneficiaries on persistence behaviour. The participants of the experiment are 30 undergraduates (16 male). The measures are persistence, perceived impact and two manipulation checks. Persistence measure is the time participants spend editing cover letters. Four items develop to measure participants' perceptions on impact to the beneficiary. The manipulation checks confirm that the manipulation is effective. The data indicates that the respectful contact with "beneficiaries increases persistence behaviour through its effects on perceived impacts" (Grant, et al., 2007).

4.5.4 Beneficiary Contact with High Significance Increases Task Persistence

Grant, et al.'s, (2007) third experiment explores if mere contact with beneficiaries increases persistence behaviour. The participants are 122 undergraduates (48 male). The four control groups have two different letters. The first cover letter is given high task significance, stating that the beneficiary was finding difficulties in making payments. The second cover letter is given low task significance, stating that the beneficiary requires additional spending money. The four control groups are: low task significance, no contact; low task significance, mere contact; high task significance, no contact; and high task significance, mere contact. The measures relate to persistence, the affective commitment to beneficiaries and manipulation checks. Affective commitment to beneficiaries' measure uses three items and a seven-point scale. Persistence is the measurement of the amount of time participants spend editing cover letters. The data indicates: increases in persistence with mere contact and high task significance only; and persistence does not increase with mere contact where there is low task significance. Therefore, where people undertake work they understand to be unimportant, contact does not improve persistence.

4.5.5 Part Summary

Level three relates with the regularity style of 'identification' as characterised by Ryan & Deci (2000a) to be the conscious valuing of activity through self-endorsed goals along with its associated autonomy. The benefits of intrinsic motivation have been found by a number of studies. Where people find a sense of autonomy, they find intrinsic motivation (Nix, Ryan, Manly, & Deci, 1999). This level seeks to improve prosocial motivation, which relates to a person's willingness to benefit others. Improvements to performance and persistence is available through interpersonal contact, between those undertaking the work and those obtaining the benefit (Grant, et al., 2007); however the improvement associates to where the people undertaking the work can perceive the value of the deliverable (Grant, et al., 2007).

4.6 Maturity Level IV Integration

4.6.1 Part Introduction

Williams and Deci (1996, p. 768) identify integration as internalisation where external regulatory pressures are taken on by an individual as their own beliefs. At Maturity Level IV intrinsic motivation occurs and there is procedural equality (Flynn, 2011) and autonomous

support. Williams and Deci's (1996, p. 767) describe "autonomy support" as part of self-determination theory, where a person in an authoritative role takes another's "perspective, acknowledging the other's feelings and perceptions, providing the other with information and choice, and minimizing [sic] the use of pressure and control". With participative management, there is encouragement for employees to contribute ideas. Deci (1973, p. 29) further identifies that "behavioral [sic] scientists believe that participative management is the most effective way of achieving high performance and also more conducive to satisfied and mentally healthy employees".

4.6.2 Autonomy, Competence and Relatedness Increases Intrinsic Motivation

Earlier discussions in this chapter explore needs hierarchies including that of Maslow (1970) (see 4.2.5 Motivational Hierarchy). Towards the bottom of Maslow's needs hierarchy is safety that includes security of body, employment, resources, family health and property. There is a clear link between safety needs and money. In relation to the construction industry, fair payment occurs through an integrated regulatory style. Deci (1973, p. 31) recognises the necessity of payment in order to attract people and keep them satisfied with their jobs. The use of money as management tool relates to integration where provided to ensure employees achieve their needs. Within Parkin, Tutesigensi, & Büyükalp's (2009) work the motivators of equality, money, food and home life relate to integration. Ryan (1995) relates integrated behaviour to the psychological needs of autonomy, competence and relatedness.

Baard et al. (2004) undertake a pilot study and a primary study. The pilot study includes 59 participants that work in a bank in America; 35 of which provide their performance evaluations. The measures include autonomy orientation, perceived managerial autonomy support, intrinsic need satisfaction scale, general health questionnaire, and work performance evaluation. Autonomy orientation measure uses a general causality orientation scale that presents "12 different vignettes about problems or situations that arise in life (e.g. opportunity to take a new job)" (Baard et al., 2004, p.2050). The 'perceptions of managerial autonomy support' measure is from responses to managerial scenarios, with responses ranging (in seven-point scales) from highly autonomous-supportive to controlling (also see 4.4.5. Controlling Feedback Reduces Intrinsic Motivation). The intrinsic need satisfaction in the pilot study is assessed using a twenty-three-item questionnaire that participants respond to using a 5-point scale. The general health questionnaire has a particular interest in depression, anxiety, somatic symptoms and social dysfunction; with responses from participants being on a four-

point scale (see 4.3.4 Extrinsic Motivation's Negative Effect on Vitality, Depression and Physical Symptoms). The work's performance measure uses the corporation's standard performance evaluation questionnaire; with responses from participants being on a four-point scale ranging from excellent to below standard.

Table 12: Baard, et al.'s Intrinsic Needs Pilot Correlation

	Variables	1	2	3	4	5	6	7
1	Autonomous causality orientation							
2	Manager autonomy support	-						
3	Intrinsic need satisfaction	✓	✓					
4	Need satisfaction autonomy	✓	✓	✓				
5	Need satisfaction competence	✓	✓	✓	✓			
6	Need satisfaction relatedness	✓	✓	✓	✓	✓		
7	Performance evaluation	-	-	✓	-	-	✓	
8	Anxiety depression	-	-	✓	✓	✓	-	-

Table 12 summarises the correlations found in Baard et al.'s (2004) pilot study. There is a correlation ($p<.05$) between 'performance evaluation' and 'intrinsic need satisfaction'. Intrinsic need satisfaction relates to interest, enjoyment and inherent satisfaction (Ryan & Deci, 2000a, p.61). In simple terms, performance is improved with intrinsic need satisfaction. The workforce enjoys what it does, therefore performs well. The study further identifies a correlation ($p<.05$) between performance evaluation and 'need satisfaction relatedness'. Baard et al. (2004, p. 2046) refers to the work of Baumeister & Leary (1995) and Harlow (1958) to identify relatedness to "a sense of mutual respect and reliance with others". Therefore, data presents a link between a mutual respect of needs and performance. The employer organisation relates and respects the workforce therefore performs well. Respect of others relates to Maslow's (1970, p. 21) esteem needs and Ryan & Deci's (2000a) integration.

The pilot study further identifies a correlation ($p<.05$) between 'anxiety and depression' and 'need satisfaction competence' and to a lesser extent ($p<.08$) 'intrinsic need satisfaction' and 'need satisfaction autonomy'. The connection between anxiety and depression at motivational styles is made earlier in this Chapter (see 4.3.4 Extrinsic Motivation's Negative

Effect on Vitality, Depression and Physical Symptoms). This work strengthens the argument to link motivational styles to competence, autonomy and intrinsic need satisfaction.

Baard, et al.'s (2004) primary study includes data from 528 first line employees from a major investment bank. In a similar way to the pilot study, the primary study investigates: workers' autonomy orientation; perceptions of managers' autonomy support; satisfaction of the needs for competence, autonomy and relatedness; vitality; adjustment; and performance. A work climate questionnaire "assesses participants' perception of the degree of autonomy supportiveness of their managers"; with responses made on seven-point scale, one not at all and seven very true. The work climate questionnaire develops from earlier work (Williams et al., 1996; Williams & Deci, 1996). In addition, a supplemental measure is undertaken using a 'problems at work questionnaire' from work by Deci, et al., (1989). Vitality uses a seven-item questionnaire assessing feelings of "physical and mental vitality, aliveness and vigour". Adjustment assessment uses the indicator of anxiety, somatization (chronic illness) and vitality. Participants' performance is from the organisation's most recent performance evaluation ratings. The work indicates correlations between most of the variables (see Table 13).

Table 13: Baard, et al.'s Intrinsic Needs Primary Correlation

	Variables	1	2	3	4	5	6	7	8
1	Autonomous causality orientation								
2	Manager autonomy support	✓							
3	Manager autonomy support	✓	✓						
4	Intrinsic need satisfaction	✓	✓	✓					
5	Need satisfaction autonomy	✓	✓	✓	✓				
6	Need satisfaction competence	✓	✓	✓	✓	✓			
7	Need satisfaction relatedness	✓	✓	✓	✓	✓	✓		
8	Performance evaluation	✓	✓	✓	✓	✓	✓	✓	
9	Anxiety depression	-	✓	✓	✓	✓	✓	✓	✓

Ryan, et al.'s (1999) work explores life goals within culture and gender groups. The gender groups include U.S. Males, U.S. Female, Russian Male and Russian Female. All four of the groups ranked life goals. The highest-ranking life goal for all groups is relatedness. The second highest-ranking item for three out of the four groups is personal growth with the exception of Russian females preferring health. Health as a life goal is the third highest ranked item for the two male groups and the fourth highest ranked item for U.S. Females. Maturity level I of the Motivational Maturity model relates to the use of financial incentivisation (see 4.3 Maturity Level I External Regulation). Financial success is ranked seventh by both Russian and US males; with US females ranking financial success eighth and Russian females fourth. Therefore, the life goal of financial success is relatively low ranking in comparison to other goals, such as relatedness.

DeVoe & Iyengar (2004) examine the cross-cultural perceptions of managers of motivation and appraisal of performance. The study explores perceived culture within a particular (banking) organisation that operates in the regions of North America, Asia and Latin America. The study does not explore culture in the location of the DBenv research. The participants of DeVoe & Iyengar's (2004) study include 185 consumer branch managers and 1760 consumer branch employees. The participants are in a small amount of countries (6nr) that is not a representative sample for the cultural generalisations made by the work. For example, data is only from two countries in Asia. Asia is a large area of land mass that encapsulates a diverse range of cultures; at least 20 times the number of countries the study examines for the region. The study does not include the data to make generalisations across specific cultures, for example, one culture has a multitude of organisations operating in different sectors. In addition, the findings of the research may be specific to the organisation in focus.

The measures of DeVoe & Iyengar's (2004) study are perceptions of motivation, performance evaluation and demographics. Employees and managers complete questionnaires that explore perceptions of motivation using likert scales. Performance data is from managers' internal human relations data. The demographic information relates to role within organisation, ethnicity, gender, age and tenure. The work makes a limited attempt to support conclusions with empirical data. The data provides an indication of perceptions which may or may not have a link to what is actually motivating people. The North American managers generally perceive their subordinates to be more extrinsically (6.98) than intrinsically motivated (6.36). The Asian managers generally perceive subordinates' motivation in approximate equal

proportions to intrinsic (7.33, 6.85) and extrinsic motivators (7.48, 6.63). Latin America managers generally perceive subordinates' motivation as intrinsic (6.60, 7.05, 7.34) in contrast to extrinsic motivators (4.18, 6.73, 6.56). Therefore, the study found three different cultural perceptions within managers. In contrast, in all of the cultures, employees generally believe motivation is intrinsic rather than extrinsic.

One way for an organisation to demonstrate relatedness is through a corporate social responsibilities policy. Skudiene and Auruskeviciene (2012) explore the effects of corporate social responsibility on employee motivation. The study explores literature form between 2003 and 2008 to identify positive effects of a company's social responsibility. The effects include: (1) employee attraction; (2) employee self-image; (3) (reduced) employee salaries; (4) employee satisfaction, commitment and loyalty; (4) employees' willingness to initiate, participate and contribute social change initiatives; (5) teamwork; (6) performance and productivity; (7) psychological need for belongingness; (8) trust; and (9) employee morale.

Skudiene and Auruskeviciene's (2012) study does not have a construction department focus, with the respondents being from marketing (28.8%), sales (27.4%), accounting and finance departments (19%). In addition, the research is not construction sector focused with the respondents being from finance and insurance sectors (27%), consultancy (23.4%) and communication and publishing (19.3%). The sectors, however, do have a role to play in supporting the construction activity. The study collects data from 11 medium to large enterprises in Lithuania using 274 interviews. The location of the study is different culturally from the DBenv study. The survey questions are statements that respondents' position on a seven-point likert scales; 1 is strongly disagree and 7 strongly agree. Therefore, similar to DeVoe & Iyengar's (2004) study, the data relates to perceptions.

More than half of Skudiene and Auruskeviciene's (2012) respondents relate corporate social responsibility to ethical conduct (78.1%) and environmental protection (59.9%). Fewer than 50% of respondents associate corporate social responsibility with social inequalities correction (48.9), public relations (28.5%), compliance with regulations (20.8%), transparency in operations (11.7%), addressing stakeholder concerns (8.0%) and stakeholder partnerships (5.5%). Similar to Skudiene and Auruskeviciene's (2012) study Chan (2011) explores the diversity agenda in UK Construction. Skudiene and Auruskeviciene's (2012) data identifies a correlation between internal and external corporate social responsibility and

intrinsic motivation. Internal corporate social responsibility relates to employees and external correlation relates to customers, local communities and business partners.

Williams & Anderson (1991) explore extra-role behaviours as organisational citizenship that is relatable to Motowidlo & Scooter's (1994) contextual performance. Williams & Anderson (1991) identify two subdivisions of organisational citizenship, namely that of individuals and organisations; with individual relating to altruism and organisational general compliance. The participants of the study are 461 (two-thirds male) full time employees working in technical/professional roles. Performance data is from questionnaires completed by 127 of the participants' supervisors from their employer. The measures of the study are performance, satisfaction, and organisational commitment. The satisfaction measure further explores extrinsic and intrinsic cognitive dimensions. Organisational commitment explores psychological attachment to the organisation in relation to: compliance and extrinsic rewards; identification and affiliation; and internalisation. These levels of psychological attachment align with self-determination theory and the DBenv thesis' maturity model for motivation.

Williams & Anderson (1991) findings provide for three different types of performance namely, in role behaviours, organisational citizenship behaviour internal and organisational citizenship behaviour external. The data indicates that organisational citizenship behaviour is an "a function of fairness of overall treatment by the organisation" and "the general fairness of the organisation policies and procedures". Therefore, an organisation needs to offer more than process management of employees to promote contextual performance (see 1.4 Performance). In case of the construction industry, performance indicators with a project focus ignore contextual performance requirements.

4.6.3 Enjoying Work Promotes Intrinsic Motivation

A recent study relates self-determination theory to physical activity, sport and health identifying that "only activities that satisfy certain basic psychological needs will be experienced as interests and be intrinsically motivated". (Ryan, Williams, Patrick, & Deci, 2009, p. 107). Intrinsic goals include such things as interest, enjoyment (Ryan & Deci, 2000a, p.61), and self-acceptance in order to satisfy a basic and inherent psychological need (Kasser & Ryan, 1996). Deci (1973, p.29) identifies that there are two aspects to intrinsically motivating people, namely designing tasks, which are: (1) interesting; and (2) that necessitate creativity and resourcefulness. Parkin, Tutesigensi, & Büyükalp's (2009) identify enjoyment

to intrinsic motivation which expands using Griffith's (1996, p. 32) work to include enjoying using technology. As the construction industry is changing, as part of the digital revolution there is increasing emphasis in making technology enjoyable to use, to promote motivation.

With Intrinsic motivation, people undertake an activity because it is inherently interesting or enjoyable (Ryan & Deci, 2000a). Such feelings may originate from a calling, for example in relation to a deity. Elangovan, Pinder, & McLean (2009, p. 430) explore callings and organisational behaviour. The work explores literature relating to religion and defines a calling as "a course of action in pursuit of pro-social intentions embodying the convergence of an individual's sense of what he or she would like to do, should do, and actually does." Elangovan, Pinder, & McLean (2009, p. 430) employs a literature review to explore the implications of callings on organisational behaviour, which is summarised in Table 14.

Table 14: Implications of Callings for Organizational Behaviour

Category	Characteristics	Supporting Literature
Work motivation	better engagement and motivation.	Deci & Ryan, 1985, 2008; Dobrow, 2004; Staw, 1976
Career choices	Inherent occupational choice	Lofquist & Dawis, 1969).
Job satisfaction	life satisfaction; health; and reduced absenteeism.	Ashforth, 2003; Wrzesniewski et al., 1997; Wrzesniewski, 2002; Pratt & Wrzesniewski, 2003
Stress	intrinsic goal focus; and health.	Dik and Duffy, 2009; Frankl, 1984; Levoy, 1997;
Escalation of commitment	commit to a course of action in the face of continued negative assessment of success	Staw, 1981; Whyte, 1986
Organizational citizenship behaviour	perform over and above call of duty	Organ, 1990; Serow, 1994; Wrzesniewski et al., 1997
Organizational commitment and employee turnover	meaningfulness in work and at work	Pratt and Ashforth, 2003; Dobrow, 2004

4.6.4 Organisational Support and Autonomy Promotes Intrinsic Motivation

Nix et al.'s (1999) work examines the effect of experimental inducement of motivation orientations on the positive effects of vitality and happiness, through three experiments. The first experiment examines whether an internal perceived locus of causality would enhance feeling of vitality. The second experiment examines whether there is a difference if a task is

undertaken with evaluative pressure (see 4.4.3 Feelings of Incompetence Reduce Intrinsic Motivation). The third explores peoples understanding of the impact of motivational processes on vitality and happiness. This Chapter previously identifies that controlling behaviour reduces motivation (see 4.4.5 Controlling Feedback Reduces Intrinsic Motivation). Controlling behaviour associates with an external locus of causality (see Figure 12: Taxonomy of Human Motivation, p. 69). The opposite of controlling behaviour is to provide people with autonomy, which relates to an internal locus of causality. Nix et al.'s (1999) first experiment examines whether an internal perceived locus of causality would enhance feeling of vitality. In construction, for example, would a site agent feeling in control of a construction project work longer than one, which felt the works were outside of their control.

Nix et al.'s (1999) experiment had 93 participants from psychology courses, which are given credit for participating. The experiment explores three measures namely, the (1) subjective and vitality scale, (2) happiness using a likert scale and (3) and perceived choice using items taken from the intrinsic motivation inventory. Assessment of respondents' vitality is undertaken before and after a task using Ryan & Frederick's (1997) subjective vitality scale; a seven-item survey that assesses feelings of aliveness and energy on a nine-point likert scale. Ryan & Frederick (1997, p.530) describe vitality as a specific physiological experience of possessing enthusiasm and spirit. There is a happiness test before and after the experiment use a nine-point scale. Intrinsic motivation inventory assess perceptions of choice and freedom. The inventory is an established approach used by a number of researchers in the field of motivation (Ryan R. M., 1982; Plant & Ryan, 1985; Ryan, Connell, & Plant, 1990; Ryan, Koestner, & Deci, 1991; Deci, Eghrari, Patrick, & Leone, 1994; Ryan, Patrick, Deci, & Williams, 2008).

In the first experiment's activity, the participants undertake a cognitive problem-solving task (Nix et al., 1999, pp.273-4). One set of participants work in a self-directed condition, in that they work freely to solve the task, with an internal perceived locus of causality. In other words, have control over how they tackle the task. Another set of participants receive direction to carry out the activities in a particular sequence, with an external perceived locus of causality. In other words have limited control over how they tackle the task. The perceived choice measure indicates the manipulation of the participants is effective, in relation to the perceived locus of causality (Nix et al., 1999, p.275). The data indicates that vitality is maintained before and after the study, where there is an internal perceived locus of

causality. In relation to Ryan and Deci's (2000a, p.61) 'taxonomy of human motivation', there is intrinsic motivation, which provides interest enjoyment and inherent satisfaction. In contrast, Nix et al.'s study indicates vitality declined where there is an external perceived locus of causality (participants with less autonomy). Therefore, the data indicates extrinsic motivator's that create an external perceived locus of causality reduce vitality. In relation to Ryan and Deci's (2000a, p.61) 'taxonomy of human motivation' it relates to external regulation that includes salience of extrinsic rewards or punishments; compliance and reactance. Nix et al.'s (1999, p. 275) data indicates no change in happiness between the two types of participant, with no reduction of happiness between the start and completion of the activity. Thus, the data indicates that external regulation, as extrinsic motivation with a perceived external locus of causality does not reduce happiness.

Nix et al.'s (1999, pp.278-80) third experiment explores peoples understanding of the impact of motivational processes on vitality and happiness. In the experiment, the direction to participants is to either imagine taking a course either for autonomous or controlled reasons. The experiment has 141 participants recruited from psychology courses and are given credit for participating; others are enrolled through solicitation of students on campus. This is significant because unlike Nix et al.(1999) previous two experiments the participants recruitment is from a broader range of disciplines. Both sets of participants from the third experiment's autonomous and controlled groups are asked to imagine that they have performed well even though the work was difficult. The participants score on a likert scale happiness and vitality items. The data indicates that the participants in the non-required condition felt more autonomy, indicating achievement of manipulation of participants. Similar to Nix et al.'s experiment one and two, participants with perceived autonomy indicate more vitality than those controlled. Thus, the data indicates autonomy that associates with intrinsic motivation promotes vitality unlike extrinsic motivation with an external perceived locus of causality; furthermore, the use of extrinsic motivators does not inhibit happiness.

Campion, Medsker, & Higgs' (1993) data is from 391 employees, 70 managers and archival records from 80 work groups; in 5 geographical units of a financial institution. The measures in the research are of work group design and work group effectiveness. Work group effectiveness uses three measures exploring productivity, employee satisfaction and manager judgements of effectiveness. Manager judgements of effectiveness are undertaken using four items on a questionnaire, specifically, quality of work, customer service, satisfaction of the

members and productivity. A five-point response format is employed with five "well above" and one "well below". The data identifies a significant correlation between productivity and self-management (employee data $p<.05$, manager data $p<.10$).

Campion, Medsker, & Higgs' (1993) data also indicates a significant correlation between productivity and social support (employee data $p<.05$). Similarly Baard et al.'s (2004) pilot study identifies a correlation between manager autonomy support and intrinsic need satisfaction ($p<.001$), need satisfaction autonomy ($p<.05$), need satisfaction relatedness ($p<.001$) and a weak correlation ($p<.08$) with need satisfaction competence (see 4.6.2 Autonomy, Competence and Relatedness Increases Intrinsic Motivation). Similar findings were found in Baard et al.'s (2004) primary study. Therefore, senior management support promotes productivity.

4.6.5 PART SUMMARY

Level four relates to the regularity style of integration involves the associated processes of hierarchical synthesis of goals of congruence (Ryan & Deci, 2000a). Ryan (1995) relates integrated behaviour to the psychological needs of autonomy, competence and relatedness. The involvement of people in decisions relating to them improves performance and mental health (Deci, 1973; Baard, Deci, & Ryan, 2004; Campion, Medsker, & Higgs, 1993) and vitality (Nix, Ryan, Manly, & Deci, 1999); it also reduces the negative effect of external regulation (Moran, Diefendorff, Kim, & Liu, 2012). The use of money as management tool relates to integration when ensuring employees achieve their needs. There are a number of needs hierarchy's one being Maslow's, which includes security of employment as a need. People do not need extrinsic motivation to undertake an activity; instead, they may find motivation through something internal, such as enjoyment, or a calling (Elangovan, Pinder, & McLean, 2009). Companies can also achieve benefit of intrinsic motivation through their corporate social responsibility policy (Skudiene & Auruskeviciene, 2012). Later parts of the DBenv thesis explore organisational relatedness further (see 5.5 Maturity Level III Future Challenges).

4.7 MIXED REGULARITY STYLES

4.7.1 PART INTRODUCTION

Earlier parts of this chapter explore different motivational regularity styles. The regularity styles allocate to different levels of a motivational maturity model (see Table 17: Motivational Maturity Model Summary, p. 100). It is possible to allocate different ways of working to a locus in a maturity model. A locus relates to a centre of focus, opposed to absolute position. Therefore, instead of having an absolute position in the hierarchy, it is possible for a particular way of working to relate to more than one level. This part explores the effect on motivation of different combinations of regularity styles.

4.7.2 INTRINSIC MOTIVATION IN ORGANISATIONS

Moran, Diefendorff, Kim, & Liu's (2012) matrix of possible motivations profiles includes low, moderate and high increments between different rows and columns (see Table 15). The columns relate to autonomous motivation. The rows relate to controlled motivation. The work suggests that there is varying degrees of motivation that vary from amotivated in the top left hand corner of the matrix, to motivated in the bottom right corner of the matrix. This is significant because rather than seeing controlled and autonomous motivation on the two ends of the same spectrum (as Figure 12, p. 69), the work sees them as interoperable with the possibility of both high levels of controlled and autonomous motivation.

Table 15: Matrix of Motivational Profiles

		Autonomous motivation		
		Low	Moderate	High
Controlled motivation	Low	Amotivated	Moderate internals	Internals
	Moderate	Moderate externals	Moderately motivated	Motivated internals
	High	Externals	Motivated externals	Motivated

Source: Moran et al (2012)

Moran, Diefendorff, Kim, & Liu's (2012) work, similar to the DBenv study relates self-determination theory to practitioners. A significant proportion of the earlier work in self-determination theory develops from data from student participants (Deci E. L., 1973; Nix, Ryan, Manly, & Deci, 1999). The participants in Moran, Diefendorff, Kim, & Liu's (2012) research are from organisations that employ more than 400 employees operating in different sectors located in China, which is a different location than the DBenv study. However, the work is similar to the DBenv study in relating self-determination theory to professional practice. The sectors of practice include a service company, real estate companies, an energy company and government agencies.

Moran, Diefendorff, Kim, & Liu's (2012) data is from 226 questionnaires returned from either managers (62) or their direct subordinates. The work provides limited information explaining the roles of the employees with their respective organisations. The participants are an average age of 38 years old, with an average of 16 years in their job. 79.4% of the participants are male. This is relevant to the DBenv study in that the UK Construction Industry has a male bias. The measures of Moran, Diefendorff, Kim, & Liu's (2012) work include: social support; job characteristics; motivation; psychological need satisfaction at work; and in role performance.

Moran, Diefendorff, Kim, & Liu's (2012) measure social support; job characteristics; motivation; psychological need satisfaction at work; and in-role performance. The measures social support uses a five point likert scale with one being strongly disagree and five being strongly agree; with three questions are from the work of Campion, Medsker, & Higgs (1993, p. 850). The job diagnostic survey is from Hackman & Oldham (1975) work and measures job characteristics; with task characteristics investigating autonomy using three questions under each of the headings of 'work scheduling autonomy', 'decision making autonomy' and 'work methods autonomy'. Earlier work of Morgeson & Humphrey (2006, p. 1321) validate the questionnaire using 540 participants holding 243 different types of jobs, demonstrating a rigorous approach.

With Moran, Diefendorff, Kim, & Liu's (2012) motivation measure participants provide responses to questions concerning the regularity styles from Ryan & Deci's (2000a) work, specifically external regulation, introjection, identification, integration and intrinsic motivation. The response to the motivation measure is a five point likert scale, from strongly agree to strongly disagree, in respect of fifteen items. Moran, Diefendorff, Kim, & Liu's

(2012) measure of psychological need satisfaction at work measure uses a scale from the earlier work (Baard, Deci, & Ryan, 2004; Deci, Koestner, & Ryan, 2001). This part of the survey includes 21 items that participants respond to using seven-point likert scale; with one being 'not at all true' and being 'very true'. In Moran, Diefendorff, Kim, & Liu's (2012) work in role performance is measured with seven items from the work of Williams & Anderson (1991) using a five point likert scale; one being 'strongly disagree' and five being 'strongly agree'.

Table 16 relates Moran, Diefendorff, Kim, & Liu's (2012) clusters to external regulation, introjection, identification, integration and intrinsic motivation. The first cluster relates to low introjection and has a profile of moderate internal; meaning it is moderately controlled and has along with cluster three a low autonomy value. Performance is relatively low 3.69. Clusters with a high autonomy value achieve higher levels of performance. The first cluster has moderate levels of motivation in each of the regularity styles, with the exception of introjection being low.

Table 16: Clusters of Motivational Types

Cluster	1st	2nd	3rd	4th	5th
Cluster Name	Low Introjection	Moderate	Low Autonomy	Self-determined	Motivated
Profile	Moderate internal	Moderately motivated	Moderate external	Internal	Motivated
Participants	16%	30.2%	12%	15.1%	26.2%
External Regulation	Moderate	Moderate	Low	Low	High
Introjection	Low	Moderate	Low	High	High
Identification	Moderate	Moderate	Moderate	High	High
Integration	Moderate	Moderate	Low	High	High
Intrinsic motivation	Moderate	Moderate	Low	High	High
Autonomy	4.15	4.81	3.47	5.38	5.34
Competence	4.61	4.91	4.18	5.56	5.76
Performance	3.69	3.82	3.55	3.81	4.02

The second cluster shows higher performance (3.82) than the first cluster (3.69), indicating that introjection does not have a negative effect on performance. However, in the cluster, autonomy is also high which could account for the high performance in comparison to the first cluster. The third cluster has the lowest performance rating out of all clusters (3.55).

The cluster has a low classification in each of the regularity styles, with the exception of identification being moderate; it also receives the lowest rating autonomy. Therefore, the cluster with the lowest intrinsic motivation and autonomy rating also has the lowest performance rating.

The fourth cluster label is self-determined and has high levels of each of the regulatory styles, with the exception of external regulation, which is low (Moran et al., 2012). A self-determined regularity style would exhibit low levels of both external regulation and introjection. Therefore, it is not correct of Moran et al.'s (2012) work to label the cluster self-determined. Based on earlier studies exploring the negative effect of external regulation on vitality expectation is that cluster four would exhibit the highest performance rating; instead, the fifth cluster shows the highest performance rating. The contrasting prevalence could be due to the fifth cluster having the highest competence rating. The fourth cluster has high levels of introjection, which has a negative effect on health and vitality. The research into self-determination theory would suggest that the best performing cluster would include low levels of introjection and external regulation. There is not a cluster with both low levels of external regulation and introjection. The fact that the fifth cluster has high levels of performance could relate to the interplay between external regulation and introjection.

4.7.3 PART SUMMARY

Moran et al.'s (2012) work confirms that when considering how employees are motivated there may be a mixture of regularity styles. The mixture of regulatory styles relates to different ways of working. Therefore, a collaborative feature may relate to more than one regularity style. In relation to the DBenv study, different ways of working are collaborative features. Moran et al.'s (2012) work attempts to summarise or make an overall assessment of regularity approaches. The work makes a clear link to performance with both autonomy and competence, which relate to the regularity style of integration (see 4.6 Maturity Level IV Integration, p. 85).

4.8 CHAPTER SUMMARY

The structure of the maturity model develops from work in self-determination theory (see Table 17: Motivational Maturity Model Summary). A number of studies develop self-determination theory in the 1990s. The earlier work in self-determination theory is

undertaken in the United States of America using students. Self-determination theory relates to adults (Kasser & Ryan, 1996) and work place motivation (Gagne & L.Deci, 2005; Baard, Deci, & Ryan, 2004; Deci, Connell, & Ryan, 1989; Moran, Diefendorff, Kim, & Liu, 2012; Ankli & Palliam, 2012). Recent studies relate self-determination theory to psychotherapy (Ryan & Deci, 2008); physical activity, sport and health (Ryan, Williams, Patrick, & Deci, 2009); across life domains (Deci & Ryan, 2008a); goal framing (Vansteenkiste, Lens, & Deci, 2006); and educational reform (Deci E. L., 2009). There is intercultural work, outside North America, which explores self-determination theory, for example in Russia; South American; Asia; Europe.

Table 17: Motivational Maturity Model Summary

Maturity Level	Consequence
I External Regulation	• Contingent Incentivisation Reduces Intrinsic Motivation • Extrinsic Motivation has a Negative Effect on Vitality, Depression and Physical Symptoms
II Introjection	• Punishment Reduces Intrinsic Motivation • Feelings of Incompetence Reduce Intrinsic Motivation • Positive Reinforcement Increases Intrinsic Motivation • Controlling Feedback Reduces Intrinsic Motivation • Self-awareness Reduces Motivation
III Identification	• Intrinsic Motivation Increases Persistence and Performance • Interpersonal Contact Increases Performance • Beneficiary Contact with High Significance Increases Task Persistence
IV Integration	• Relatedness, Competence and Autonomy Increases Intrinsic Motivation • Enjoying Work Promotes Intrinsic Motivation • Organisational Support and Autonomy Promotes Intrinsic Motivation

CHAPTER 5 RISK

5.1 CHAPTER INTRODUCTION

Discourse in literature concerns the ability of different collaborative ways of workings to achieve performance. A combination of ability and motivation generates performance (Whetten et al., 1996, p.8). Motivation explores the ability of the supply chain to exceed performance requirements. Therefore, this chapter explores the ability of the supply chain to achieve performance through risk mitigation and management, which Section A Introduction identifies to collaboration. The aim of this chapter is to provide a risk maturity model to evaluate collaborative practice and calibrate one axis of Crowe and Fortune's' (2012) maturity model. In order to achieve the aim the work synthesises a maturity model; and validates the maturity model using peer-reviewed literature.

5.2 HIERARCHY SYNTHESIS

5.2.1 PART INTRODUCTION

The aim of this part of the DBenv thesis is to synthesis a maturity model. The model will need to offer transferability to practitioners working on higher education estates. There are risks with different emphasis between different higher educational organisations. For example, internationally, a university in England will have very different risks than one operating in a state with significant social upheaval. It is for this reason the DBenv research focuses on the English higher education sector and does not attempt to over generalise findings. In addition, an English University Hospital will have very different risks than one with a Music focus. This part of the thesis will develop a maturity model flexible enough to offer transferability between higher education institutions in England.

5.2.2 RISK PROCESSES

Chapter 5 Risk explores construction risk challenges that exist for employer or client organisations operating in the higher education sector. The DBenv study explores existing theory to assess supply chain risk during procurement of construction and refurbishment services. Jüttner et al., (2003, p.201) use a literature review to identify four constructs of supply chain risk management, namely: assessing sources of supply chain risk; defining supply chain risk consequences; tracking supply chain risk; and supply chain risk mitigation strategies. Table 18 summarises the risk process in a flow diagram. The DBenv study

assesses sources of supply chain risk and defines supply chain risk consequences; for example, political upheaval is a risk source relating to the consequence of project programme prolongation. Chapter 11 and Chapter 15 relate risk to particular organisations.

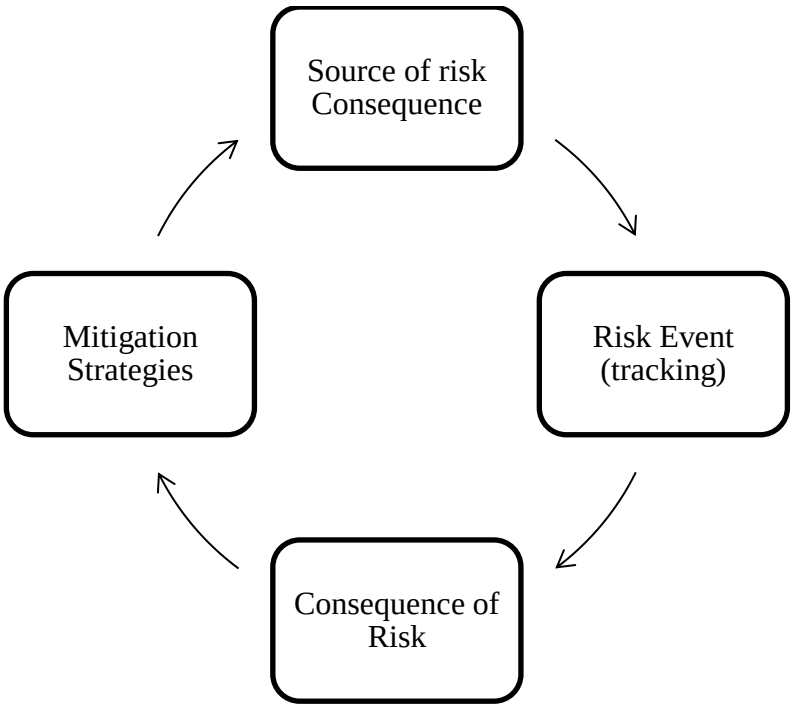

Table 18: Risk Flow Diagram

Processes are available to track and mitigate supply chain risk. Four risk mitigation strategies include avoidance; control, co-operation and flexibility (Jüttner et al., 2003, p.206; Miller, 1992, p.321). Section A Introduction identifies that collaborative (or partnering) practice is available to mitigate risk. This receives further support from an obvious connection between collaboration and co-operation. There is a requirement for the maturity model to be flexible similar to the Motivational maturity model in Chapter 4. Where flexibility is required as is the case with the DBenv study, imitation can be in the form of processes; with Miller (1992, p.321) identifying the organisational response to uncertainties as imitation. This chapter does not explore existing tools to undertake risk management in detail, which is already available from literature. With BS EN 31010:2010, identifying thirty-one different existing tools and techniques to manage risk (BSI, 2010a).

5.2.3 RISK MATURITY MODEL

Hillson (1997) develops a four level hierarchy to evaluate the maturity of organisational supply chain management, which includes (1) naive, (2) novice, (3) normalised and (4) natural. This chapter in contrast, places emphasis on risk source and consequences instead of the process. Therefore, the DBenv study fits better with Kamarazaly et al.'s (2013) work. Kamarazaly et al. (2013) explore the challenges faced by facilities managers from Universities in Australasia. A literature review establishes internal/controllable challenges, external controllable challenges and future challenges (see Table 19: Challenges Faced by University Facilities Managers). Kamarazaly et al.'s (2013) data is from 25 interviews with Australasian university facility managers, which are members of the Tertiary Educational Facilities Managers Association. The data collection sample in relation to the overall population is not representative and is from a different location than the focus of the DBenv study; therefore, there are limits to transferability of the findings. It is for this reason this chapter needs to test the transferability of the study against other work.

Table 19: Challenges Faced by University Facilities Managers

Categories	Challenges	Kamarazaly et al.'s (2013) Citation
Current Challenges: Internal / controllable challenges	Money Management Manpower Machinery Method Materials	Prasad (1999)
Current Challenges: External / uncontrollable challenges	Political Economic Socio-cultural Technological Environmental Legal Institutional	RAPIDBI (2009)
Future challenges	Economic Social Environmental	Elkington (1998)

5.2.4 PART SUMMARY

This part of the DBEnv thesis proposes the use of maturity model focusing on risk source and consequence. The reason for the focus on risk consequence aligns with the output focus of

the research. There are already significant contributions in risk management processes. The DBenv's risk maturity model that the research offers for the framework is based on research from Australsia. Kamarazaly et al.'s (2013) challenges form the basis of the DBenv's risk maturity model of which the transferability of the findings needs testing against other research.

5.3 MATURITY LEVEL I INTERNAL CHALLENGES

5.3.1 PART INTRODUCTION

Kamarazaly et al.'s (2013) identifies that there are challenges that relate to internal managerial issues, with a focus is on internal management. During the execution of works by estates departments, there are sources of risk and consequences of risk. This part of the thesis relates internal management to both sources and consequences of risk. The work goes on to explore risk mitigation.

5.3.2 RISK CONSEQUENCE

Rethinking Construction (Egan, 1998) is an influential 1990s report in the UK Construction Industry. In response to Rethinking Construction, the Department of Environment Transport and Regions, publish with the assistance of a working group, the KPI Report for the UK Construction Minister (The KPI Working Group, 2000). Table 20 (p.105), includes a list of indicators from the report. Industrial acceptance of the indicators is evident in the broad spectrum of members of the working group, which includes private sector organisations. The report demonstrates along with other documents the presence of performance measurement in the UK Construction industry (Constructing Excellence; Department of Business Enterprise & Regularity Reform, 2008).

Toor & Ogunlana (2009) undertake an indicative pilot study comprising of a literature review, which industry experts extend to identify nine key performance indicators. 76 questionnaires improve the scientific generalisation of the findings, which are from project managers, deputy project managers, project engineers and line managers working on Suvarnabhumi Airport. The respondents to the questionnaires are international with 46 number respondents being from Thailand and 12 from England. Respondents rank between and including 1 and 5, with 1 being not important at all, 3 important sometimes, 4 important and 5 extremely important.

The practitioner participants score between 3.95 and 4.61, signifying perceptions of importance for all the indicators (see Table 20).

Chan and Chan's (2004) work uses a literature review to develop a framework of key performance indicators, for measuring construction success. The literature review explores work from a range of industrial sectors outside the United Kingdom (Shenhar et al., 1997; Lim & Zain Mohamed, 1999; Atkinson, 1999; Sadeh et al., 2000). Shenhar et al.'s (1997) data is from 177 questionnaires that explore projects undertaken in Israel. Lim & Zain Mohamed (1999) draws from international case studies (Kuala Lumpur, Sydney) and literature. Atkinson (1999) draws from literature. Sadeh et al (2000) draws from literature and a study of fixed price and cost plus defence projects undertaken in Israel. Table 20 includes Chan and Chan's performance indicators and confirms alignment in the construction industry. This Part of the thesis explores the performance indicators as risk consequences.

Table 20: Risk Consequences

The KPI Working Group, (2000)	Toor & Ogunlana (2009)	Chan and Chan's (2004)
Time	On Time	Time
Cost	Under Budget	Cost: e.g. variation cost, modification cost, legal claims and litigation
	Efficiency (use of resources)	
Health and safety	Safety	Health and safety
Quality	Meets the specification	Quality, technical specification
	Free from defects	
Client satisfaction	Conforms to stakeholders' expectations	Participant's satisfaction
		User expectation / satisfaction
	Doing the right thing (effectiveness)	
	Minimised construction aggregation disputes and conflicts	
Business performance		Commercial profitable value
Change orders		
		Environmental performance

5.3.3 RISK CONSEQUENCE - PROGRAMME

A number of authors identify the risk consequence of time (Chan & Chan, 2004; The KPI Working Group, 2000; Toor & Ogunlana, 2009; Larson, 1997; Tah & Carr, 2001; Bing et al., 2005; Mills, 2001; Zou et al., 2006). Odeh & Battaineh (2002) explore the causes of construction delay in traditional contracts. The research focuses on large public and private buildings, roads, water and sewer projects in Jordan. The questionnaire is sent to 100 contractors and 50 consultants working on large projects in excess of one million Jordanian dollars. The questionnaire ranks 26 factors. In the work, there is a list of major delay categories including client, contractor, consultant, material, labour and equipment, contract, contractual relationships and external factors.

Table 21 relates Zou et al. (2006) time related risks to in Odeh & Battaineh (2002) work. Zou et al. (2006), establishes risks from literature and then analyses data from 20 Australian practitioners to establish the occurrence of the risks at project level. Similar to Odeh & Battaineh (2002) work, factors relate to clients, contractors and consultants. In Odeh & Battaineh (2002) work clients are the highest ranking delay category. Both, contractors and consultants rank owner interference (Consultant 4; Contractor 2) and slow decision making by owners (Consultant 5; Contractor 8) high, in relation to capacity to cause delay. Capacity of client's to cause delay also includes high performance or quality expectations; and excessive and late contract variation (Zou et al., 2006, p.6; Bing et al., 2005; Xue et al., 2004, p.417; Vrijhoef et al., 2001)

Table 21: Sources of Delay

Rank	Odeh & Battaineh (2002)		Zou et al. (2006)	Supporting Citation
	Category	Factors	Risks	
1	Client	Finance and payments of completed work; owner interference; slow decision making by owners; unrealistic imposed contract duration	High performance or quality expectations; Incomplete approval and other documents; tight project schedule; unsuitable construction program planning; variations by the client; variations of construction programs	Bing et al., 2005; Vrijhoef et al., 2001; Xue et al., 2004
2	Contractor	Subcontractors; site management; construction methods; improper planning; mistakes during construction; inadequate contractor experience	Inadequate program scheduling; Unsuitable construction program planning; Variations of construction programs	Ala-Risku & Kärkkäinen, 2006; Barker et al., 2000; Beach et al., 2005; Briscoe et al., 2001; Errasti et al., 2007; Khalfan et al., 2001; Mills, 2001; Ofori, 2000; Palaneeswaran et al., 2003; Proverbs & Holt, 2000; Tah & Carr, 2001; Yeo & Ning, 2006; Xue et al., 2007; Xue et al., 2004;
3	Consultant	Contract management; preparation and approval of drawings; quality management/control; waiting time for approval of tests and inspections	Design variations; Incomplete approval and other documents	Mills, 2001; Xue et al., 2004; Vrijhoef et al., 2001
4	Material	Quality of material; shortage of material		
5	Labour and equipment	Labour supply; labour productivity; equipment availability and failure		Yeo & Ning 2006
6	Contract	Change orders; mistakes and discrepancies in contract documents		

Rank	Odeh & Battaineh (2002)		Zou et al. (2006)	Supporting Citation
	Category	Factors	Risks	
7	Contractual relationships	Major disputes and negotiations; inappropriate overall organisational structure linking all parties to the project; lack of communication between the parties		Akintoye et al., 2000; Ala-Risku & Kärkkäinen, 2006; Aloini et al. 2012; Barker et al., 2000; Beach et al., 2005; Briscoe et al., 2001; Errasti et al., 2007; Khalfan et al., 2001; Ofori, 2000; Saad et al., 2002; Tah & Carr, 2001; Tindsley & Stephenson, 2008; Tserng & Lin, 2002; Vrijhoef & Koskela, 2000; Xue et al., 2004, 2007; Yeo & Ning, 2006
8	External factors	Weather conditions; regularity changes and building control; problems with neighbours and unforeseen ground conditions		See 5.4 Maturity Level II External Challenges

The second highest category that Odeh & Battaineh (2002, p.70) identify as a cause delay is contractors. The category includes a number of factors, including what consultants consider the highest factor to cause delay, as inadequate contractor experience. In addition to main contractors, sub-contractors have capacity to cause delay (Odeh & Battaineh, 2002). Mills (2001, p.250) uses a literature review to establish sources of risk to include time to include expediting, poor performance control and the broad risk of contractors/sub-contractors performance. Expediting relates to the timely delivery of goods and materials. Similarly, Yeo & Ning (2006, p.123) identify that the management of time uncertainty in major equipment procurement in engineering construction projects can significantly contribute to project performance. Similar findings are found by Aloini et al. (2012) that explore risk factors that associate to implementing supply chain management in construction. Data collection is in the form of an analytical literature review, which explores 140 research articles published (2000-2011) by Emerald, Science Direct (Elsevier), Springer and IEEE-Xplore; concerning supply chain management and risk management. Aloini et al. (2012, p.746) identify significant number of contributions in literature that identify with the late involvement of parts.

The third highest category that Odeh & Battaineh (2002, p.70) identify as a cause delay is consultants. Consultant risk sources include contract management; design variations; incorrect documents; preparation and approval of drawings; quality management/control; waiting time for approval of tests and inspections (Xue et al., 2004, p.417; Vrijhoef et al., 2001; Zou et al., 2006; Mills, 2001, p.250).

5.3.4 Risk Consequence - Cost

Similar to Kamarazaly et al.'s (2013) current internal challenges other authors recognise the financial consequence of risk (Chan & Chan, 2004; The KPI Working Group, 2000; Toor & Ogunlana, 2009; Larson, 1997; Tah & Carr, 2001; Bing et al., 2005; Mills, 2001; Zou et al., 2006). Table 22 compares Zou et al.'s (2006, p.6) sources of cost with programme risk. The programme and cost list is similar in many ways. Items on the cost list not on the programme list include occurrence of a dispute, price inflation of construction materials and incomplete or inaccurate cost estimate. This part of the DBenv thesis dose not explore price inflation on construction materials further as it relates to external challenges.

Table 22: Sources of Cost Risk

Risk Source	
Cost	Programme
Tight project schedule	Tight project schedule
Design variations	Design variations
Variations by the client	Variations by the client
Unsuitable construction program planning	Unsuitable construction program planning
Occurrence of dispute	
Price inflation of construction materials	
Excessive approval procedures in administrative government departments	Excessive approval procedures in administrative government departments
Incomplete approval and other documents	Incomplete approval and other documents
Incomplete or inaccurate cost estimate	
Inadequate program scheduling	Inadequate program scheduling
	High performance or quality expectations
	Variations of construction programs

Source: Zou et al.'s (2006, p.6)

There are cost risk consequences that relate to professional fees (2001, p.250) and construction final accounts. Procurement routes allocate different risks between the employer and members of the supply chain (Palaneeswaran et al., 2001, p.166). For example, a traditional route with the employer's team providing the bills of quantities has a very different risk allocation than a design, build, finance and operate procurement route.

> *If we gain a €100 million design-build contract, and our bid was miscalculated by 10%, we lose €10 million. In a traditional type arrangement, our bid would have been €95million…but we have put in claims for extra work to compensate. Thus, in a design-build situation, our profit slips away. Because of this we easily end up in an atmosphere of charging for each nut and bolt. Not because we want to [sic], but simply we have to do it" (Laan et al., 2011, p.103).*

One way to manage construction risks is through construction contracts. Palaneeswaran et al., (2003, pp.573-74; Xue et al., 2007, p.154) identify an interrelationship between different levels of contractual completeness and relational contracting (see Figure 13). Different characteristics relate to different contractual styles. At this level of the DBenv maturity model there is less of a focus on relational contracting which associates to future challenges and more of a focus on contractual completeness. Figure 13 identifies both low and high contractual completeness to sources and consequences of risk. Palaneeswaran et al., (2003,

p.574) relate adversarial ways of working to low relational contracting. A number of authors identify the problem of adversarial bargaining (Xue et al., 2004, p.417; Vrijhoef et al., 2001; Faems et al., 2008).

High	High power exploitations; high potentials for conflicts and contractual non-commitments leading to 'breach of contract' and litigation; compensation / penalties are normally defined by the contract	Lesser conflicts and claims; lower transaction costs; disputes/claims could be settled by arbitration; enhanced harmony; improved product quality; and overall best value in 'win-win' atmosphere
Contractual Completeness Low	Higher potentials for conflicts, claims and disputes; higher transaction costs; compensation / penalties are normally decided by the law and litigation	Higher trust to enhance contractual relationships; conflicts and contractual non-commitments settled through local 'adjustments' and / or 'renegotiations'; disputes / claims could be settled by mediation
	Low Relational Contracting High	

Figure 13: Comparison Matrix Contractual Completeness and Relational Contracting

Source: Palaneeswaran et al., (2003, p.574)

Faems et al.'s (2008) identifies the negative effect of adversarial bargaining. Faems et al.'s (2008) collects data from two research and development alliances between the two firms, namely Graph and Jet. Graph (employer) is an international imaging company that employs 20.000 people in 40 different countries. Jet (supplier) is an inkjet company employing 185 people. The purpose of the alliance is to "evaluate new technological opportunities by conducting upstream activities such as fundamental research, experimenting and testing" (p.12). Data from two sources, namely interview and documents are triangulated. Respondents reflect on concrete events opposed to abstract concepts. The research is undertaken in three different stages. The first explorative stage includes two unstructured interviews and document analysis of 126 private documents. At the second stage there are semi-structured interviews with managers and engineers asking "how" and "why" questions. The third (and final) inductive stage comprises of content analysis and a more theoretical second order analysis to create a model. Feedback interviews check the model.

The first alliance Faems et al. (2008, p.17) explore is the side shooter head agreement, which is let in 1999. In the agreement, there are target dates, performance standards and contractual milestones for payment. The performance standards allow the monitoring of the supplier

partner (Faems et al., 2008, p.18). The supplier limits the active involvement of the employer in an attempt to protect intellectual property (Faems et al., 2008, p.20). The agreement does not include a requirement to communicate. Therefore, the employer has limited capacity to assist with unanticipated technological problems during development of the product. Unable to improve the situation by sharing knowledge, the employer is left only with capacity to undertake external regulation using the agreements milestones. The external regulation results in the supplier placing greater emphasis on achieving the milestones opposed to obtaining sustainable solutions (Faems et al., 2008, p.21). On delivery of the product, the employer's representatives identify that the product is sub-standard to the specification, resulting in loss of confidence (Faems et al., 2008, p.22). The relationship between the two organisations breaks down with the employer terminating the contract in 2001 (Faems et al., 2008, p.23).

The second alliance Faems et al. (2008) explore is the end shooter head agreement, let in 2000. Due to organisational difficulties of the Supplier organisation, the Employer is in a stronger position to negotiate agreement terms (Faems et al., 2008, p.23). The agreement similar in ways to the earlier agreement includes target dates, performance standards and contractual milestones for payment similar to the previous agreement. The agreement deviates from the earlier agreement, in that it enhances Employer involvement. Employer involvement includes working with the supplier to develop the product. The Employer works with the Supplier to define unforeseen technical problems and find solutions in joint brainstorming sessions. The involvement of the Employer in product development assists the employer's team "acquired a fine-grained understanding" of the unforeseen technical problems "and felt actively involved in addressing these issues" (Faems et al., 2008, p.27), resulting in a holistic approach to the application of the contractual milestones (Faems et al., 2008, p.30). Relationships between the organisations improved (Faems et al., 2008, pp.28-29).

Similar to Zou et al.'s (2006, p.6) a number of authors identify disputes as a source of risk (Toor & Ogunlana, 2009; Larson, 1997; Mills, 2001; Odeh & Battaineh, 2002). Disputes may be in the form of quarrelling, as is the case at the close of the national archives project in Kringsja (Aarseth et al., 2012, pp.276-78). Resolution procedures are available to reduce the probability of dispute escalation. Aloini et al. (2012, p.746) identify a number of authors

recognise absence of a conflict resolution procedure as a source of risk (Beach et al., 2005; Palaneeswaran et al., 2003; Ng et al., 2002, p.442).

5.3.5 RISK CONSEQUENCE - QUALITY

Kamarazaly et al. (2013, p.8) identifies the board category of maintenance to refer to value management of existing estates (retrospective maintenance), for example deciding between 'retain and maintain' versus 'upgrade and replace'. The item relates to an internal challenge of managing the existing estate retrospectively, in contrast to managing the estate proactively, that would position in future challenges. Other authors identify risk consequences of quality (Chan & Chan, 2004), technical performance (Larson, 1997; Toor & Ogunlana, 2009), defective materials (Mills, 2001, p.250; Odeh & Battaineh, 2002) and workmanship (The KPI Working Group, 2000; Toor & Ogunlana, 2009; Bing et al., 2005; Mills, 2001, p.250). Workmanship includes free from defects (The KPI Working Group, 2000; Toor & Ogunlana, 2009). Table 23 summarises the consequences of quality risk.

Table 23: Consequences of Quality Risk

Quality Risk Consequence	Citation
Quality	Chan & Chan, 2004
Technical performance	Larson, 1997; Toor & Ogunlana, 2009
Defective materials	Mills, 2001; Odeh & Battaineh 2002
Workmanship (including defects)	Bing et al., 2005; Mills, 2001; The KPI Working Group, 2000; Toor & Ogunlana, 2009

Table 24 relates Zou et al.'s (2006, p.6) quality risk sources to the risk consequences of programme, cost and safety. There is alignment between the different risk consequences, in that risk sources relate to more than one risk consequence. For example, tight programme relates all the risk consequences in the table. A number of authors identify sources of construction risk, beyond that identified by Zou et al. (2006, p.6) including construction quality control/quality assurance (Palaneeswaran et al., 2001, p.166; Mills, 2001, p.250) and inaccurate data and engineering drawings not fit for purpose (Xue et al., 2004, p.417; Vrijhoef et al., 2001).

Table 24: Comparison of Quality Risk to other Sources

Risk Source	Risk Consequences			
	Cost	Programme	Quality	Safety
Tight project schedule	✓	✓	✓	✓
Inadequate program scheduling	✓	✓	✓	
Unsuitable construction program planning	✓	✓	✓	✓
Incomplete or inaccurate cost estimate	✓		✓	
Low management competency of subcontractors			✓	✓
High performance or quality expectations		✓	✓	✓
Variations of construction programs		✓	✓	✓
Unavailability of sufficient amount of skilled labour			✓	✓
Design variations	✓	✓	✓	✓
Lack of coordination between project participants			✓	✓
Variations by the client	✓	✓		
Occurrence of a dispute	✓			
Price inflation of construction materials	✓			
Excessive approval procedures in administrative government departments	✓	✓		✓
Incomplete approval and other documents	✓	✓		
Bureaucracy of government		✓		
Unavailability of sufficient professionals and managers				✓
General safety accident occurrence				✓

Source: based on Zou et al. (2006, p.6)

5.3.6 RISK CONSEQUENCE - SAFETY

A number of authors make specific reference to the safety (Chan & Chan, 2004; The KPI Working Group, 2000; Toor & Ogunlana, 2009). Kamarazaly (2013) does not include safety specifically within internal challenges, however, includes the challenge of risk management. The risk management challenge relates to the improvement "on the accuracy of risk analysis, contingency planning and the effectiveness of risk monitoring and risk response" (Kamarazaly et al., 2013, p.8). Zou et al. (2006, p.6) identify a number safety risk sources

that also relate to cost, programme and/or quality risk consequences (see Table 24). There are also risk sources that only relate to the risk consequence safety including: unavailability of sufficient professionals and managers; and general safety accident occurrence.

5.3.7 Risk Consequence - Effectiveness

This chapter previously identifies free from defects. A reduction of project defects logically reduces rework. The KPI Group (2000) recognise the right first time agenda. Love et al. (2010) undertake 23 interviews to explore rework in two hydrocarbon, offshore oil and gas projects. The data indicates increases in working hours affecting workforce congestion and then re-work. The study identifies the causes of acceleration to include slow information due to inadequate/incomplete documentation, programme acceleration and additional work within original timescales. A number of authors identify the reduction of rework is one way to achieve efficiency and effectiveness (The KPI Working Group, 2000; Toor & Ogunlana, 2009).

5.3.8 Risk Mitigation

Larson (1997) explores partnering in construction projects and the relationship between partnering activities and project success. Data is from members of the Project Management Institute in the United States of America and Canada, which is a different location that of the DBenv study. 1200 questionnaires are randomly distributed among the members. 291 participants respond with the backgrounds (40%) prime contracting, (6%) sub-contracting, (26%) owners, (8%) architects/designers, (12%) auditors/inspectors and (8%) other project roles. The questions concern participants' experience of recently complete construction projects. Part one of the questionnaire asks respondents to evaluate their project based on a five-point scale with successful and unsuccessful at either end. Therefore, the survey relates to perceptions of success, opposed to actual measures of success. Larson's (1997) success categories include meeting schedule, controlling costs, technical performance, customer needs, avoiding litigation and overall results. Table 25 reconciles the success categories with earlier sections of the DBenv thesis. Larson's work confirms nearly all of the DBenv thesis's risk consequences with the exception of safety.

Table 25: Reconciliation of Larson (1997) work with DBenv Thesis

Larson's (1997) success categories	Part of DBenv Thesis
Meeting schedule	5.3.3 Risk Consequence - Programme
Controlling costs	5.3.4 Risk Consequence - Cost
Technical performance	5.3.5 Risk Consequence - Quality
Customer needs	Later maturity levels
Avoiding litigation	5.3.4 Risk Consequence - Cost
Overall results	5.3.7 Risk Consequence - Effectiveness

Part two of Larson's (1997) questionnaire explore on a 'yes' and 'no' basis if principals on the practitioners' project had previously worked together. A similar scale to that in part one measures the partnering variable of how practitioners feel top management supports teamwork. Part three of the questionnaire explores the occurrence of partnering variables on a 'yes' and 'no' basis including problem solving process established, provisions for continues improvements, conflict identification, team building sessions, fair profit assumption and utilisation of a joint project charter. Table 26 identifies a correlation a number of partnering variables and overall results. There is a significant correlation between overall results and previous work experience, top management supported teamwork, problem solving process established, conflict identification and fair profit assumption. No significant correlation is found for overall results and provisions for continuous improvement and joint project charter. Larson (see Table 26) identifies a correlation between nearly all of the collaborative features and risk consequences. The exception being joint project charter, which the data indicates having limited potential to mitigate risk.

Table 26: Correlation between Collaborative Features and Overall Results

Collaborative feature	Correlation					
	Meeting Schedule	Controlling Cost	Technical Performance	Customer Needs	Avoiding Litigation	Overall results
Previous work experience		✓(p< .01)			✓(p< .01)	✓(p< .01)
Top Management Supported teamwork	✓(p< .01)	✓(p< .01)		✓(p< .01)	✓(p< .01)	✓(p< .01)
Problem-solving Process Established	✓(p< .01)	✓(p< .05)	✓(p< .01)	✓(p< .01)	✓(p< .05)	✓(p< .01)
Provisions for Continuous Improvement	✓(p< .01)	✓(p< .05)	✓(p< .01)			
Conflict Identification		✓(p< .01)	✓(p< .01)	✓(p< .01)		✓(p< .01)
Teambuilding Session	✓(p< .05)				✓(p< .01)	
Fair Profit Assumption				✓(p< .01)	✓(p< .05)	✓(p< .05)
Joint Project Charter						

Source: based on Larson's (1997, p.194) multiple regression table.

5.3.9 RISK MITIGATION - TOP MANAGEMENT SUPPORTED TEAMWORK

Akintoye et al. (2000) undertake a survey of supply chain collaboration and management in the UK Construction Industry. The questionnaire replicates three previous studies that explore collaboration in the retail supply chain. The questionnaire is sent to 100 of the largest contractors, by value of projects operating in the United Kingdom as listed in July/August 1998 issue of the Chartered Institute of Building's Construction Manager. There are 40 replies, which is a small sample size in comparison to the overall population of construction professionals. The respondents are directors (50%); other managerial (30%); chairman (5%); chief executive (5%); researcher (2.5%) and no designation (2.5%); meaning the data is from decision-makers within organisations. The final section explores success factors to collaboration using a five point likert scale. Data concerns: key factors in effective construction relationships in the supply chain; and major barriers to construction supply chain relationships. Akintoye et al.'s (2000) highest scoring factor concerning what makes it difficult to implement efficient supply chain collaboration is top management commitment (4.03) (Akintoye et al., 2000, p.164). The third lowest factor also associates to senior management support, namely inappropriate organisation structure to support commitment (3.90). Similarly, other authors identify a lack of senior management support as an issue in project partnering (Ng et al., 2002, pp.440-2).

Baiden et al. (2006) explore the extent of team integration within construction projects. The study selects interviewees from Construction Manager of the Year Awards between 2000 and 2003 for large projects (£28-210million). The nine projects are in England; five of the projects are in London and two in Greater Manchester. There is limited attempt to reconcile the interviews with project documents. In addition, there is limited attempt to reconcile the findings with other project participants. Out of the nine case studies, seven of the projects have organisational boundaries (Baiden et al., 2006). Two of the case studies partially achieve seamless operation with no organisational boundaries. Different ways to manage the boundaries will result in different risks, for example, collaborative procurement reduces the risk of litigation, which occurs between boundaries. Baiden et al., (2006, p.19) identify equitable team relationships and respect is a characteristic of all projects (fully achieved 6nr, partially achieved 3nr). To a slightly lesser extent, a no blame culture is also a characteristic of all projects (fully achieved 5nr, partially achieved 4nr). The work indicates that all project case studies achieve team flexibility and responsiveness to change. Indicating a connection

between ‘equitable team relationships and a no blame culture’ with ‘flexibility and responsive to change’.

Ng et al. (2002) identifies problematic issues with partnering from a contracting perspective. The work collects data from 6 Australian competitively tendered projects with a range of project values. Participants have experience of unsuccessful project partnering across three states in Australia. Two of the projects have a value exceeding AUS$20million, with the rest of the projects being below this value. Ng et al. (2002, p.442) identifies that the majority of contractors that form part of the study (5 out of 6) believe that there is a lack of empowerment of client representatives, having a damaging effect on the problem solving process, contractors commitment to the partnering process and the contractors budget. Therefore, senior management is a risk source.

5.3.10 Risk Mitigation - Problem-solving Process Established

In 3 of the 6 of Ng et al.’s (2002) project case studies, the confidential nature of the specifications and an inefficient problem solving process results in problems with drawings and specifications. Similar to Table 26 (p. 117), there is an indication that transparency and problem solving process assists with cost risk mitigation. The respondents indicate “inclusion of the contractor earlier in the design stage could better prepare their understanding of the design and its construction” (Ng et al., 2002, p.444).

Ng et al. (2002, p.442) identify a reason for “failure pertinent to some partners willing to compromise” relate to “disintegration of the problem resolution process resulted in a lack of evaluation of team solution, which converted to an individualistic approach”. Restrictions on the problem resolution process are also found by Aarseth et al., (2012, pp.276-78) on a Canadian railway project as lack of participation in problem resolution process. Ng et al. (2002, p.442) identify “reasons for failure pertinent to issues are allowed to slide and escalate” which relate to “a lack of regular monitoring of the problematic issues”.

Cicmil & Marshall (2005) explore collaboration at project level focusing on the tender process. The research explores a case study using interviews and participant observation in the United Kingdom. The participant observer uses reflective practice to explore his own and other practitioners’ concrete experience of two-stage tendering. The client procures the services of the project team in three packages, namely, (1) multidisciplinary architectural; (2)

quantity surveying; and (3) contractors. Based on the advice from the Quantity Surveyor there is a two stage tendering process to procure the contractor. The interview of the five contractors tendering at the first stage establishes their level of understanding of the project and to asses if the proposed team will build a relationship with the design team. Once the preferred contractor is appointed to the second stage the project team undertake a collaborative process to develop the design, cost the work and agree the programme. The second stage concludes when the project team agree the costs for the works and the project receives approval to proceed to construction. The research identifies expected relational and performance advantages. Expected relational advantages include a better understanding of the project by the contractor; and more time to build relationships and develop trust through the second stage. Performance related advantages include the collaborative development of programme and budget to achieve the highest cost certainty for the client; and collaboration for the benefit of the design stage reducing rework and changes during project execution. The case study indicates a benefit of sharing knowledge and expertise that relates to collaborative procurement and risk mitigation.

5.3.11 Risk Mitigation - Provisions for Continuous Improvement

Barker et al. (2000) explore the terrain scanning methodology to assess and improve supply chains in constructing house building in the United Kingdom. The terrain scanning methodology's data is from interviews, brainstorming sessions, archival and process mapping. The research collects data from manufacturers, housing providers and designers/consultants. The housing providers include a private builder, social builder and a social landlord. The work is similar to action learning, involving reflecting on practice and implementing solutions. The output of the research is a number of actions (or recommendations). One action involves undertaking continuous improvement meetings, which includes monthly review meetings and performance management (Barker et al., 2000, p.189). Therefore, the study identifies similar to Mills (2001) a lack of performance control as a risk.

5.3.12 Risk Mitigation - Teambuilding Session

Table 26 (p.117) indicates that teambuilding sessions assist with meeting schedule and avoiding litigation. Practitioners in instances however do not always perceive the benefit of team building. Aarseth et al., (2012, pp.276-78) identify that during the construction of a National Archives project that not all the practitioners could see the reason for partnering with

many partnering meetings being time consuming. This could however be down to management of the meetings, which were not always carefully planned.

5.3.13 Risk Mitigation - Fair Profit Assumption

Table 26 (p.117) indicates fair profit assumption assists with achieving customer needs, avoiding litigation and overall results. Surprisingly there is no correlation found with controlling cost. Fair profit assumption can relate to the tender process in addition to maintain budgets during construction. Ng et al. (2002, p.440) identifies that over emphasis on budget results in participants adopting a self-protection mode. Such a self-protection mode results in inadequate communication, which is a risk source (see Table 21). Aloini et al. (2012, p.746) identify a number of authors recognise the risk source of inadequate communication.

5.3.14 Risk Mitigation - Joint Project Charter

Table 26 (p.117) indicates limited connection between risk consequences such as cost and joint project charter. This is partially down to challenges in defining partnering. Aarseth et al. (2012, pp.276-78), identify a number of challenges in defining partnering including: lack of clarity in documents and plans (mix of concepts and words concerning partnering); challenges and clarity concerning and dependent on actors that understand partnering; and the challenge of defining roles.

5.3.15 Risk Mitigation - Lean Construction Principles

Barker et al.'s (2000) data indicates a problem (or risk) of high wastage due to theft or damage. One way to reduce the risk of wastage is though lean construction and deliveries made just in time. Other opportunities include to increase standardisation and improve performance of materials in respect of weather (Barker et al., p.189). Chapter 3 Implementation explores lean construction in detail.

5.3.16 PART SUMMARY

Table 27: Sources of Risk

Category	Risk Sources	Citation
Client	High performance or quality expectations; finance and payments of completed work; incomplete approval and other documents; lack of empowerment; owner interference; slow decision making by owners; unrealistic imposed contract duration; variations by the client	Bing et al., 2005; Love et al., 2010; Mills, 2001; Ng et al., 2002; Odeh & Battaineh, 2002; Palaneeswaran et al., 2001; Zou et al., 2006; Vrijhoef et al., 2001; Xue et al., 2004
Contractor	Subcontractors; site management; construction methods; improper planning; mistakes during construction; inadequate contractor experience; suitable working hours; poor performance control; time to include expediting	Ala-Risku & Kärkkäinen, 2006; Barker et al., 2000; Beach et al., 2005; Briscoe et al., 2001; Errasti et al., 2007; Khalfan et al., 2001; Love et al. 2010; Mills, 2001; Odeh & Battaineh's, 2002; Ofori, 2000; Palaneeswaran et al., 2003; Proverbs & Holt, 2000; Tah & Carr, 2001; Yeo & Ning, 2006; Xue et al., 2007; Xue et al., 2004; Zou et al., 2006
Consultant	Contract management; design variations; incorrect documents; preparation and approval of drawings; quality management/control; waiting time for approval of tests and inspections	Love et al., 2010; Mills, 2001; Odeh & Battaineh, 2002; Xue et al., 2004; Zou et al., 2006; Vrijhoef et al., 2001
Material	Quality of material; shortage of material	Odeh & Battaineh, 2002
Labour and equipment	Labour supply; labour productivity; equipment availability and failure	Odeh & Battaineh, 2002; Yeo & Ning, 2006
Contract	Change orders; mistakes and discrepancies in contract documents	Odeh & Battaineh, 2002

Category	Risk Sources	Citation
Contractual relationships	Adversarial bargaining; major disputes and negotiations; inappropriate overall organisational structure linking all parties to the project; lack of communication between the parties	Akintoye et al., 2000; Ala-Risku & Kärkkäinen, 2006; Aloini et al. 2012; Barker et al., 2000; Beach et al., 2005; Briscoe et al., 2001; Faems et al., 2008; Errasti et al., 2007; Khalfan et al., 2001; Odeh & Battaineh, 2002; Ofori, 2000; Palaneeswaran et al., 2003; Saad et al., 2002; Tah & Carr, 2001; Tindsley & Stephenson, 2008; Tserng & Lin, 2002; Vrijhoef et al., 2001; Vrijhoef & Koskela, 2000; Xue et al., 2004, 2007; Yeo & Ning, 2006; Zou et al., 2006;
External factors	Weather conditions; regularity changes and building control; problems with neighbours and unforeseen ground conditions	Odeh & Battaineh 2002

Table 27 summaries the sources of risk from this part of the DBenv thesis, which relate to the management of internal factors. Mitigating external and future risks are at later levels of the risk maturity model. The aim of collaboration is to mitigate the sources of risk before they occur. Table 28 summarises methods available to mitigate risk consequences. Literature identifies mostly positively in relation to the risk mitigating collaborative features, the exception being the joint project charter.

Table 28: Internal Risk Consequence Mitigation

Collaborative Feature	Consequence Mitigation Citation	
	Mitigation	No Mitigation
Previous work experience	Larson, 1997	
Top management supported teamwork	Akintoye et al., 2000; Baiden et al., 2006; Larson, 1997; Ng et al., 2002	
Supply chain design integration; problem-solving process established	Aarseth et al., 2012; Cicmil & Marshall, 2005; Ng et al., 2002; Larson, 1997	
Provisions for continuous improvement	Barker et al., 2000; Larson, 1997; Mills, 2001; Ng et al., 2002	
Conflict identification	Larson, 1997	
Teambuilding session	Larson, 1997	Aarseth et al., 2012
Fair profit assumption	Larson, 1997; Ng et al., 2002	
Joint project charter		Aarseth et al., 2012; Larson, 1997
Lean construction	Barker et al., 2000; Cabinet Office, 2011; Eriksson, 2010	

5.4 MATURITY LEVEL II EXTERNAL CHALLENGES

5.4.1 PART INTRODUCTION

External challenges relate to Tah & Carr's (2001, p.839) external risk sources that occur uncontrollably outside of the project. At this level, organisations mitigate external changes. The focus is on risk sources that impose from the outside world onto a project and therefore concerns, for example, the availability of resources, experiences and competence at appropriate rates. The consequences of risk are the same as the previous level of the risk maturity level; therefore, there is no attempt to explore them further. In summary, this part of the thesis establishes external risk sources.

5.4.2 RISK SOURCE - POLITICS

A number of authors identify with the risk source of governmental and political uncertainties (Kamarazaly et al., 2013; Tah & Carr, 2001; Bing et al., 2005; Miller, 1992; Palaneeswaran et al., 2001). Bing et al., (2005, p.28) identify to political and governmental policy the risk factors: unstable government; expropriation or nationalisation of assets (Miller, 1992, p.314); poor public decision-making process (Zou et al., 2006, p.6); and strong political opposition/hospitality. Miller (1992, p.314) identify events that associate to unstable government include: war, revolution, coup d'état, democratic changes in government and other political turmoil. Social uncertainties include changing social concerns, social unrest, riots, demonstrations and small-scale terrorist movements (Miller, 1992, p.314). In 2010, there is a change in Government in the United Kingdom. Governmental and political uncertainties create the risk of influential economic events.

Bing et al. (2005, p.28) identifies the risk that associates to influential economic events. A number of authors recognise changes in interest rates as a risk factor (Bing et al., 2005; Miller, 1992; Kamarazaly et al., 2013). Depending on the procurement route, organisations borrow finance to fund projects. For example, private finance initiative projects acquire funds from shareholders and banks through special purpose vehicles. The Companies Act (UK Parliament, 2006a) provides the legal framework in the United Kingdom for the formation of special purpose vehicles. Interest rates are subject to fluctuation in the United Kingdom. Depending on the particular procurement route adopted there are different allocations of risk associating to changes in interest rates. Bing et al. (2005, p.28) also identify the risk of a poor financial market. In a poor financial market there is a risk that organisations may find it

difficult to acquire and retain finance. The risk of insolvency emerges in both the cases of shortage of finance and increases in the cost of finance.

A number of authors identify the external challenge of economic (Kamarazaly et al., 2013; Tah & Carr, 2001; Bing et al., 2005; Miller, 1992). Bing et al. (2005, p.28) identify poor financial market. The fluctuation of workload in construction results in unemployment during troughs and experience shortage during peaks. A number of authors identify the availability of resources from the supply chain including sub-contracting, labour, machinery and materials (Kamarazaly et al., 2013; Tah & Carr, 2001; Bing et al., 2005; Mills, 2001; Zou et al., 2006, p.6). Troughs in construction output at national and local level create the risk of insolvency. Bing et al (2005) identifies the risk factor of insolvency/default of sub-contractors or suppliers. In addition, The KPI Working Group (2000) identify a performance measure as work undertaken by profitable companies.

Contractors undertake future works using rates agreed at an earlier point in time, for example with measured term and lump sum contracts (JCT, 2011d; JCT, 2011r; JCT, 2011). As well, as changes in interest rates there is also the risk of changes due to inflation (Bing et al., 2005; Miller, 1992; Kamarazaly et al., 2013; Zou et al., 2006, p.6) and relative prices (Miller, 1992). Relative prices deviate from inflation, where there is movement only in a particular element of purchasing. In relation to employers, changes in relative prices influence income on investment. In relation to the supply chain, it relates to changes in the cost of a particular material. Where the purchase of labour and materials is international, there is risk associating to changes in currency exchange rates (Miller, 1992; Kamarazaly et al., 2013).

Miller (1992, p.314) identifies terms of trade as a risk factor. There are a number of international treaties between countries, which affect construction procurement in the United Kingdom (UK Parliament, 2006). The European treaties (European Economic Community, 1957; European Union, 2007) bring with them the risk of increases in competition to the supply chain. In addition to the risk of current treaties, there is the risk of future treaties. In relation to the employer, they bring with them the potential of legal challenge (J Varney & Sons Waste Management Ltd v Hertfordshire County Counci, 2011). Legal action/challenge is a risk (Bing et al., 2005).

In addition to case law, there is legislation that emerges in the United Kingdom from a number of sources including the UK Parliament, Scottish Parliament, National Assembly for

Wales, Northern Ireland Assembly and the European Union. Bing et al (2005, p.28) identify the risk factor of legislation change. Other risks that associate to legislation include change in tax regulation and industry regulation change (Bing et al., 2005, p.28). Miller (1992, p.314) identifies governmental policy uncertainties as government regulation, price controls, trade restrictions, barriers to earnings repatriation and inadequate provision of public services. Mills (2001, p.250) identifies the planning risks of development approval, building control and local government contributions. Palaneeswaran et al., (2001, p.166) identify that the risk of co-ordination of work with other agencies, approvals and permits allocate differently dependent on procurement route, between the employer and the supply chain.

5.4.3 Risk Source - Natural Environment

A number of authors identify environmental performance, sustainability, weather conditions and conditions on site (Chan & Chan, 2004; Kamarazaly et al., 2013; Tah & Carr, 2001; Bing et al., 2005; Miller, 1992; Palaneeswaran et al., 2001; Mills, 2001, p.250). Conditions on site include geotechnical conditions, ground contamination, hurricanes, accessibility, site flooding and force majeure (Bing et al., 2005, p.28; Miller, 1992, p.314; Mills, 2001). Geotechnical conditions include soil conditions, contaminated soil and earthquakes. Sustainability is an internal risk (Tah & Carr, 2001, p.838); in that construction works, have an environmental impact. Zou et al. (2006, p.6) identify the environmental risks that also relate to cost, time, quality and/or safety include: tight programme schedule; variations to construction programmes; unavailability of sufficient professionals and managers; excessive approval procedures in administrative; variations by the client; low management competency of subcontractors; high performance or quality expectations; and inadequate program scheduling. Zou et al. (2006, p.6) uniquely identifies the risks to the environment as: inadequate or insufficient site information (soil test and survey report); and serious noise pollution caused by construction.

Sustainability as an external challenge relates to "finding innovative and sustainable ways of managing energy use, waste disposal, resource use and environmental pollution/ contamination; achieving the Reduce, Re-use and Recycle mandate to waste management" (Kamarazaly et al., 2013, p.9). There is risk of a construction project damaging the local environment, for example polluting a river or ground water. The environment is however something outside and external, that a construction project exists within. For example, there

is a risk that materials do not perform to a standard to overcome weather conditions (Barker et al., 2000, p.189).

Ofori, (2000, p.203) explores Greening the construction supply chain in Singapore. A literature review identifies strategies in environmental purchasing to include the categories of product standards and behaviour standards. Standards are implementable through external regulation, for example through construction contracts and entry requirements. Green et al. (2012) explores whether environmental collaboration and monitoring enhances organizational performance. An online questionnaire collects data from 159 manufacturing managers holding management positions at plant level in United States of America manufacturing organisations. The study establishes questions from literature. Responses are made using a five point likert scale. There is limited attempt to validate the data using other sources. The data indicates a link between environmental performance and successful environmental monitoring. Therefore, a risk source is a lack of environmental monitoring. In addition, monitoring supports compliance with customer requirements relating to environmental sustainability and governmental environmental sustainability requirements (Green et al., 2012, p.200).

5.4.4 Risk Source - Available Technology

This chapter of the DBenv previously identifies quality as a risk in relation to technical performance (see 5.3.5 Risk Consequence - Quality). There is currently a worldwide communications revolution. In addition, technology is advancing in other areas such as sustainability, lean construction, teaching methods (Barrett et al., 2013) and the integration of disabled people. The external challenge is for construction projects to provide the latest innovations in technology, in an international market. Humphreys et al., (2001) identify when undertaking a study in the context of China and Hong Kong, that information technology has become a popular prescription in enhancing supply chain management. Other authors identify benefits of electronic supply chain management in the car industry (Wiengarten et al., 2013), as part of industry globalisation (Tserng & Lin, 2002) and to reduce material delivery problems (Ala-Risku & Kärkkäinen, 2006).

Xue et al., (2007, p.150) identifies two types of internet mechanisms, namely market and coordination flow. Market mechanisms relate to the tendering of works. Tindsley & Stephenson, (2008) explore e-tendering process with a UK perspective. The work collects

data using mixed methods that includes interviews and questionnaires. The questionnaire is sent to a spectrum of the supply chain. Generalisations are made that the data cannot support. However, qualitative information from the study provide an insight into the obstacles to e-tendering which include the poor presentation of documents, tender costs being transferred to tendering contractors, systems not being user friendly and limits to contractors' IT capabilities.

Xue et al.'s (2007, p.150) identify coordination mechanisms that relate to the sharing of information. Wikforss and Lofgren (2007, p.17) explore communication in construction. The data is from case studies. The first case study is the National Defense [sic] College and the Swedish Institute of International Affairs in Stockholm. Appointment of the team is on a single project basis. Time and cost restrictions along with difficulties with technical specifications affect relationships and cooperation between team members. Strained relationships results in informal mechanisms of communication in the place of shared project data. The second case study involves the rebuilding of the Sockenplan subway train station. The team has experience of working with each other. A project management system is set up to manage communication. The system is set up late. Similar to the first case study, project participants fall back on informal methods of communication.

Briscoe et al (2001, p.252) identify from tier 3 and below contractors/suppliers a requirement for training in IT and computing skills. In addition, to training Akintoye et al. (2000, p.164) identify a major barrier to construction supply chain relationships as lack of appropriate information technology (3.13). When Chin et al., (2012, p.614) explore supply chain management in Malaysia small to medium size enterprises are found "lagging behind in appreciating how integrated supply chain drives remarkable changes in business processes and work with positive results in better quality services, cost reduction and efficiency". Information technology is a form of innovation in the UK construction industry. Lee et al., (2012) uses case studies to identify 4 levels of innovation, namely closed innovation, collaborative innovation, open innovation and co-innovation.

5.4.5 Risk Source - Organisational Culture

Kamarazaly (2013, p.9) identify institution and socio cultural challenges (Kamarazaly et al., 2013, p.9). Institutional challenge relates to organisational politics including catering for multiple stakeholders; lack of facility management representation; and senior management's

view of facilities as being part of the operational costs that must be minimised, rather than a strategic asset that must be optimised" (Kamarazaly et al., 2013, p.9). The socio cultural challenge relates to providing for the diverse needs of the users of the facilities and the infrastructure; including "creating a safe and conducive environment for work and other uses for the facilities" (Kamarazaly et al., 2013, p.9). A number of authors identify user / customer / stakeholder satisfaction (Chan & Chan, 2004; Toor & Ogunlana, 2009; Larson, 1997; Kamarazaly et al., 2013).

Mills (2001, p.250) identifies the risk source of quality of the brief and neighbours. Similarly, a number of authors identify problems in understanding owners' wishes, changes in owners' wishes and long procedures to discuss changes (Xue et al., 2004, p.417; Vrijhoef et al., 2001). Ng et al. (2002, pp.442-3) identifies that bureaucratic requirements restrict contractors to compromise (see 5.3.9 Risk Mitigation - Top Management Supported Teamwork). Similarly, Aarseth et al., (2012, pp.276-78) observe the challenge from case studies relating to the client organisation including strong leadership and challenges of making team decisions work within a traditionally bureaucratic organisation. All (contractor) respondents in Ng et al., study identify that win-lose attitudes attribute to client unwillingness to commit to a project partnering relationships, in particular in relation to "lack of client compromise and a conflicting organisational culture (Ng et al., 2002, p.440).

Aarseth et al., (2012) explores practical difficulties in attempting to implement a partnering approach. Data is from two case studies one Norwegian experimenting with four pilot partnering projects; and the other Canadian; proving observation of five partnering projects. The four Norwegian case studies include: the regional state archives in Bergen; Oslo district court ($7million); the Norwegian Institute for Public Health in Oslo; and the national archives in Kringsja ($33million). The Norwegian data is from fifty-three semi-structured interviews and attendance at participant meetings as a neutral observer. The Canadian data is from four interviews with the project management team. Aarseth et al., (2012, pp.276-78) identify observed challenges from partnering projects including meetings involving up to 35 persons leading to difficulties in decision making and; poor management of stakeholders (despite a common focus on stakeholders). Similarly, Ng et al. (2002, p.440) identify a large number of client representatives can make forming relationships difficult, which is evident in three of the six project case studies that the study explores.

5.4.6 PART SUMMARY

Table 29 summarises the sources of risk from this part of the DBenv thesis that relate to external risk. The previous part (5.3 Maturity Level I Internal Challenges) explores the consequences of risk that are similar to that this level of the maturity model.

Table 29: Sources of External Risk

Category	Challenges	Citation
Politics	changes in government; government contributions; governmental controls; inadequate public services; influential economic events; legislation/ regulation; poor public decision making; and strong political hospitality/ opposition; terms of trade.	Bing et al., 2005; Kamarazaly et al., 2013; Miller, 1992; Palaneeswaran et al., 2001; Tah & Carr, 2001; Zou et al., 2006.
Natural Environment	lack of environmental monitoring; and site conditions; weather.	Barker et al., 2000; Bing et al., 2005; Chan & Chan, 2004; Kamarazaly et al., 2013; Miller, 1992; Mills, 2001; Ofori, 2000; Palaneeswaran et al., 2001; Tah & Carr, 2001; Zou et al. 2006.
Available Technology	failing to use available technology including that relating to construction, procurement and specification; and lack of innovation	Ala-Risku & Kärkkäinen, 2006; Akintoye et al., 2000; Chin et al., 2012; Humphreys et al., 2001; Lee et al., 2012; Tindsley & Stephenson, 2008; Tserng & Lin, 2002; Wiengarten et al., 2013; Xue et al., 2007.
Culture	bureaucracy; neighbours; socio cultural; and understanding of stakeholder/ user requirements.	Aarseth et al., 2012; Chan & Chan, 2004; Kamarazaly et al., 2013; Larson, 1997; Mills, 2001; Toor & Ogunlana, 2009; Vrijhoef et al., 2001; Xue et al., 2004.

5.5 MATURITY LEVEL III FUTURE CHALLENGES

5.5.1 PART INTRODUCTION

Section A Introduction, identifies the importance of a long-term considerations including that in relation to institutional sustainability (see 1.2.5 Consequence of Capital Works, p.8). Future risks concern the future development of the estate, in contrast to the development of a particular or series of assets at a point in time. At this level, focus and rational is on future risk consequences. The internal and external risk sources are similar to previous levels in the

maturity model. This part of the thesis explores risk consequences and mitigation in relation to future risk challenges.

5.5.2 Risk Consequence - Asset Utilisation

Employers construct and refurbish assets for a return. Kamarazaly et al (2013, p.13) identify a number of risk sources associating to asset utilisation that this chapter visits in earlier levels of the maturity model, including statutory compliance; sustainability; technology; user needs assessment and satisfaction; cost cutting; and work environment. The difference between the occurrence of the items at an earlier point in the maturity model and at this level is the capacity for proactive mitigation of risk during the operation an asset. The risk sources have consequences.

Risk consequences associating to asset utilisation include maintenance, operational efficiency, emergency management and utilisation return (Kamarazaly et al., 2013; Palaneeswaran et al., 2001, p.166; Chan & Chan, 2004; Bing et al., 2005, p.28). Utilisation return associates to commercial profitable value (Chan & Chan, 2004), occupancy rate, rental income, sale of building and yield (Mills, 2001). Emergency management associates with "disaster management and recovery plans; safety and security; business continuity and contingency arrangement" (Kamarazaly et al., 2013, p.13). Maintenance includes the rectification of latent defects (Mills, 2001, p.250) with consequences including maintenance costs higher than expected and maintenance more frequent than expected (Bing et al., 2005, p.28).

5.5.3 Risk Consequence - Resource

Chan and Chan (2004) identify the performance indicator of participants' satisfaction. Other authors refer to the supply chain in relation to the risk consequences of availability of resources including labour, machinery and materials (Kamarazaly et al., 2013; Tah & Carr, 2001; Bing et al., 2005; Mills, 2001). Akintoye et al. (2000, p.164) identify risk consequences of effective construction supply chain relationships as reliability of supply (4.30), mutual interest (4.00), joint business planning (3.48) and closer links between demand and supply (3.40). Consideration of availability of resources on a project-by-project basis relates to risk sources and earlier levels of the maturity model. Consideration at this level of the maturity model considers a number of projects over the life of an organisation.

5.5.4 Risk Consequence - Human Resource

Kamarazaly et al (2013, p.13) identify a number of risk challenges that associate to human resource including facilities management staff development and outsourcing. The risk consequence is having the availability of a team with the relevant ability. Ability is a combination of aptitude, training and resources (Whetten et al., 1996, p.8). Employee health is also a risk consequence. Organisations employ staff directly they also outsource activities to other organisations. At this level of the maturity model, there is a focus of attracting and retaining human resources to work for the organisation. Aarseth et al. (2012, pp.276-78) identify from the case studies: frequent personnel changes contributed negatively to actors' commitment, with a project being vulnerable to key people leaving. In addition, there is a focus on the development of human resource. In relation to the supply chain, the obvious way to develop the supply chain is through long-term relationships. Akintoye et al. (2000, p.164) identify the major barriers to construction supply chain relationships as low commitment of partners and poor understanding of the concept.

5.5.5 Risk Consequence - Operational Effectiveness

Kamarazaly et al. (2013, p.13), identify the risk of corporate image. Similarly, Steiner et al. (2013) uses a literature review to create a model of university identity (see Figure 14). The model includes internal elements and external elements. Internal elements include organisational and symbolic identity. Organisational identity relates to strategic, structural and cultural dimensions (Steiner et al., 2013, p.409). Symbolic identity relates to buildings artefacts, embodied identity and aesthetic impression (Steiner et al., 2013, p.409). Symbolic identity relates readily to the output of the construction industry. Externally, Steiner et al.'s (2013) model includes the risk consequences of reputation comprising of public relations, social responsibility and institutionalised third part stakeholders. Earlier parts of this thesis explore corporate social responsibility further (see 4.6 Maturity Level IV Integration).

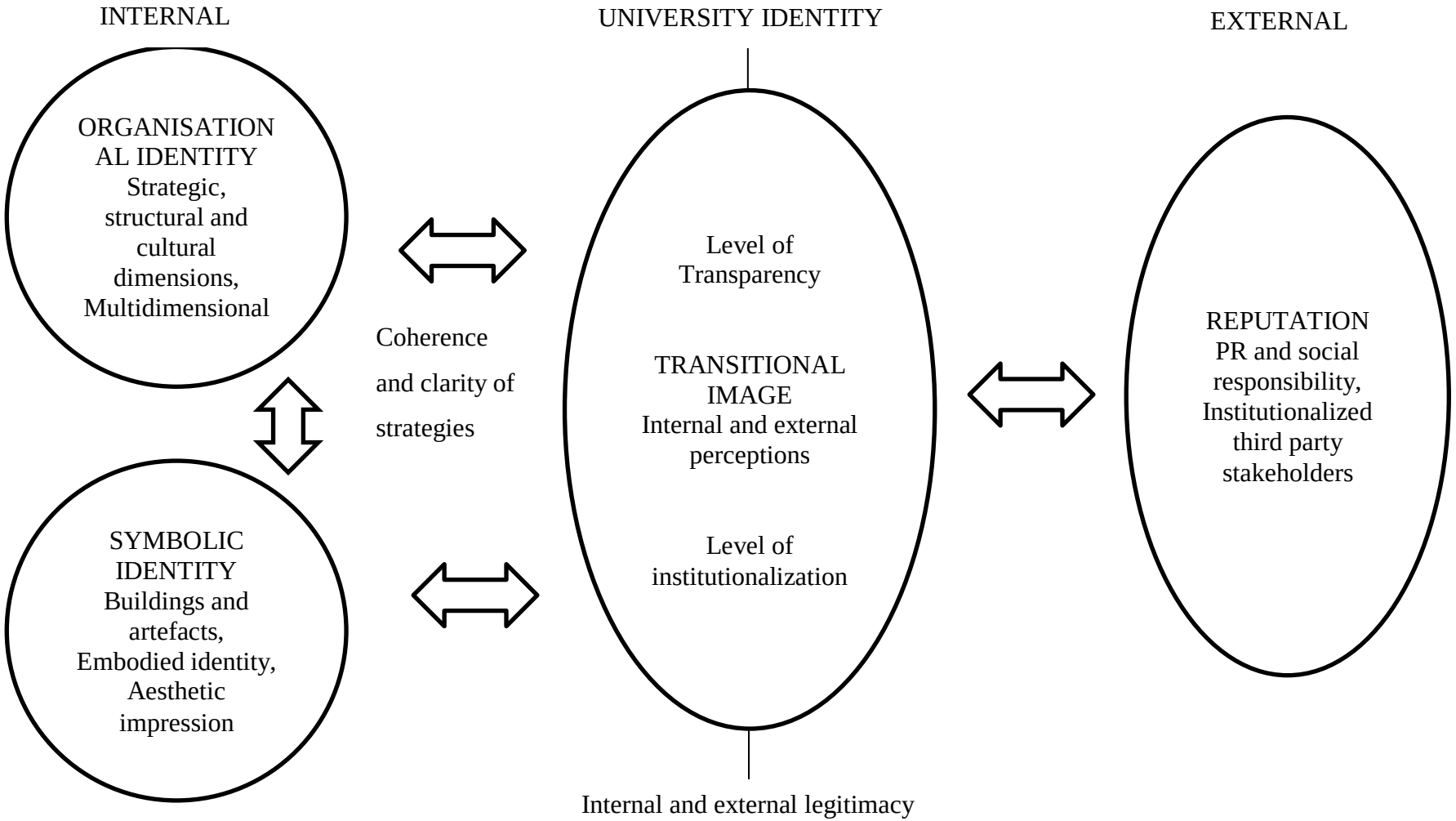

Figure 14: Model of University Identity

Source: Steiner et al. (2013)

5.5.6 RISK MITIGATION - RELATIONAL CONTRACTING

Adedokun et al., (2013) assess competitive tendering methods of procuring educational buildings in Nigeria, which is a location culturally different from the location of the DBenv study. Participants include architects (16%), quantity surveyors (24%), builders (12%) and engineers (48%) (p.87). Data is from twenty-five questionnaires. There is limited attempt to establish the overall population. Respondents' education is to the levels: HND (4%); BSc/BTech/BEng (40%); postgraduate (24%); and MSc/MTech (32%). Twenty-one respondents (84.64%) have corporate membership of a professional institution. Respondents are asked to rank reasons for selecting open and selective tendering. The top four ranking factors for open tendering methods are: (1) quality level; (2) enhances accountability; (3) price competition; and (4) responsibility (Adedokun et al., 2013, p.89). The top four ranking factors for selective tendering methods are: (1) quality level; (2) speedy execution of project; (3) responsibility; and (4) price competition. The factor 'enhances accountability' ranks at seventh for selective tendering methods.

Tendering works in either open or selective tendering procedure increases accountability. At the end of the tender process bid selection can be made on tender price; with the lowest tender price securing the works. McDermott et al. (2005, p.24) indicates on a £2million road development, what was understood to be low tender price by a contractor and client results in a negative spiral between the two parties. Vrijhoef & Koskela (2000) identify other risk sources using three case studies that focus on flows of pre-fabricated materials in buildings. In the third case study, there is a link between purchase price of the materials and site logistic costs. Extra logistic costs (between 50% and 250%) associate to lower purchase price of materials. Therefore, risk mitigation that associates to accountability causes other risks to emerge.

Faems et al. (2008) explores literature to establish structural and relational perspectives. The perspectives relate to focus of analysis, theoretical basis, main assumptions, governance mechanism and criticism (see Table 30). The structural perspective has a theoretical basis of transaction cost theory. The assumption of the theory includes partners tend to act opportunistically, with alliance performance being "driven by the quality of the initial structural design" and complex contracts (Faems et al., 2008). Where a contractor is driven by financial tendencies, such is the case with transaction cost theory, there is a potential that a contractor will become un-committed to effective communication and have a self-sustainable

attitude (Ng et al., 2002, p.440). Chapter 4 explores the negative involvement of financial tendencies on Motivation.

Table 30: Structural and Relational Perspectives

	Structural Perspective	Relational Perspective
Focus of analysis	Single transaction	Inter-firm relationship
Theoretical basis	Transaction cost theory	Social exchange theory
Main assumptions	Partners have a tendency to act opportunistically Alliance performance is driven by the quality of the initial structural design	Partners have a tendency to act in a trustworthy fashion Alliance performance is driven by the quality of the ongoing relational processes
Proposed governance mechanism	Complex contracts	Trust
Criticism	Undersocialized view on human action	Oversocialized view on human action
Reference publications	Pisano, Russo & Teece (1988); Pisano (1990); Williamson (1991); Hennart (1991, 2006); Parkhe (1993a); Oxley (1997); Sampson (2004);	Larson (1992); Ring & Van de Ven (1992); Zaheer & Venkatraman (1995), Gulati (1995); Uzzi (1997); Dyer & Singh (1998); Salk (2005)

Source: Faems et al. (2008)

Faems et al. (2008) is similar in a number of ways to Palaneeswaran et al.'s (2003, p.574) work (see Figure 13, p111). One similarity relates to the identification of the relationship of trust with high levels of relational contracting. The assumption of social exchange theory includes partners have a tendency to act in a trustworthy fashion, with alliance performance being "driven by the quality of the ongoing [sic] relational process" and trust (Faems et al., 2008). The benefits of long-term relationships receive confirmation from Larson (see Table 26, p117) that identifies a correlation between previous work experience and the risk consequences of controlling cost, avoiding litigation and overall results. In contrast to Palaneeswaran et al.'s (2003, p.574) work Faems et al. (2008) sees the relationship between contractual completeness and relational contracting at two ends of an extreme, instead of two axes on a matrix.

In a similar study Dubois & Gadde (2000) explore purchasing behaviour in the construction industry. Data is from twenty-seven interviews from a case study of a renovation and

construction project in Sweden worth 10 million US dollars. The inter-organisational relationships in the case study, of which the work suggests there is generalisation to the wider industry, are found to be transactional opposed to relational. Competitive tendering, that associates to transactional cost theory, inhibits flexibility (Ng et al., 2002, p.444) and comes with transactional costs. Such transactional costs include the cost to tender (Dubois & Gadde, 2000, p.7). Where there is a low bid contractors "often adopt an optimistic, mistake-hiding, quality shirking, extra work claiming strategy, so that the principle organization [sic] usually faces most of the project risks" (Laan et al., 2011, p.103). With a contractor claiming "if we come across failures in project specifications, we claim for the extra work immediately. Accordingly, if three projects are put to tender, and we are only able to bid for one, we will choose the project with the best claim potential" (Laan et al., 2011, p.103).

Szczepański & Światowiec-Szczepańska (2012, p.791) develop from a literature review and four case studies a holistic model of strategic partnership risk management (see Figure 15). The model includes: elements of external partnership risk management system; control; relational risk; and performance. The elements of external partnership risk management includes: managers risk propensity; relational capacity; expected benefits; and acceptable risk level in the organisation. Similar to Palaneeswaran et al.'s (2003, p.574) work control includes two elements namely formal and relational mechanism. Szczepański & Światowiec-Szczepańska's (2012, p.791) formal mechanism includes governance mode and formal control (contract). Palaneeswaran et al., (2003, p.573) identify with transactional binding forces: the bind needs to meet contractual commitments; short-term benefits (monetary gains); contractual commitments and torturous for liability and accountability; pressure (from stakeholders) to enforce contractual rights; and other transactional binding forces. This chapter previously relates high contractual completeness with low relational contracting identifies with "high power exploitations; high potentials for conflicts and contractual non-commitments leading to 'breach of contract' and litigation; compensation/penalties are normally defined by the contract" (see Figure 13, p111).

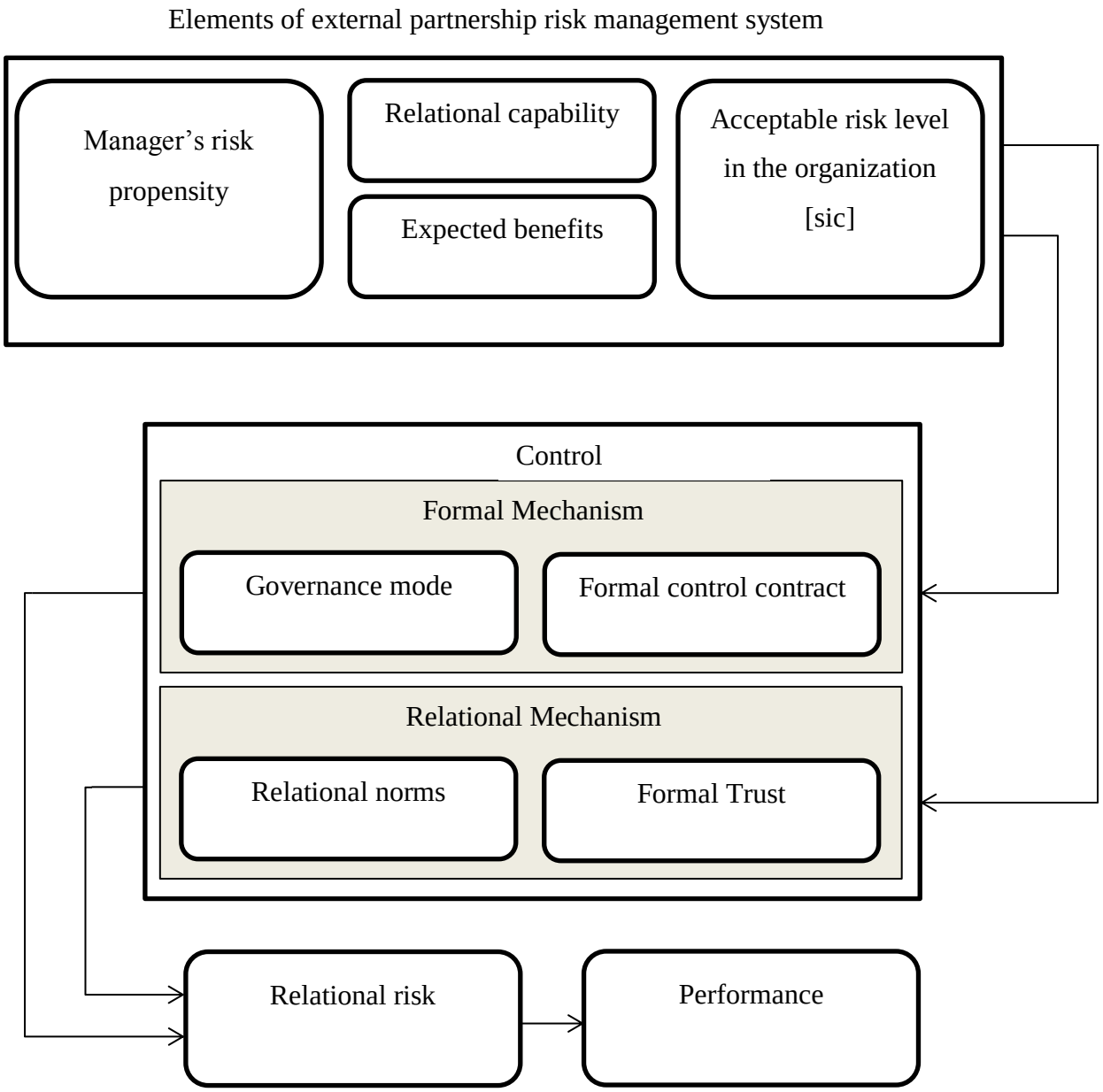

Figure 15: Holistic Model of Strategic Partnership Risk Management

Source: Szczepański & Światowiec-Szczepańska (2012, p.791)

Szczepański & Światowiec-Szczepańska's (2012, p.791) relational mechanism includes relational norms and trust (see Figure 15, p137). Palaneeswaran et al., (2003, p.573) identify the relational bonding forces: trust and mutual respect; long-term values of continuous relationships; sharing of risks and rewards; ethics and discipline; transparency and effective communications; other non-contractual motivational measures (e.g. bonuses/awards, additional opportunities); and other relational bonding forces. Relational contracts are a record of agreement and not a document that overrules verbal agreements. Low contractual completeness and low relational contracting relates to "higher potentials for conflicts, claims and disputes; higher transaction costs; compensation/penalties are normally by the law and litigation" (Palaneeswaran et al., 2003, p.574; Xue et al., 2007, p.154). The opposite, high contractual awareness with high relational contracting results in "lesser conflicts and claims; lower transaction costs; disputes/claims could be settled by arbitration; enhanced harmony; improved product quality; and overall best value in 'win-win' atmosphere" (Palaneeswaran et al., 2003, p.574; Xue et al., 2007, p.154).

Low contractual completeness with high relational contracting "Higher trust to enhance contractual relationships; conflicts and contractual non-commitments settled through local 'adjustments' and/ or 'renegotiations'; disputes/claims could be settled by mediation" (Palaneeswaran et al., 2003, p.574; Xue et al., 2007, p.154). Darabi & Clark, (2012) identify that trust is fundamental to collaborative settings. Ng et al. (2002, p.441) identify a lack of trust in other peoples motives as a reason for failure pertinent to stakeholders commitment to the partnering arrangement. Laan et al., (2011) explore building trust in construction partnering projects through an exploratory case study. The work relates literature on trust to risk, control and performance. The work establishes risk in the form of positive and negative cycles. The data is from a longitudinal case study, which is a £30million rail project in Netherlands. Data collection initiates at the start of the construction phase in the form of interviews. Thirty semi-structured interviews are undertaken in three rounds, analysed using thematic analysis. The project has an alliance steering committee consisting of two people from both the employer and the contracting organisation. The project also has an alliance management team, comprising of two people from both the employer and contractor team, responsible for the day-to-day project management. Contractor "in fact, it is a matter of just doing it. Be honest and stay away from playing games. If your project partner does the same, then you create the feeling of really doing it together" (Laan et al., 2011, p.105).

McDermott et al., (2005) explore trust in construction projects. There is a limited attempt to demonstrate auditability in the presentation of the data. The first case study is a large-scale infrastructure project with a value of £37million and eighteen months duration. The second case study involves the re-construction of coastal defences £10million, undertaken in eighty weeks. Some of the statements could be more rigorous, for example, relating to the statement "in real terms, the project was delivered 14 week early" (McDermott et al., 2005, p.22). The third case study is a school project with a value of £1.2million and 40-week duration. The fourth case study explores a road development project, £2million in value with 32-week duration (McDermott et al., 2005, p.23).

Table 31: McDermott et al.'s Interview Content Analysis

Category	Example Vocabulary
Trust (654)	Trust/trusted/trustworthiness (577), mistrust/untrustworthy (24), betray trust (17)
Relationships (124)	Partnering/relating/friendship (57), support/co-operation (26)
Value (76)	Value (76)
Confidence (51)	Confidence (33), faith (18)
Competence (28)	Competence (28)
Professional (21)	Professional (20), unprofessional (1)
Promise keeping (149)	Promise/promise keeping (42), delivery (74), reliability (27)
Fairness/Reasonableness (110)	Fairness (58), Unfairness (16), Reasonable (28)
Mutuality/Reciprocity (97)	Mutuality (39), reciprocity (14), expectations/obligations/duty (32)
Honesty/integrity (94)	Honesty (51), integrity (13), truth (16)
Openness/communications (82)	Communications (42), openness/frankness (40)
Values/ethics (72)	Values (39), ethics/morals (19)
Reputation (70)	Reputations (44), respect/valued (26)
Blame culture (21)	Blame culture (21)

Source: McDermott et al.'s (2005, p.25)

McDermott et al.'s (2005, p.25) work develops a list of elements of trust using content analysis of 32 number interviews. Table 31 includes categories and example vocabulary from the data analysis of the interviews. The numbers in brackets indicate the number of times a word occurs in the 32 interview transcripts. The work tests categories using 187 questionnaires (McDermott et al., 2005, p.25). There is a limited attempt to incorporate the data from the interviews into the work. The work then establishes elements of trust under the headings of relationship, communication, commitment and reliability. The work develops a

diagram indicating layers of context for trust development, which includes two circles representing organizational [sic] context coming together to provide project context. Within project, there is interpersonal context (see Figure 16).

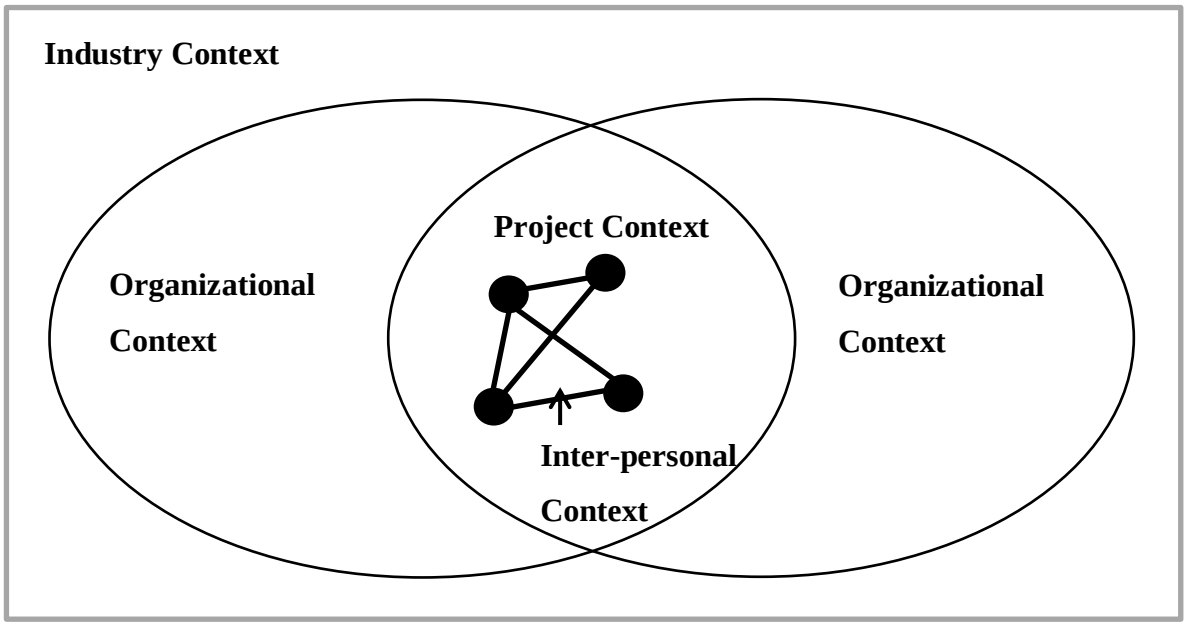

Figure 16: Layers of Context for Trust Development

Source: McDermott et al.'s (2005, p.27)

One way to manage resources over a period is through supply chain management. Proverbs & Holt (2000) develop a model for minimising construction labour costs using European best practice. Performance data from European contractors form the basis of the discussion. A recommendation is that reducing overall construction cost is achievable by targeting the supply chain members, including that at tier 3 and beyond, which form part of the key construction practices (Proverbs & Holt, 2000, p.149). Errasti et al., (2007) identify a reduction costs over a two-year period in two sub-contractor case studies. The sub-contracting organisations made the savings using fewer suppliers, supplier integration and the implementation of quality system (Errasti et al., 2007, p.254).

5.5.7 Risk Mitigation - Corporate Social Responsibility

Chapter 4 Motivation explore Skudiene and Auruskeviciene (2012) study that identifies a correlation between internal and external corporate social responsibility and intrinsic motivation (see 4.6 Maturity Level IV Integration, p85).

5.5.8 RISK MITIGATION - PERSONNEL DEVELOPMENT

Briscoe et al., (2001) interviews senior executives from twenty small to medium enterprises. The trade specialism of the organisations include building services; specialist building sub-contracting; specialist civil engineering sub-contracting; material and component supply and labour. Eighteen of the companies have less than sixty employees. Participants respond using a likert scale. All of the skills achieve a level of (3) useful or above (4-5, 5 being essential). The skills allocate to: numeric and financial skills; client/contractor relationships; design communications; supplier communications; teamwork within the firm; planning and problem solving and manual skills. Briscoe et al.'s (2001) client/contractor relationships relate to the skills of verbal communications (4.47 mean, rank 4); marketing techniques (4.05 mean, rank 12) and negotiation ability (4.53 mean, rank 3). Teamwork within the firm relates to the skills of motivation (4.42 mean, rank 6); leadership and instruction (4.45 mean, rank 5); and training (3.53 mean, rank 16).

Similar to other authors that Section A Introduction and Chapter 4 Motivation explores, Ling et al., (2000, p.390) differentiate between contextual and task performance. Ling et al.'s (2000, p.390) contextual performance factors includes conscientiousness, initiative, social skills, controllability and commitment. Ling et al., (2000) undertake a survey to develop an understanding of the importance of design consultants' soft skills in design and build projects. The data similar to Briscoe et al. (2001) indicates a requirement for both hard and soft skills. Training develops both hard and soft skills. Ng et al. (2002, p.441) identify lack of training (employer and contractor) as detrimental to partnering. Barker et al. (2000, p.189) supports this identifying training in partnering as a quick hit opportunity and recommendation. Training is available to improve practitioners self –efficacy that relates to a person's self-belief in their own ability to complete tasks. Zhang & Ng's (2012, p.1332) hypothesis eight explores if "perceived knowledge self-efficacy has a positive effect on individuals' attitude toward knowledge sharing in construction teams". The data indicates a relationship exists between knowledge self-efficacy and attitude ($p \leq 0.001$) (Zhang & Ng, 2012, p.1340). The DBenv thesis introduces Zhang & Ng's (2012) work in Chapter 4 Motivation.

Smits & Marrewijk (2012) explore practices of collaboration in the Panama Canal Expansion Program ($5.25billion), including chaperoning. Data is from insider ethnographic research undertaken over one year (2009-2010). The project management appointment includes collaborative clauses. "In performing the Program Management Services, the PM will work

in close coordination with the ACP's [employers] existing personnel to form a unified team capable of delivering the Program in accordance with ACP's requirements" (Smits & Marrewijk, 2012, p.446). In addition, the appointment sets out a requirement to train the employer's personnel. "Training both by working with the ACP personnel in performing Program Management Services and also by means of seminars, handbooks and any other material which would provide the ACP's personnel with the best training possible to acquire the skills necessary for assuming more responsibilities in the supervision of the Works". In the context of the project, the role's label is chaperoning.

Chapter 4 Motivation identifies that information may be informational opposed to controlling. Zhang & Ng (2012, p.1340) hypothesis six explores "perceived knowledge feedback has a positive effect on individuals' attitude toward knowledge sharing in construction teams" (2012, p.1331). The data also indicates a relationship exists between knowledge feedback and attitude ($p \leq 0.001$). Therefore, there is a link between risk mitigation relating to knowledge management and the findings of Chapter 4 Motivation and regularity styles.

5.5.9 Risk Mitigation - Knowledge Management

In addition to inter-organisational training, Ofori, (2000, p.203) identifies that supply chains develop through inter-organisational knowledge sharing. Pathirage (2010) explores the important role of sharing lessons learned in disaster mitigation strategies. Serpell (2010) explores knowledge management in the construction industry. The research data is from sixty-five questionnaires from construction companies in the Metropolitan Region of Santiago, Chile. The data indicates the most appropriate forum for sharing experiences is through meetings.

Serpell et al., (2010) identifies a main barrier to implementing knowledge management systems is a lack of time. In contrast, Zhang & Ng (2012, p.1331), fifth hypothesis explores whether "perceived reduced workload has a positive effect on individuals' attitude toward knowledge sharing in construction teams". The data does not indicate a relationship between reductions in workload and attitude (Zhang & Ng, 2012, p.1340). Other barriers identified to knowledge management include lack of senior management support, lack of participation by professionals and lack of forums. Similarly, Hippel (1987) explores know how trading and cooperation between rivals.

The DBenv thesis introduces Zhang & Ng's (2012) work in Chapter 4 Motivation. Zhang & Ng's (2012, p.1340) hypothesis one explores whether "individuals' intention to share knowledge has a positive effect on their knowledge sharing behaviour in construction teams" (Zhang & Ng, 2012, p.1330). The data indicates a relationship exists between intention and behaviour ($p \leq 0.001$). Therefore, a requirement emerges for supply chain employees to have an intention to share knowledge. One way to improve intention to share knowledge is through relationships. Zhang & Ng (2012, p.1340) seventh hypothesis explores whether "perceived enhanced personal relationships has a positive effect on individuals' attitude toward knowledge sharing in construction teams". Surprisingly, the data does not indicate a connection between enhanced knowledge relationship and attitude (Zhang & Ng, 2012, p.1331).

Loss of intrinsic motivation is a risk challenge, particularly in relation to employees of the supply chain working on a number of projects over the life cycle of the estate. The negative effect of introjection as a regularity style on intrinsic motivation is explored in Chapter 4. Zhang & Ng (2012, p.1330) third hypothesis explores "Perceived losing face has a negative effect on individuals' attitude toward knowledge sharing in construction teams". The data indicates a relationship exists between perceptions of losing face and knowledge sharing ($p < 0.01$) (Zhang & Ng, 2012, p.1340). Therefore, ego involvement that associates to introjection creates the risk of inhibiting knowledge sharing. This also supports the motivational maturity model.

5.5.10 Risk Mitigation - Operation Integration

Chapter 3 Implementation explores operation integration, such as PFI (3.3.3 Operation Integration, p45). Bing et al., (2005) explore the allocation of risk on PPP/PFI (Public Private Partnership/ Private Finance Initiative) construction projects in the UK. The work relates risks from literature to practice using a survey with 53 respondents. 75% of respondents projects involve a design build finance operate procurement system. Projects ownership of the asset remains with a special purpose vehicle. The Companies Act (2006a) provides the framework for forming the special purpose vehicle. The public and private sector own the company to different extents, depending on the individual agreement. The special purpose vehicle, however, undertake work using construction contracts with construction project risks. Bing et al.'s (2005) work identifies Risk Factor Categories that are very similar to the ones that the DBenv study identifies (see Table 32).

Table 32: Risk and Private Finance Projects

Risk Meta Level	Risk Factor Category Group	
Macro level risks	Political and Government Policy	Social
	Macroeconomic	Natural
	Legal	
Meso level risks	Project Selection	Construction
	Project finance	Operation
	Residual risk design	
Micro level risks	Relationship	Third party

Source: Bing et al.'s (2005)

5.5.11 PART SUMMARY

Table 33: Future Risk Consequences

Category	Challenges	Citation
Asset Utilisation	business continuity; commercial profitable value; disaster management; emergency management; maintenance costs and frequency; occupancy rate; operational efficiency; rental income; sale of building; safety and security; and utilisation return.	Bing et al., 2005; Chan & Chan, 2004; Kamarazaly et al., 2013; Mills, 2001; Palaneeswaran et al., 2001
Resource	availability / reliability of organisational resources including labour plant and materials; closer links between demand and supply; mutual interest; and joint business planning.	Akintoye et al.,2000; Bing et al., 2005; Kamarazaly et al., 2013; Mills, 2001; Tah & Carr, 2001
Human resource	health; availability of suitably trained personnel; attracting staff; and staff retention.	Aarseth et al., 2012; Kamarazaly et al 2013
Operational effectiveness	organisational identity; and symbolic identity.	Kamarazaly et al., 2013; Steiner et al., 2013

Table 33 summarises the consequences of risk from this part of the DBenv thesis that relate to future risk. The risk consequences at this level are different from that at earlier levels in that they relate to things that will happen in future, following completion of a project. Table 34 summaries a number of ways to mitigate (or avoid) future risks. There is a relationship between the implementation of the mitigation techniques and risk consequences.

Table 34: Future Risk Mitigation

Risk Mitigation	Achieves/increases	Citation +	Avoids/reduces	Citation -
Relational Contracting	fair payment; controlling costs; ethics and discipline; knowledge sharing; harmony; long-term values of continuous relationships; product quality; reduced logistic costs; sharing of risks and rewards; and trust; working together.	Faems et al., 2008; Laan et al., 2011; Larson, 1997; McDermott et al., 2005; Palaneeswaran et al., 2003; Szczepański & Światowiec-Szczepańska, 2012; Vrijhoef & Koskela, 2000; Xue et al., 2007; Zhang & Ng, 2012.	accountability; claim strategy; conflicts; high power exploitations; litigation; uncommitted to communication; opportunistic behaviour; self-sustainable attitude; and transactional costs	Adedokun et al., 2013; Dubois & Gadde, 2000; Faems et al., 2008; Laan et al., 2011; Larson, 1997; Ng et al., 2002; Ng et al., 2002; Palaneeswaran et al., 2003; Xue et al., 2007
Corporate social responsibility	employee attraction, self-image, satisfaction, commitment and loyalty; employees' willingness to initiate, participate and contribute social change initiatives; equality; moral; motivation; organisational citizenship; performance and productivity; psychological need for belongingness; teamwork; and trust.	Skudiene and Auruskeviciene, 2012; Williams & Anderson, 1991.	employee salaries	Skudiene and Auruskeviciene, 2012
Personnel Development	chaperoning; hard and soft skills; improves attitude; inter-organisational training; numeric and financial skills; relationships; teamwork; and partnering skills	Barker et al., 2000; Briscoe et al., 2001; Ling et al., 2000; Ng et al., 2002; Ofori, 2000; Smits & Marrewijk, 2012; Zhang & Ng, 2012.		
Knowledge Management	disaster mitigation; and shared knowledge.	Ofori, 2000; Zhang & Ng, 2012.	not sharing knowledge	Zhang & Ng, 2012
Operation Integration	aligned interests; and design, construction operation integration.	Bing et al., 2005; Cabinet Office 2012a, 2012, 2011, Treasury & Infrastructure UK, 2011	poor value	James, 2011

5.6 CHAPTER SUMMARY

This chapter identifies risk from literature. The bespoke nature of construction makes it difficult to identify all project risks. This chapter sets out a maturity model for the implementation collaborative features to reduce risk. The three levels are (1) internal challenges, (2) external challenges and (3) future challenges. Future research is available to form an additional level in the maturity model that relates to inter-organisational risk. Table 35 relates risk mitigation from this Chapter to the collaborative features from Chapter 9 Implementation.

Table 35: Risk Mitigation Summary

Category	Collaborative Feature	Risk Mitigation
Interpersonal Contract	acting: in good faith; in an open and trusting manner; in a cooperative manner; continuity of relationships; integration of other stakeholders; lessons learned meetings; shared office spaces; soft skills; teambuilding processes; and training.	conflict identification; personnel development; top management supported teamwork
Value Management and Engineering	change control; risk management; value engineering and management; and whole life cycle costing.	provisions for continuous improvement
Performance Based Contracting; Performance Management	incentivisation; performance; performance based contract; performance management; performance indicators procurement route; and target contracts.	
Practice, Procedures, Information Technology	BIM; organisational level documents; inter-operability of systems; and electronic meeting systems, web 2.0-based collaboration technologies.	knowledge management
Design and Operation Integration	design-construction integration; design and build; private sector engagement into design, construction and maintenance; frameworks; integrated project insurance; private finance initiative; prime contracting; project partnering contract; management agent contracting; organisational standard procurement; soft landings; and two stage open book.	problem-solving process established; operation integration; supply chain design integration;
Inter-client organisational Knowledge and Initiatives	benchmarking; Considerate Constructors Scheme; CSCS; forward programme; research and development; grants; health and safety co-operation; health and safety risk reduction; and professional networks.	

Category	Collaborative Feature	Risk Mitigation
Legal Framework and Tendering	adjudication; change control; charters; contract simplification; contract completeness; contractor selection; enhanced health and safety conditions; CSCS; collaborative working clauses, collaborative/integrated supply chain; communications protocol; design, build, operate contract; dispute ladder; enhanced sharing information; environment and sustainability; facilitation; incentivisation; fair payment; risk assessment and allocation; financial incentivisation; legislative compliance; overarching collaborative agreement; non-competitive tendering; performance indicators; multi party contracts; pre-construction services agreement; simplification of contracts; standard pre-qualification; standardisation contracts and frameworks; sub-contractor relationships; mediation; and value engineering.	previous work experience; relational contracting; fair profit assumption
Strategy	condition of the estate; space efficiency; carbon reduction; environmental performance; affordability; and institutional sustainability.	corporate social responsibility
Shared Services	iBIM; lead buying; piggy backing; shared services; third party advisory; third party outsourcing; shared frameworks; and third party purchasing.	

CHAPTER 6 LITERATURE SECTION SUMMARY

6.1 CHAPTER INTRODUCTION

The aim of this Chapter is to provide a succinct summary of the literature section of the thesis. The literature section creates a maturity model for organisations to use to evaluate collaborative features. This Chapter will provide a succinct summary of the three themes implementation, motivation and risk; relate the three themes to Crowe and Fortune's (2012) model; and assess the model for use on a hierarchical basis.

6.2 FRAMEWORK MATURITY MODELS

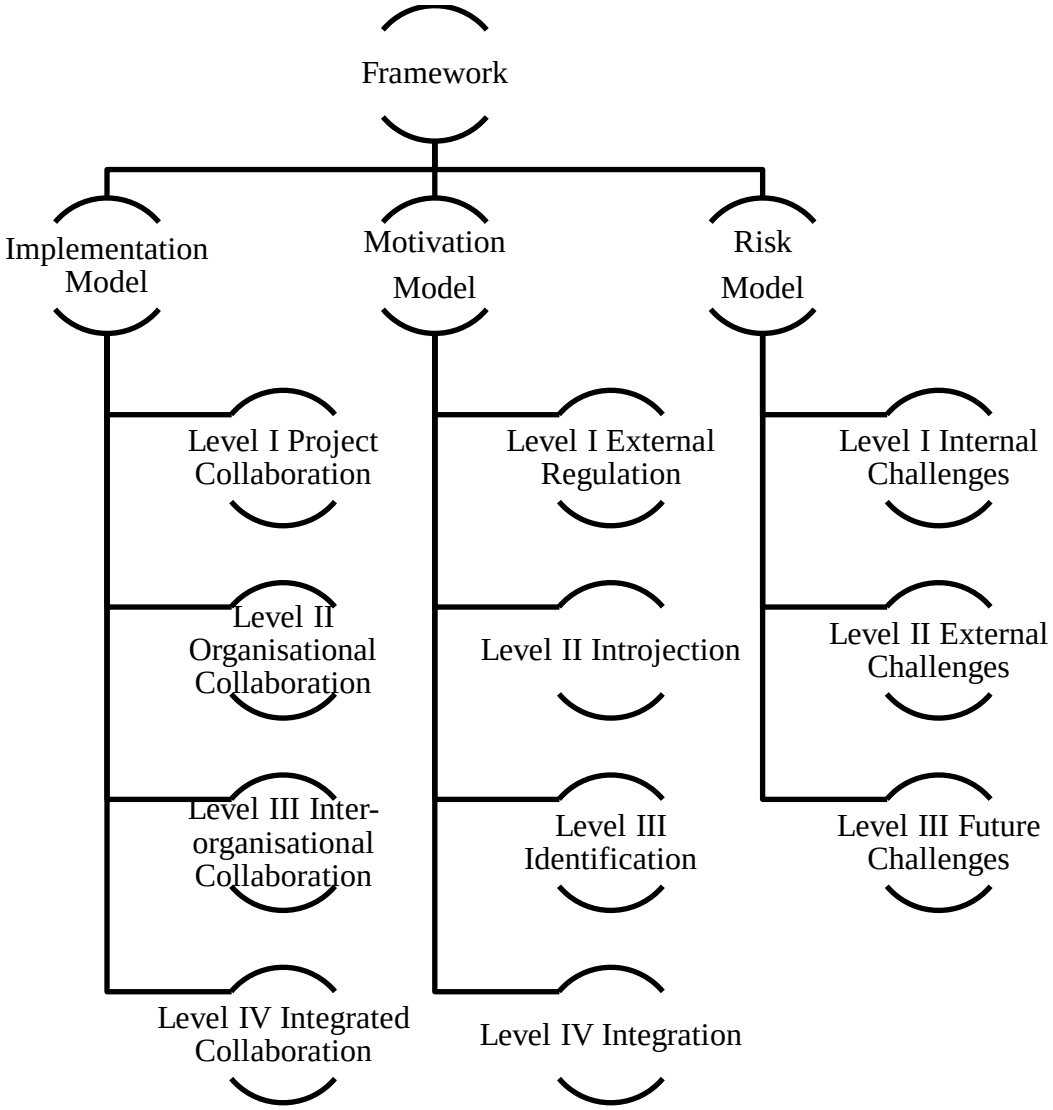

Figure 17: Pictorial Representation of Literature

A summary of the literature section is in Figure 17. There are calibrations for the three themes, creating maturity models. Implementation and motivation has four calibrations and risk three. Implementation and Risk theme calibrations are constructed from peer-reviewed work from recognized journals. In addition, the implementation theme calibrations receive support from governmental strategies, reports and the likes. The governmental strategies offer the work transferability across the HE sector. Motivation is constructed from work relating to human motivation, which concerns itself with what motivates people as an organism, therefore has natural transferability.

Each Chapter is split into Parts, which relate to levels of calibration. There is a summary for each Part in the Implementation Chapter listing collaborative features. The collaborative features allocate to different levels within the maturity model. Similarly, the Risk Chapter provides tables in Part summaries, which list risk sources, consequences and mitigation. The Tables will be use when investigating organisational collaboration in later stages of the research.

6.3 RECONCILIATION WITH EARLIER STUDY

The aim of the Section of the DBenv thesis is to test and offer calibrations to earlier work by Crowe and Fortune (2012). Crowe and Fortune's (2012) work identifies three different maturity axes. The work suggests that best performance relating to overall deliverables is achievable through high levels of maturity. Section B Literature finds significant contributions in literature confirming the three themes, therefore offering validation to their use as part of the DBenv study. In addition, the work finds the use of similar hierarchal approach model in construction and in other fields including psychology and business management. One particular maturity model that is prominent in construction is evident in Bew & Underwood's (2009) work.

The literature section finds that although it is possible to allocate particular collaborative ways of working to levels of the maturity model, particular was of working may allocate to more than one calibration in a maturity model. This means that instead of considering the collaborative features as a calculation it is more accurate to consider their position as a locus. In particular, in Chapter 4 Motivation a Part explores the use of mixed regularity styles. The use of a locus in place of exact positioning identifies with the self-determination theory that is well established in fields of psychology and business management.

6.4 CHAPTER SUMMARY

This Chapter provides the basis of a framework that includes three maturity models for the next stage of the research (see Figure 17, p.148). In addition, the literature from this Section validates the themes from earlier work (Crowe & Fortune, 2012).

SECTION C RESEARCH DESIGN

CHAPTER 7 RESEARCH APPROACH

7.1 CHAPTER INTRODUCTION

Literature calibrates the three themes from Crowe & Fortune's (2012) maturity model. The aim of this chapter is to set out a rigorous research approach to achieve the Aim of the DBenv study. The work develops a philosophical framework for the research using common threads in the existing knowledge base; assesses the significance and relevance of philosophical foundations to practitioner led research; and develops a framework for methods and methodology. The work explores secondary sources from specialists in the field of philosophy and research methods. The work also explores sampling and data analysis. Data concerning the primary and auxiliary case studies are later Chapters of the research.

7.2 KNOWLEDGE AND PHILOSOPHY

7.2.1 PART INTRODUCTION

The knowledge and philosophy part of the chapter considers and justifies a philosophical framework in relation to social research in the built environment. The work explores key texts in the field of social science research.

7.2.2 PHILOSOPHICAL FRAMEWORK

Crotty (1998, pp.2-9) identifies four questions or elements during the development of a research proposal, namely, epistemology, theoretical perspective, and methodology and methods. Gray (2004, p.16) refers to Crotty's forma when considering a framework. In contrast Saunders, et al., (2009, p.108) contains six elements namely philosophies, approaches, strategies, choices, time horizons, techniques and procedures. Further and in contrast Guba & Lincoln (1994, p.107) similar to Bryman (2008, p.24) relates paradigms to ontology, epistemology and methodology.

Saunders, et al.'s research onion considers philosophy in a single layer of complexity, whereas Crotty's forma and Bryman consider philosophy in two layers of complexity. Bryman's (2008, pp.18-21) first layer considers objectivism and constructionism as ontology. Ontology considers existence and the nature of objects that exist (Williams & May, 1997, p.200). Ontology does not feature in Crotty's forma due to alignment with epistemology. Epistemology studies the justification of claims of what is knowledge (Williams & May,

1997, p.197). Similar to Bryman's first layer Crotty (1998, pp.2-9) identifies three viewpoints of epistemology, namely, objectivism, constructionism and subjectivism. Bryman's (2008, pp.14-15) second layer considers a description of epistemology, positivism and interpretivism. The analysis relates to what Crotty (1998, pp.2-9) identifies as theoretical perspectives as positivism, interpretivism, critical inquiry, feminism and post modernism. Saunders, et al.'s (2009, p.108) single layer of the research onion refers to four philosophical paradigms, that are similar to Bryman's and Crotty's second layer namely, positivism, realism, interpretivism and pragmatism. As a result, a common two-layer approach to philosophical paradigms and their complexity is in the explanatory model shown in Figure 18, which frames the following discussion.

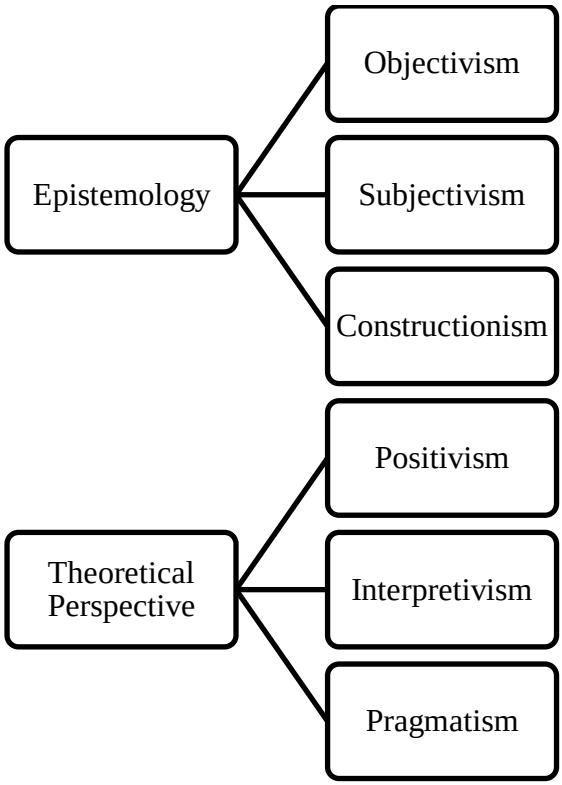

Figure 18: Philosophical Framework Based on Key Texts

7.2.3 PRE MODERN SCIENCE

The framework in Figure 18 does not consider the premodern paradigm. Seidman (2008, p.163) when exploring work of Lyotard (1924-98) identifies the prevalence in premodern societies of narrative types of knowledge, which tell a story that is intended to shape human behaviour. The knowledge being contained in such books (listed in no particular order) as the

Bible and Koran; which comes from God. There are clear benefits to research undertaken with a premodern epistemological paradigm relating to the built environment particularly in relation to ethical behaviour. The premodern paradigm is connected to epistemology in the retried framework in Figure 19.

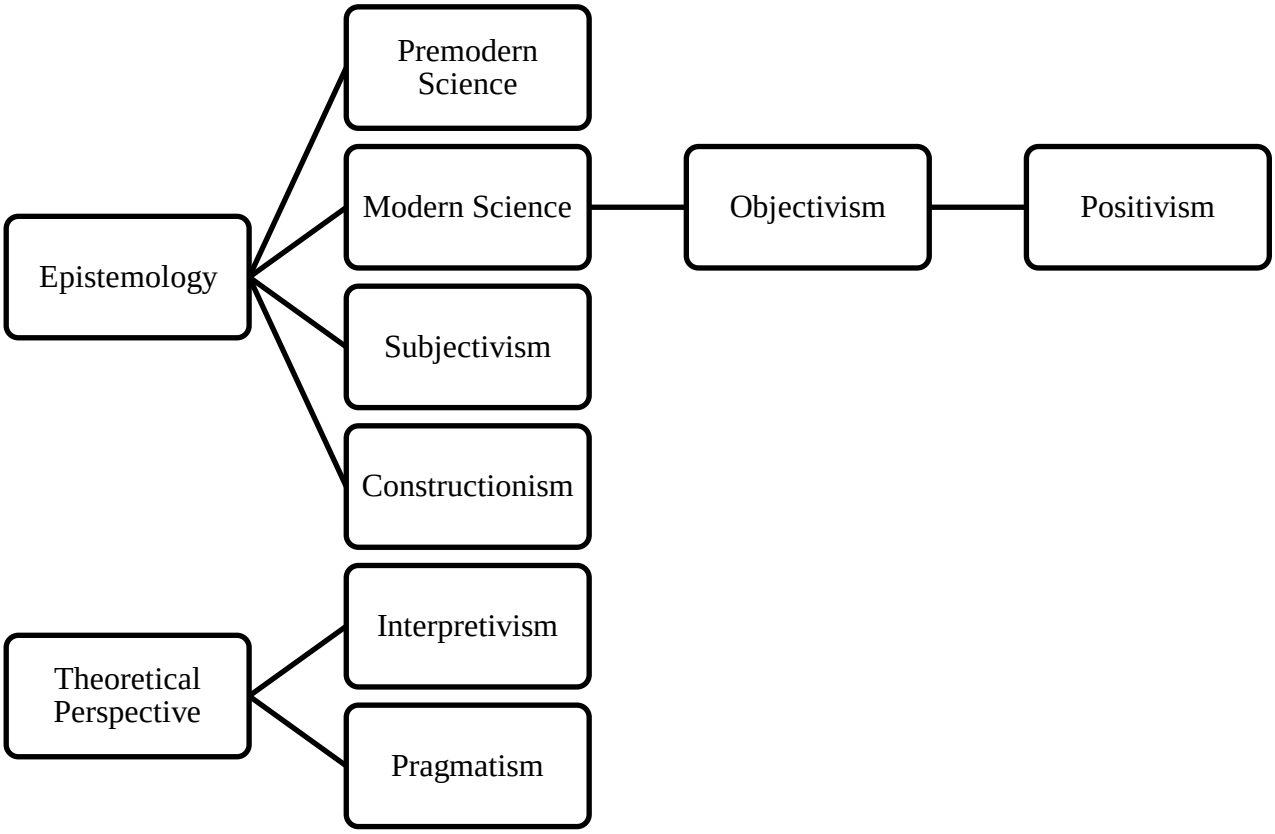

Figure 19: Philosophical Framework including Premodern and Modern Science

7.2.4 MODERN SCIENCE

Seidman (2008, p.164) employs work of Lyotard to indicate that the modern epistemological paradigm dismisses the premodern stories as knowledge; instead knowledge creation is through science that can yield objective truths. Crotty (1998, p.5) relates the modern epistemological paradigm to objectivism, as the viewpoint accepts objects as being entities that act "independently of consciousness and experience". The objectivism epistemological paradigm relates to the positivist theoretical perspective. The framework in Figure 20 includes the common thread of modern science, objectivism and positivism.

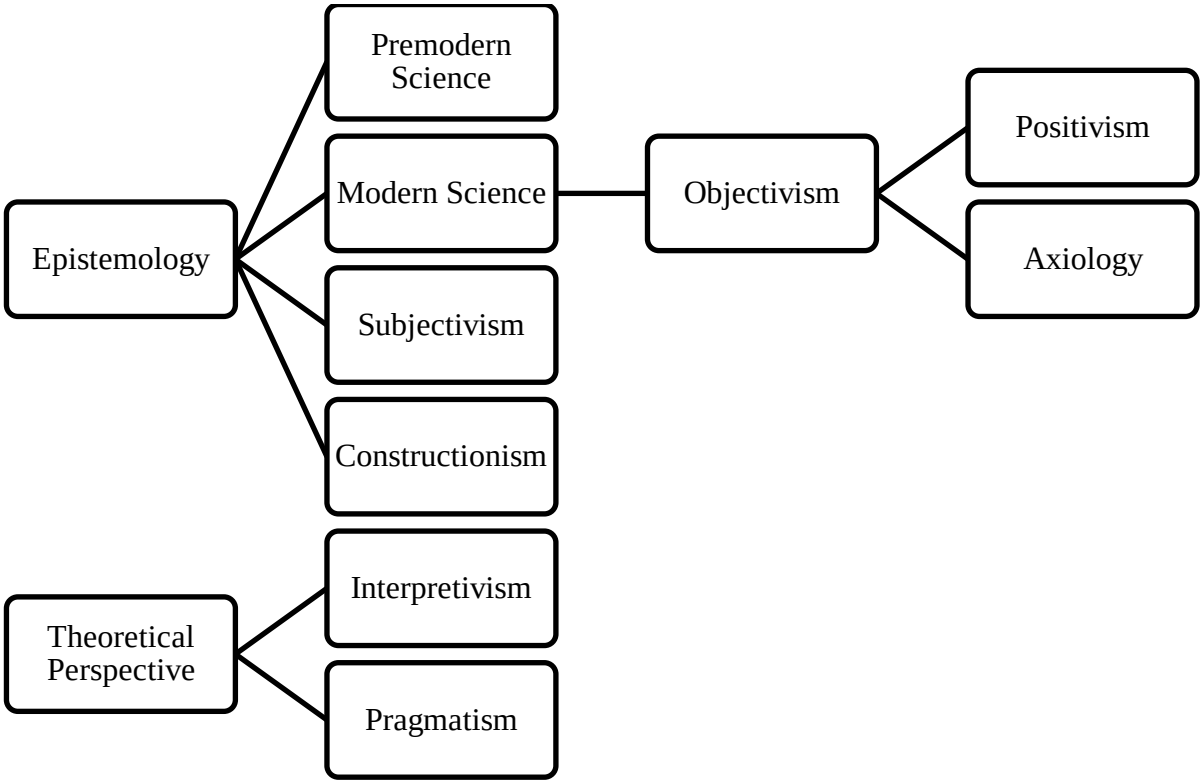

Figure 20: Philosophical Framework including Axiology

Hughes (1980, p.20) refers to a thesis produced by Giddens that relates the positivist paradigm to four claims. The first claim is the belief with in the positivist paradigm that in order for it to be a science, measurement relating to that sensed by the body needs to be undertaken. There are instances where a premodern epistemological paradigm improves clarity in comparison to positivism. For example, a positivist view that the creation of knowledge requires the study of attributes confirmed by the five senses would imply that no knowledge existed before the empirical world. This indicates prior to the creation of matter that there was nothing to sense and as such no science or knowledge. Such a statement would perhaps appear to be a misconception and naive to someone with premodern epistemological beliefs, which would typically believe all knowledge, derives from god. In addition, a paradox could exist, in that positivist science as described by Giddens, could not consider the initial catalyst of everything that it seeks to explore; or justify itself in relation to axiology. Saunders, et al.'s research onion or Crotty's schema do not refer to axiology. Axiology is part of philosophy that considers value in the fields of aesthetics and ethics (Bryman, 2008, p.116). The framework in Figure 20 includes axiology.

Giddens second positivist claim is that philosophy is parasitic to science. In contrast in Crotty's (1998, pp.2-9) schema philosophy informs research methods and methodology. The pragmatist paradigm sympathizes with the viewpoint of Giddens; in that it enables the research question to determine the epistemology, ontology and axiology, even to the extent a combination of characteristics from positivism and interpretivism may be utilized (Saunders et al., 2009, p.109). Crotty (1998, p.61) relates pragmatism with constructionism and the work of Charles Sanders Peirce, William James, John Dewey and George Herbert Mead. Crotty (1998, p.62) identifies the work of Mead that explores symbolic interactionism as "pragmatism in sociological attire"; for this reason, there is a thread between the two paradigms in the framework in Figure 21. Further consideration is given to symbolic interactionism later in the work (see Figure 22).

Hughes (1980, p.20) further considers the third positivist claim by Giddens, that the natural sciences and the empirical sciences share similar methodological foundation through a discussion of the work of Durkheim that explores the issue of social phenomenon and the positivist paradigm. Durkheim creates knowledge by exploring suicide (Hughes, 1980, p.20) using quantitative tools with analysis that associates to objectivity, for example, statistics and correlation. This suggests that the use of the tools from the natural sciences, such as quantification, is of use in the social sciences. Quantitative methods are also suitable for the investigation of cognitive phenomenon with questionnaires and attitudinal scales such as the likert. The use of such a system can provide objectivity to the data from the person undertaking the study. The data analysis uses quantitative data analysis methods. The fact the data originates from mental phenomenon and not by empirical means results in an inability to comply with the fundamental requirement of positivism, that suitable data collection is only available from measures associated to the five senses. However, in relation to the positivist paradigm the empirical exploration of peoples lived experiences is suitable for measurement, for example, through data obtained from outward behavioural patterns (Hughes, 1980, p.20). There are physical artefacts available to the DBenv research. Thus, quantitative statistical tools are suitable for exploration of peoples lived experiences. For this reason, in Figure 21 the framework does not relate epistemology to quantitative and qualitative research methods.

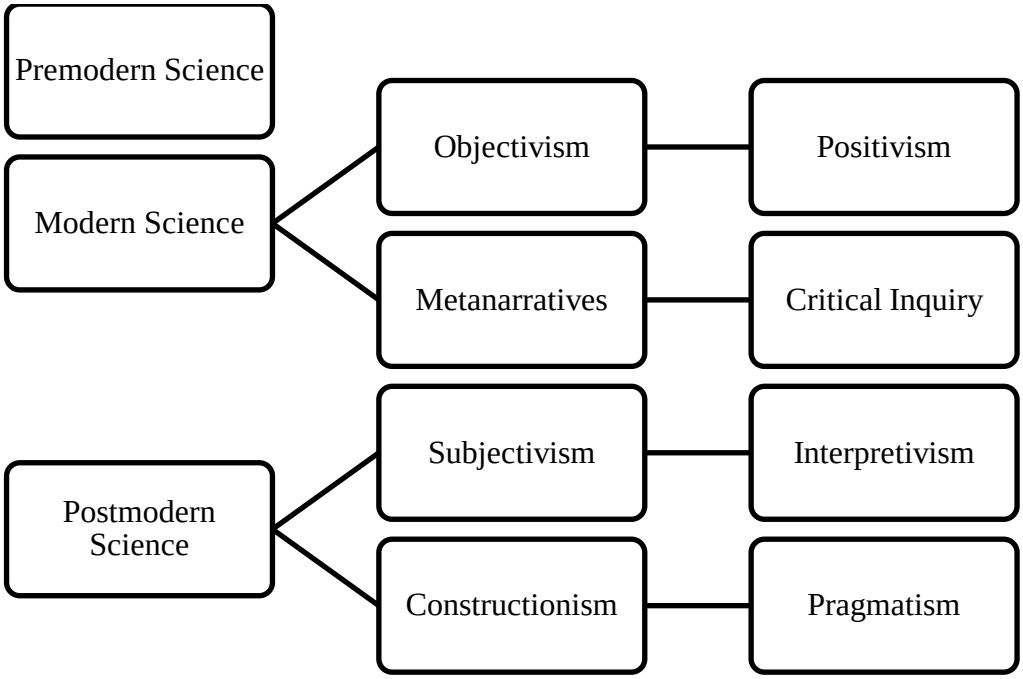

Figure 21: Philosophical Common Threads

The fourth positivist claim by Giddens that there is a distinction between fact and value is supported by Benton & Craib (2001, p.13); when exploring the logical positivists Carnap & Ayer that concern themselves with differentiating science as genuine knowledge and that of religion, metaphysics, psychoanalysis and Marxism. Hughes (1980, p.20) identifies further dissatisfaction when exploring Hume's thoughts on metaphysics; indicating where knowledge creation is not through abstract reasoning concerning quantity, or of matter of fact and existence, it should be erased. To take account of the different viewpoints the framework in Figure 21 differentiates the objectivism thread (including positivism) from other viewpoints.

Seidman (2008, pp. 164-5) when exploring work of Lyotard (1924-98) indicates modern science must in the end appeal to metanarratives for legitimation such as that provided by Marx. Suggesting achieving legitimacy the positivist paradigm must rely on the very thing that it attempts to avoid. Benton & Craib (2001) explore critical inquiry in two chapters namely, '7 Critical Rationality' and '8 Critical Realism and the Social Sciences'. In chapter 7, critical theory relates to the non-communist Helgelian Marxism and the philosophers Adorno, Horkheimer, Marcuse and Habermas. Crotty (1998, pp.112-57) also considers critical inquiry through the work of Marx and Habermas. Marxism relates to the work of Karl Marx (1818-1883) which was similar to the work of Jürgen Habermas, which explores and links to epistemology social evolution.

7.2.5 POST MODERN SCIENCE

When exploring work of Lyotard (1924-98), Seidman (2008, pp.164-5) finds a postmodern science, which moves away from metanarratives that associate to modern science, towards "local, contextualized and pragmatic conceptual strategies". The modern science paradigm suggests that there is an objective truth, at the same time relying on metanarratives for justification that offer no such objectivity. For example, an empirical experiment creating knowledge through dissection of living people, with great human suffering, is clearly science as the claims of the Giddens' positivist paradigm. However, the metanarratives of modern political and social practice in the United Kingdom would perhaps be less than accepting of such information, as knowledge in the name of science.

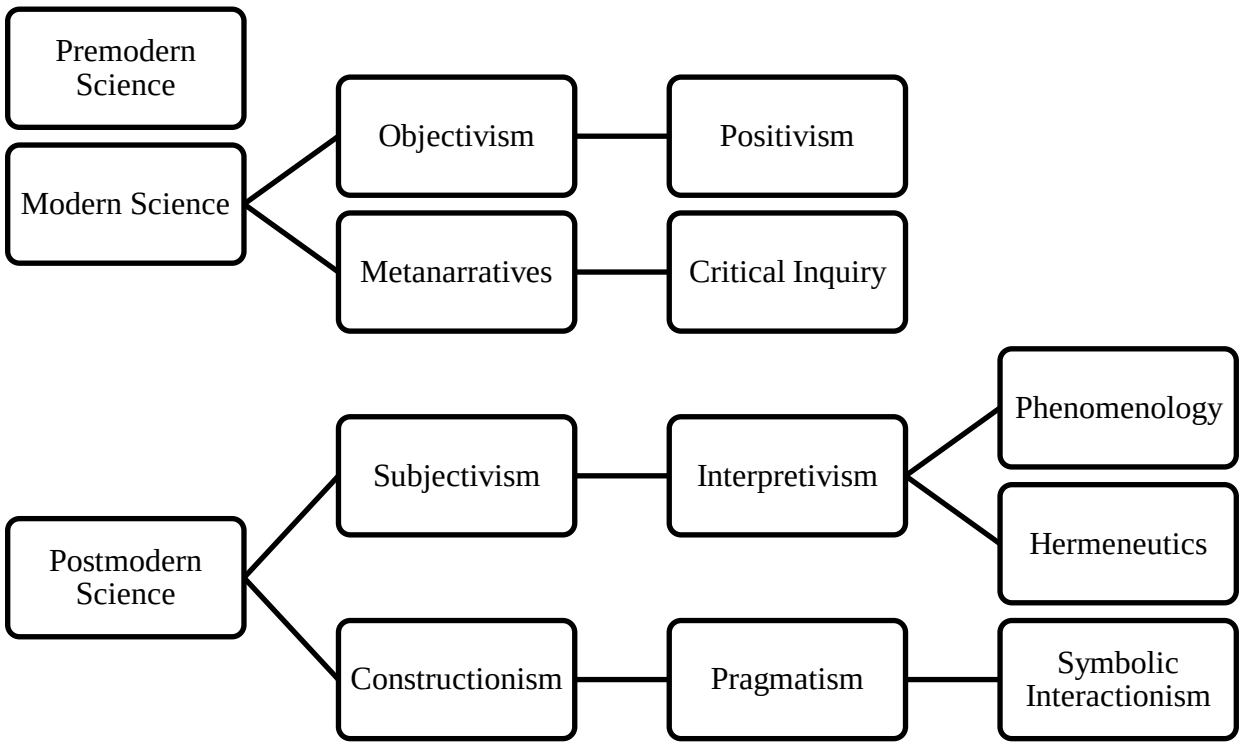

Figure 22: Philosophical Framework with Variants of Interpretivism

The metanarratives of Nazi Germany or Colonial Briton would be very different from those of contemporary Europe. As such, the science claiming to be objective must have clear axiological foundations relating to metanarratives. In Figure 22, axiology now reads metanarratives; there is a thread of postmodern science that includes constructionism and subjectivism. Interpretivism is in the subjectivist's thread. Pragmatism is now in the

constructionism thread. Constructionism and pragmatism are in the postmodern science viewpoints, in that such paradigms cannot state objectivity, in that it accepts the creation of knowledge through non-empirical means. To simplify the model the headings of epistemology and theoretical perspective are not in Figure 22.

Where science requires an objective view of the empirical world, knowledge is something different from many of the things important to the shaping of many peoples lived experiences including psychology, religion, law, politics and ethics. The Interpretivist paradigm is described by Williams & May (1997, p.199) as "approaches to social sciences that prioritize the meanings and actions of agents". Both Bryman (2008, p.15) and Crotty's forma (1998, p.5) identify the variants of interpretivism as symbolic interactionism, phenomenology, and hermeneutic, which are in Figure 22. Symbolic interactionism is present in the pragmatism thread in accordance with earlier discourse of this chapter. Robson (2002, pp.197-8) identifies a suitable view symbolic interactionism from its development of qualitative methodology in relation to seven principles (established after Sarantakos). Robson's first principle concerns the development of social life through attachment of basic meaning by interacting people; and the meanings they assign to the world. Therefore, moves away from the objectivist paradigm with an overall objective truth towards constructionism.

Although Crotty (1998, p.60) recognises other contributions and early work, derives social constructionism from Mannheim (1893-1947) and Berger and Luckmann in 'Social Constructionism of Reality' in 1967. Crotty (1998, pp.60-61) recognises the significance of the movement in work by Hegel, Marx, Brentano, Husserl, Heidegger, Sartre, Ponty, Peirce, James, Dewey and Mead (1863-1931). The forerunner to these contributors is Vico (1668-1744) in the form of the "The New Science" which reads as a chaotic combination of arguments. The work is in places premodern with discussions surrounding God. Marx recognises the work which creates a new philosophy of knowledge "grounded by language, rhetoric and law" where the human mind constructs into new forms over time (Lock & Strong, 2010, pp.12-13). Linking to Robson's second principle, symbols (including language) express social life. The third principle is that social research's aim is to study the "structure, functions and meaning of symbolic systems".

The fourth principle of symbolic interactionism is that methods suitable for social research include inspection and explorative studies. Robson's heading makes a link between symbolic interactionism and qualitative research, suggesting a common thread. Quantitative unlike

Qualitative research involves the manipulation of numeric data in contrast to expression of data in words (Wallman 2006). Crotty (1998, p. 15) identifies descriptions in most research textbooks identify qualitative and quantitative research as two opposites with a divide between. In contemporary times, discourse exists in construction management research, which includes work by Seymour & Rooke (1995), Seymour et al. (1997), Runeson (1997) and Harriss (1998). Recent work includes that by Dainty (2008). Data is from papers in volume 24 of the Construction Management and Economics (CME) journal. The quantitative data analysis allocates the papers to broad classifications namely: quantitative, methods routed in a positivist approach; qualitative, methods routed in an interpretive approach; mixed methods, combining inductive and deductive research methods; and a review not using empirical methods. Earlier researchers have undertaken similar undertakings. Carter & Fortune (2004) review publications from ARCOM 2000/1 and Heriot-Watt University Postgraduate Research 2001-2003. Loosemore et al., (1996) review CME 1983-1993. Dainty allocates data on the assumption that there is a link made between qualitative or quantitative research and particular epistemological paradigms, for example, quantitative research associates positivism.

Research with an objectivism viewpoint associates with quantitative methods. In contrast, constructionist or subjectivist paradigm associates to qualitative methods. This assumption cannot be correct, in that work describing that the senses experience can be in the form of data that associates to both qualitative and quantitative research. For example, where tools associate with qualitative research describe empirical qualities of an object. Similarly, quantitative tools are suitable for non-empirical data. Non-empirical data does not fit into the claims of the positivist epistemological paradigm established by Giddens. A such the framework contained in Figure 22 does not link an epistemological paradigm with quantitative or qualitative research.

The Robson's fifth principle is that data and analysis depend on the context of the study and must be verified and corrected. Seidman (2008, p.164) explores work of Jean-Francais Lyotard (1924-98) including 'The Post Modern Condition' to identify metanarratives that place modern science into context. Lyotard (1924-98) further considers a movement away from metanarratives in postmodern science. Lyotard's postmodern paradigm "abandons absolute standards, universal categories and grand theories in favour of local, contextualized, and pragmatic conceptual strategies" (Seidman, 2008, p.165). This indicates an acceptance

within the postmodern movement that knowledge changes over time in a localised context with a specific and particular occurrence. This postmodern view fits explorations of practitioner led research, where knowledge relates to a particular issue in the context of the world they work. For example, a study into procurement in construction in Wales during the 1990s will be relevant at that given point in time, in relation to the localized occurrence. The knowledge will be available to make improvements in the localised context and may be transferrable to other occurrences; however, there would be limited availability to offer scientific generalization across procurement worldwide.

Phenomenology fits into the postmodern paradigm described by Williams & May (1997, p.201) associating to the work of Brentano, Husserl and Schutz; and as a method that involves systematic investigation into objects of the consciousness. Denscombe (2003, p.97) identifies phenomenology as a strategy that "focuses on how life is experienced". A clear link occurs between phenomenology with the subjectivist paradigm as understanding meaning as that "imposed on the object by the subject" (Gray, 2004, p.17). Schutz's work analyses the relationship between the individuals' efforts at making sense of the world against its prestructurization (Lock & Strong, 2010, p.36). Thus, phenomenological work not only has interest in subjective knowledge of the individual but also meanings through social interaction, which identifies with Robson's sixth principle as a curiosity of symbolic interactionism. Robson's seventh principle is that "meanings are employed, managed and changed through interaction". In contrast to meanings through interaction is hermeneutics, which Williams & May (1997) describe as the investigation and interpretation of intentional human action and in associated with the work of Dilthey. Hughes (1980, p.66) identifies that Dilthey (1853-1911) rejects the use of positivist methodology in the social sciences, with knowledge relating to people generating through the recreation of the experiences of others.

7.2.6 PART SUMMARY

To offer rigour the research sets out a philosophical position including epistemology and axiology. Authors such as Crotty (1998) place less importance on the identification of ontological positioning, understanding an aligned with epistemology. In relation to epistemology, researching practitioners have two options either to create new bespoke philosophical knowledge or to rely on the work of other specialists in the field available from the current explicit knowledge base. The work of other specialists in the field has had the benefit of hundreds of years of discourse built from paradigm and incremental shifts in

positions. Where philosophical foundations are not clear from such specialists in the field the research must be able to identify how the bespoke philosophical stance fits into the boundaries of the explicit knowledge base. Such an approach ensures rigour of the research in relation to its philosophical discourse. For example if a researching practitioner were to undertake an opinions survey, how would the bespoke philosophical stance deal with the lack of empirical basis for the study?

Reference to other peoples work in philosophy allows researching practitioners to concentrate on the task in hand, without becoming entrenched in discourse in areas of philosophy, away from the true area of study. Relating the research to an analogy, undertaking bespoke undertakings outside the home area of specialism is like a qualified architect spending many years studying structural engineering in order to design the loading of a wall. A simpler approach may be for the Architect to obtain the advice of an already practicing structural engineer, allowing the architect to focus on his or her own specialist area of practice. On this basis, it would appear appropriate for the researching practitioner to refer and build from the work of philosophical specialists.

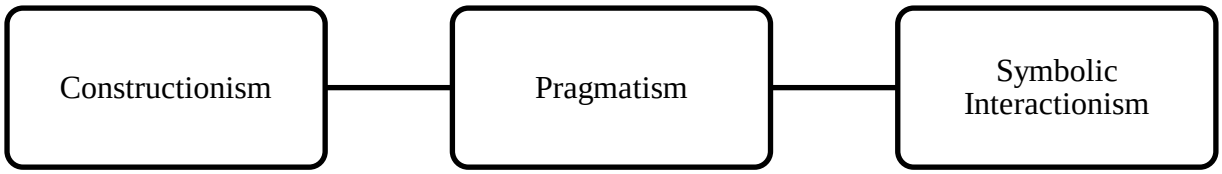

Figure 23: DBenv's Philosophical Approach

This chapter establishes the philosophical stance of research. An incorrect philosophical position may result in a misconception towards the benefit of the research deliverable. This chapter relates the research approach to specialists in the field of philosophy. The work includes a philosophical framework for practitioner led research (see Figure 22, p.158). The philosophical approach of the DBenv study is in Figure 23. The framework firstly relates epistemology to premodern, modern and postmodern paradigms that have threads in relation to the epistemological paradigms. Alignment exists between ontology and epistemology and as such, ontology is not separate in the framework. There is not an epistemological condition precedent, in relation to qualitative and quantitative research.

7.3 RESEARCH METHODS AND METHODOLOGY

7.3.1 PART INTRODUCTION

Philosophical foundations have a reflection on research methods and methodology. The philosophical stance for this work is postmodernism; constructionism and pragmatism (see Figure 23). The pragmatic approach offers flexibility compared to other paradigms by allowing the objectives of the research to determine the strategy along with methods. Research data from empirical and non-empirical sources are appropriate. This is in contrast, for example with the positivism paradigm, which is less flexible. This Part establishes a rigorous research design for the DBenv thesis from accepted practice.

7.3.2 METHODOLOGICAL FRAMEWORK

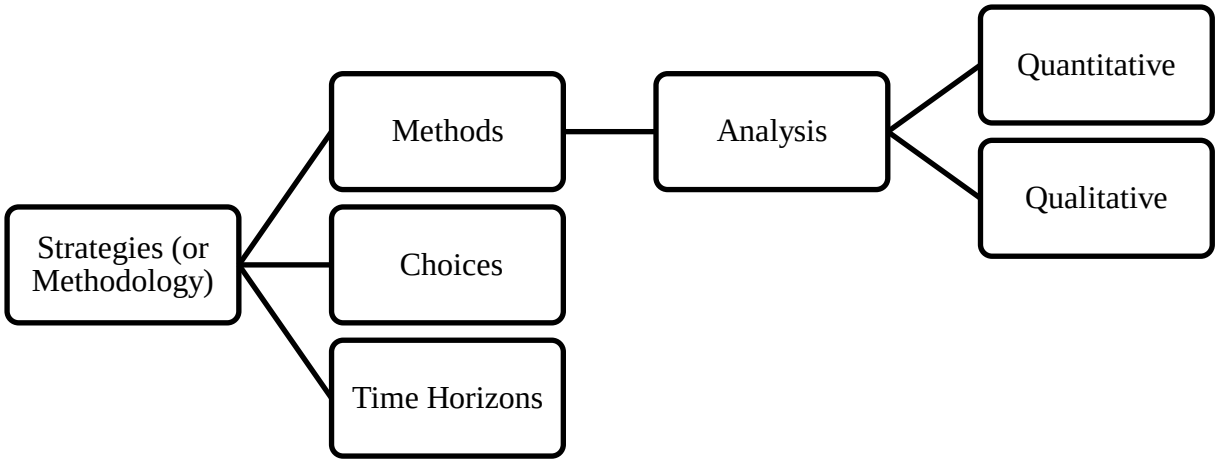

Figure 24: Framework for the Study

Crotty's (1998, p.5) forma considers a framework of research methodologies and methods. In further detail, Denscombe (2003) identifies strategies, methods and analysis; with the basis of analysis being quantitative or qualitative data. In even more detail, Saunders, Lewis & Thornhill's (2009, p.108) research onion contains six elements namely, approaches, strategies, choices, time horizons, techniques and procedures. Figure 24 outlines a path to design the research.

7.3.3 METHODS

Table 36: Research Methods Accepted Practice

Crotty (1998)	Saunders, et al., (2009)	Denscombe (2003)	Strategies Available for the Research
Action Research	Action Research	Action Research	Action Research
	Archival Research		
	Case Study	Case Studies	Case Studies
Discourse analysis			
Ethnography	Ethnography	Ethnography	Ethnography
Experimental research	Experiment	Experiments	Experiments
Feminist standpoint research			
Grounded theory	Grounded Theory	Grounded Theory	Grounded Theory
Heuristic inquiry			
		Internet Research	
Phenomenological research		Phenomenology	Phenomenology
Survey research	Survey	Surveys	Surveys

Table 36 brings together literature in the field to identify accepted practice in research methods. Crotty's methodologies from his forma are alongside strategies from Saunders, et al.'s (2009) research onion and work by Denscombe (2003). The items are in alphabetical order instead of preference. Crotty includes 'etc.' at the end of the list contained within the forma, indicating it is not exhaustive. Common tends are in the final column of the table and are available strategies for the research.

7.3.4 DBENV RESEARCH

The objectives of the research require three phases (see Figure 25, p.165). The first phase is a literature review. The second phase develops the Framework using a particular case study. Denscombe (2003, pp.30-31) identifies the case study approach includes: a spotlight on one instance; an in-depth study; a focus on relationships and processes; a natural setting; and multiple sources and multiple methods. The aim of a spotlight focus on one instance is to identify insights with wider implications that a strategy that explores a large population would not make evident (Denscombe, 2003, p.30). Bryman (2008, pp.52-53) identifies nineteen of what is described as the best-known examples of single case studies. They divide into categories, namely, single community, single school, single family, single organisation, single

person and a single event. Thus, for the purposes of this research the single case study approach is as an established method to generate knowledge.

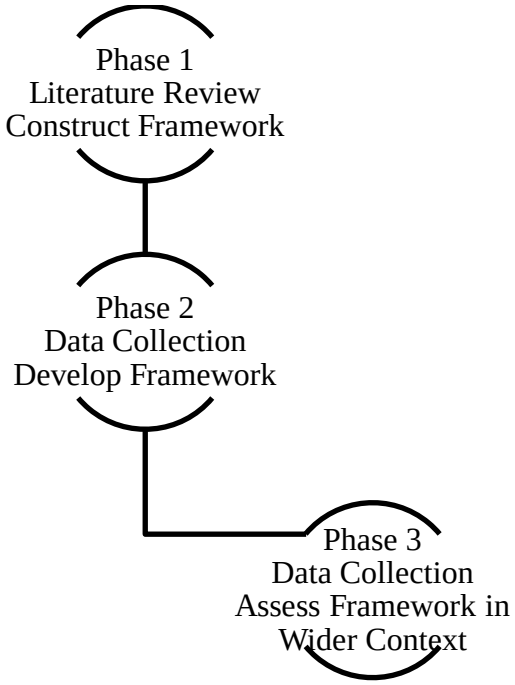

Figure 25: DBenv Research Framework

7.3.5 PRIMARY CASE STUDY

Denscombe (2003, pp.33-34) identifies that case study selection as a typical or extreme instance, relevance (or lack of relevance) to theory and/or on a pragmatic basis. The primary case study is a client organisation. The client has a city centre estate with satellite buildings throughout the world, with a focus on the United Kingdom. The client is of particular interest due to the board spectrum of buildings it maintains with an equally broad spectrum of uses; which receives stimulation by varied curriculum. To gain an understanding of the organisation there are differently levels of focus (see Chapter 8).

Denscombe (2003, p.37) identifies comparators to explore include physical location, historical location, social location and institutional location. The physical location of the primary case study is a city in the North West of England. There are specific cultural, religious and fiscal influences that would not necessarily apply to other similar case studies, undertaken with different characteristics. Denscombe (2003, pp.34-35) further identifies a pragmatic basis including "a matter of convenience" and intrinsically interesting. There is also a pragmatic reason for the selection of the Primary Case Study that include access/availability of data, low

cost in accessing the data and close proximity to data collection. The researching practitioner's employment provides a unique opportunity to study the phenomenon. Denscombe (2003, p.35) also identifies unique opportunities as a basis for the selection of case studies.

Table 37: Research Methods Exploring Collaboration

Research Method	Number
Case Study	15
Conceptual	7
Literature Review	1
Simulation	0
Survey	8
Other	2
Choice Experiment	1
Mixed Methods	17 (13 of which use case studies)

Source: Bemelmans et al. (2012, p.348)

Bemelmans, et al., (2012, p.348) analyses articles in terms of research methods, identifying seven different types namely, "case study, conceptual, literature review, simulation, survey, other, and mixed". In Table 37, case study and mixed methods are the predominant research approach in the field. In the mixed methods, case studies appear in 13 number articles, therefore case study and mixed methods are popular in the field of research. This supports the selection of case studies and mixed methods for the purpose of the DBenv research.

7.3.6 TRANSFERABILITY & EXTERNAL VALIDITY

There is a requirement for phase three of the research to improve transferability (see Figure 25: DBenv Research Framework). The implementation and motivation themes establish transferability in Literature. There is a requirement in phase three to establish the transferability of the collaborative features and risk theme. Yin (1994, pp.35-36) identifies external validity as a concern relating to case study research. In simple terms, external validity relates to the transferability of the research findings. The philosophical foundations of the DBenv thesis are from a well-established stance (see Figure 23) that attempt to move

away from over generalising concepts to offering solutions that are more pragmatic. It is for this reason the research does not attempt to make claims of external validity outside the English higher education sector.

Berg (2007, p.291) when exploring the work of Stake (1994, 1995), establishes that case study selection is on three different classifications, namely, intrinsic, instrumental and collective. The work of Creswell (1998) and Stake (1994, 2000) explore intrinsic case studies, which is where the researcher requires a better understanding of a particular case. Creswell (2002) and Stake (1994), identify instrumental case studies as where the case becomes of secondary importance, against the actual research interests. The Primary Case Study undertaken as part of this DBenv is instrumental, in that it relates practice to the theoretical explicit knowledge base. The work examines the primary case study in depth to provide an insight into an issue from practice and literature.

An element of transferability emerges from Section B Literature, however, there is a requirement to test the transferability of the risk maturity model to the HE sector. Table 36 identifies surveys, which are available to improve generalisation. Bryman (2008, p.255), however, has a number of concerns with surveys including: problem of meaning; problem of omission; problem of memory; social desirability effect; question threat; interviewer characteristics; and a gap between actual and stated behaviour. The primary concern with using surveys as part of this research is that the views of the individuals may not represent the organisational stance. Therefore, there is a requirement to undertake a wide analysis of organisational documents.

7.3.7 Data and Internal Validity

The DBenv's research design (see Figure 24, p.163) requires the establishment of data collection methods. Phase two of the research requires data from a case study source. Phase three requires methods suitable to document analysis of a wide population. Bryman (2008, pp.137-585) considers sources in three parts, namely, quantitative, qualitative and mixed methods. The philosophy section of this chapter recognises that there is not a strict alignment between the philosophy and qualitative/quantitative tools. There are philosophical tendencies, with objectivism being associated to quantitative tools. Yin (2009, pp.101-13) identifies six sources that do not necessarily align themselves with the qualitative or quantitative research,

namely, Documentation, Archival Records, Interviews, Direct Observations, Participant Observations and Physical Artefacts.

Yin (2009, p.100) recommends for case study research, evidence from two or more different sources to support the main topic areas. The use of more than one source of data allows triangulation or reconciliation, of the findings of different data collection methods. Figure (p.163) includes 'choices' relating to the selection of qualitative, quantitative or mixed methods. Bryman (2008, pp.603-26) explores the mixed methods approach, which, combines qualitative and quantitative research, to achieve the benefits of both. For example, Berg (2007, p.8) identifies a weakness of quantitative data when referring to the work of Mills (1959), in that there is a concern that although it may be arithmetically correct it may not fit reality. Qualitative research does not suffer from this weakness, and can relate the data to a real world phenomenon. To receive the benefit of transferability with data that relates to real world phenomenon, the DBenv research uses both summative and thematic content analysis.

Table 38: Data Analysis and Collection

Sources (Yin, 2009, pp.101-13)	Data analysis method	Sample/Source
Archival Records, Documents	Thematic data analysis (Bryman, 2008, pp.529-31) Content Analysis (Bryman, 2008, pp.280-81)	Contract, Client Procedural Documentation, Policies, Public Information
Open-ended Interviews	Thematic data analysis (Bryman, 2008, pp.529-31) Content Analysis (Bryman, 2008, pp.280-81)	Project Perspective, Organisational Perspective
Observations (direct/participant)	Thematic data analysis (Bryman, 2008, pp.529-31)	Audit checking

In the Primary Case Study, data is collected from interviews to guide the researcher around the artefact. The concern with interviews is that there can be difference between what people say and what actually happens. The triangulation of the data deals with construct validity in that the "multiple sources of evidence essentially provide measures of the same phenomenon" (Yin, 2009, p.116). The DBenv study uses documents to validate what is said in the interviews. Bryman (2008, pp.514-35) identifies documents as sources of data including personal documents, official documents, mass-media outputs, virtual documents. Archival research uses administrative records and documents produced as a product of activities outside the research environment as the primary source of data (Saunders et al., 2009, p.150).

Private sources include that of companies. Examples of private sources identified by Bryman (2008, p.522) include "annual reports, mission statements, press releases, advertisements and public relations material". Documents and Archival Documents are in Table 38, which identifies accepted data analysis methods for the DBenv research.

Yin's sources of data include three types of interviews, namely, focus, open-ended and structured. Logistics prevent the research from undertaking a focus group of relevant parties. Structured interviews, surveys and summative content analysis fit with quantitative data analysis. Quantitative data analysis focuses on the analysis of numeric values. The values may naturally occur in the data or be created through codification from other descriptive methods of communication, for example, text or pictures (Denscombe, 2003, p.239). The key focus is on statistical analysis and tests. Codification is also used to analyse qualitative data, such is the case with thematic analysis. However, Miles & Huberman (1994, p. 9) identify the difference in codification is with qualitative research's interest in 'patterns and processes, commonalities and differences' (Denscombe, 2003, p.272). Commonalities refer to literal replication; and differences theoretical replication.

Table 39: Strategy for Validity

Strategy (Robson, 2002, p.174)	Methods for Validity
Prolonged involvement	Participant observation over a period incorporated into the study to improve reactivity and understanding of the research topic.
Triangulation	Data triangulated using a number of data sources.
Peer debriefing/support	Research presented at conferences including COBRA, ARCOM and Joint DBenv workshop. Event arranged as part of the study to discuss research field.
Member checking	Transcripts sent to interviewees for review.
Negative case analysis	Section E Transferability
Audit trail	Audit trail in data collection and interpretation.

The findings are new to the research community and include archival records, documents, and open-ended interviews. Robson (2002, pp. 163-199) relates case studies to a flexible design that has threats to its validity in relation to description, bias and interpretation. The audit trail to the data collection, including the recording of interviews, avoids the description issue. Robson (2002, p.174) recognises that bias can be managed in relation to the researcher and the respondents through the research design; in respect of prolonged involvement, triangulation, peer debriefing/support, member checking, negative case analysis and audit

trail. This research not only recognises, but also accepts bias in the data sources which adds to richness. In Primary Data, different sources come together in reconciliation, comparison and contrast. The methods to manage the validity of this research are in Table 39.

Bryman (2008, pp.529-33) explores the interpretation of documents including semiotics, hermeneutics and qualitative content analysis. Semiotics brings out the hidden meaning that recedes in texts (Bryman, 2008, p.531). Hermeneutics is concerned with bringing out the meaning of the text as the intentions of the author (Bryman, 2008, p.532). The most prevalent approach Bryman (2008, p.529) identifies involves the identification of themes. Bryman (2008, p.530) explores an established research approach where cartoons are identify with themes. The first set of themes relate to artefacts such as the government, refugee, immigration system and the public. The second set of themes relate to a meaning applied to the artefact, for example, too slow and too tough. Densombe (2003) identifies the internet also as a source of data including websites, chat rooms, mailing lists, bulletin boards and newsgroups. The DBenv study undertakes theme identification on sources and relates the themes to case studies. In addition to theme identification, the work includes summative content analysis of documents improve the transferability of the findings.

When exploring the analysis of qualitative data, Saunders, et al., (2009, p.502) identifies inductive data analysis, in the form of data display and analysis, template analysis, analytic induction, grounded theory, discourse analysis and narrative analysis. Bryman (2008, pp.538-62) explores qualitative data analysis in relation to general strategies, basic operations in qualitative data analysis, thematic analysis, narrative analysis and secondary analysis of qualitative data. The two general strategies are analytic deduction and grounded theory. Analytic deduction shown in Bryman's (2008, p.540) Figure 22.1, is a spiral process, where a number of cases are explored to arrive a hypothetical explanation attempting to offer generalisation. Which, as identified by Bryman (2008, p.540) removes focus from the individual occurrences of peoples experiences.

The spiral process in the grounded theory approach, visualised by Bryman's (2008, p.545) Figure 22.2 uses saturate categories. Denscombe (2003, p.112) acknowledges that Glaser and Strauss' grounded theory has its roots in pragmatism, which fits into the context of this research. This philosophical positioning provides the method with sympathy to different understandings of knowledge creation. Denscombe (2003, p.128), however, also identifies a "positivist strand of thought" in grounded theory, that knowledge created is not open to be

refuted by the later discovery of facts. This is supported by Bryman (2008, p.549) when referring to work by Charmaz (2000), that identifies that most work, including that by Glaser, Strauss, and Corbin, places grounded theory in the objectivist philosophical paradigm. Thus, grounded theory has weaknesses, in relation to the interpretivist philosophical paradigm.

Bryman (2008, pp.550-54) explores under the heading of "basic operations in qualitative data analysis" to explore coding which is also a feature of grounded theory and thematic analysis. Thematic analysis is different from analytic deduction and grounded theory in that it presents its data as a series of cases and variables. It is not so much refining the data to a conclusion instead looks at identifying themes in the data. The research data is in accordance with the recommendations of Ryan and Bernard (2003) and Bryman (2008, p.555) to identify similarities and differences. Accepting that differences exist is an approach open to pragmatist and the interpretivist philosophical paradigm. To an extent the DBenv research approach accepts that different practitioners undertake their activities differently.

7.3.8 Ecological Validity

The second phase of the research undertaken as part of this DBenv is inductive in nature and aligns with the deliverable of qualitative as opposed to quantitative research. It is interested in making sense of theory in practice, which results in structured interviews and surveys not being in Table 38. In any case Yin (2009, p.8) identifies that strategies that use surveys are not appropriate to explore "why", which is an important objective of the second phase of the research project. The focus on a qualitative methods is an established form of research, as evident by the work of Bryman (2008, pp.366-98) that explores a multitude of research projects with such a characteristic. As a result, the second phase of the research is predominantly qualitative in nature, in relation to its data collection and analysis methods.

This chapter previously explores the theoretical perspectives of phenomenology and symbolic interactionism. This research hopes to gain an understanding of practitioners' experiences. In contrast to the positivist philosophical paradigm, phenomenology accepts different versions of reality imposed on the object by the subject. Denscombe (2003, p.103) identifies data from interviews to phenomenology. The research deliverable to an extent is flexible to facilitate different viewpoints, which receives support from work in phenomenology. However, the research has a symbolic interactionism perspective, with interviews guiding the researching practitioner around the artefact.

Bryman (2008, p.401) considers ethnography alongside participant observation as the "involvement of the researcher in the social life of those he or she studies". Denscombe (2003, p.87) when referring to the work of Hammersley 1990, identifies that it produces theoretical, analytical and thick descriptions of societies, small communities, organisations and social worlds. Participant observation forms part of this research, in that it explores an area of practice worked on by the researcher. It provides certain benefits in a greater extent than interviews, for example, it promotes a more thorough investigation having less time constraints. The researcher has complete participant involvement in the primary case study, which is a characteristic of action learning. An ethnographic like role has the purpose of providing the research with a detailed understanding of events and relates theory to real life. In order to prevent bias in the research the ethnographic role reconciles with other data collection techniques. There is an element of participant observation included in Table 38 (p.168), which includes audit checking.

7.3.9 Time Horizons

Bryman (2008, p.62) and Saunders, et al., (2009) identify the time horizons as being cross sectional and longitudinal. In addition to this Berg (2007, p.293) further identifies pre or post case studies. Berg (2007, p.293) relates the longitudinal and pre-post case studies in relation to one research entity. The research undertaken as part of this study will explore multiple entities. Berg (2007, p.293) relates multiple entities to snapshot case studies, described as cross sectional time horizons by other authors. In order not to over complicate the comparison of the themes, this research focuses on a cross sectional time horizon, which is an established way to undertake research; of which Bryman (2008, p.62) provides nine examples in his standard textbook on research methods. Similarly, Bemelmans (2012) identifies that out of fifty articles only seven used a longitudinal approach. The primary case study is contemporary and not historical, to allow it to be a reflection of current practice and to simplify the data collection process for participants. This allows the study to reflect on the findings of earlier studies using current thinking and practice.

7.3.10 Ethical Approval

The research process is subject to the University of Salford's ethical process and has had two applications accepted by the Ethics Panel. The research protects the information that participants provide in a number of ways. All information is anonymously given and is in a

non-relatable format to the participant interviewees and/or organisations. Signed consent forms identify any specific requirements that individuals and/or organisations require. For example, there is a request that data is not appended to the thesis. Disposal of raw data occurs within an agreed time with the interviewees. Finally participants are given a complaints handling procedure complete with escalation ladder should they feel unhappy with any way the research is undertaken.

7.3.11 PRACTITIONER RESEARCH

The research philosophy thread is in the philosophy section of this chapter and has foundations in postmodernism, constructionism and pragmatism. The data collection and findings of this this study considers the viewpoint by Lyotard that Seidman (2008, p. 165) explores. The particular viewpoint is that of the postmodernist abandons the concept of absolute "standards, universal categories and grand theories in relation to local, contextualised and pragmatic conceptual strategies". This means that there is no attempt in the research to undertake large-scale data collection that the positivist paradigm may consider more suited to scientific generalisation. Instead, the third stage of the research tests transferability to similar phenomenon. The work seeks to understand if the framework deliverable of the research would be appropriate for other organisations. There is no attempt to suggest organisations undertake the same collaborative features.

Professionals change the way they perform their duties for a number of reasons. Examples may include fitting a product to a specific client's requirements or incorporating new technology into a process. Where processes develop over numerous years and become as described by (Schön, 1983, p.61) 'repetitive and routine', there is a possibility that the practitioner will fail to learn from their experience and reflect on what they have achieved. There is also the potential as Bennet and Bennet (2008, p.381) identify that as "people grow and live they develop and become comfortable with their way of working and will usually resist any external influence to change". Failure of a professional to change is a risk that may result, for example, in a client not receiving their expected deliverable or a practice not being profitable. Reflective practice reviews inputs, processes and outputs to reduce the risk of methodological stagnation during the performance of duties by the disciplines.

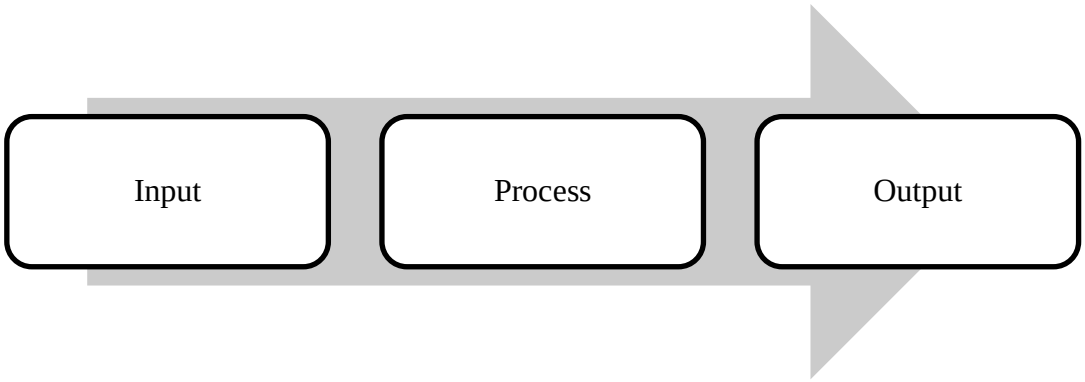

Figure 26: Professional Practice Process Map

Action learning is a form of reflection that is not about reviewing areas of unknown practice (Pedler, 1997, p.5), but instead relates itself to known professional practice. Professional practice delivers services using processes with an input as raw data and output, which is the product of the service in the process map in Figure 26. Where the output and input of the process are fixed, what is described by Schön (1983, p.39) as technical rationality is available, which involves the selection of a process from explicit knowledge. However, often in professional practice, the input and output of a process are not fixed. In this instance the professional will use experience and training or tacit knowledge to understand the input and to develop processes to achieve a suitable output. The tacit knowledge constructed from professionals prior experiences that include interaction with other professionals, similar phenomenon and explicit knowledge. The way that professionals deliver services is subjective and is often dependent on the professional/s involved. An example of this is in the construction industry, in the selection of contracts. There is a multitude of different contracts available for the same types of project. Professionals often have a preference, for a particular form of contract based on their tacit knowledge base. Examples may include 'Joint Contract Tribunal', 'New Engineering Contract' and 'partnering forms of contract'.

Action research relates itself to the postmodern movement. It involves promoting change through a spiral process for practical real world problems (Denscombe, 2003, pp.73-74). It is also relevant to this research in that it involves a practitioner learning and researching in the context of practice. Sheehan & Kearns (1995) when exploring work by Kolb identifies the cycle in Figure 27. The four stages of learning identified in Kolb's model are concrete experience, reflective observation, abstract conceptualisation and active experimentation. Concrete Experience is that gained by the professional providing the service or undertaking

the process, using explicit and tacit knowledge to determine inputs, processes and outputs. This research uses participant observation during the concrete experience stage. Reflective observation involves taking a step back from the professional services (Sheehan, 1995) and looking at achievements during the concrete experience stage. Framing and recording of the professional service inputs, process and outputs. This research records participant observations and interviews during the reflective observation stage.

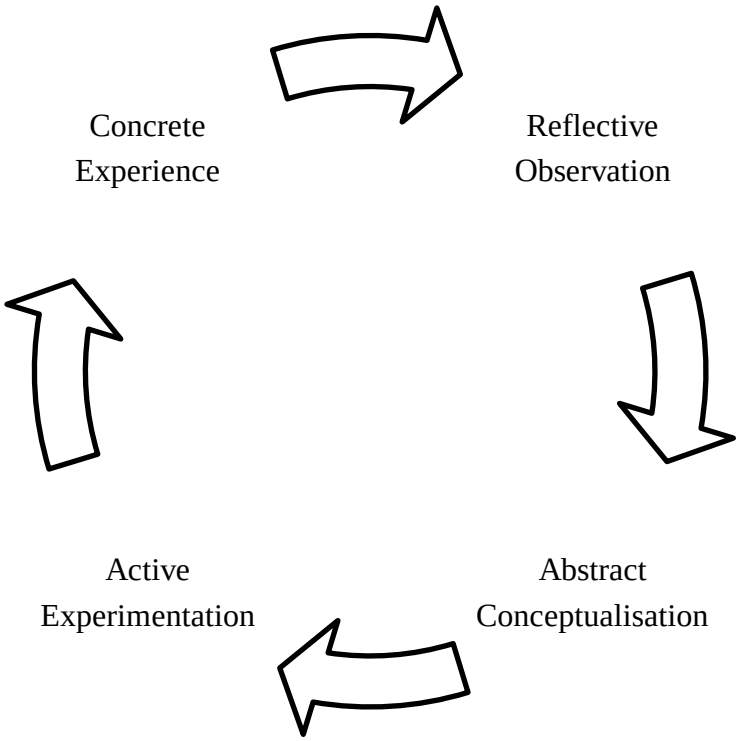

Figure 27: Kolb's Learning Model

Source: Sheehan & Kearns (1995)

Abstract conceptualisation identifies relationships and develops theories from the information at the reflective observation stage. Active Experimentation involves taking the theories derived under abstract conceptualisation and identifying new methods or procedures that may improve the service delivered. It may for example include a method or procedures to overcome the trends or obstacles identified as an example in the abstract conceptualisation phase. Active experimentation is a research project, planned for after the completion of the professional doctorate. The reason for not undertaken detailed experiments as part of the research is that as Yin (2009, p.8) identifies, strategies that use experiments also requires

control of events. The motivational theme would be particularly suitable for post completion experimentation.

Action learning sets are a reflective practice method that this DBenv research adopts during early stages. A facilitator supports and enables the action learning set, which develops skills through reflective practice; involving reflection by practitioners on their working practice during regular meetings of a group of likeminded people. The group's purpose is to find ways to overcome the issues and problems encountered by action learning set members. The set discuss the scope or type of issues and problems, firstly in an inception meeting and then through further regular meetings. The action learning set works with the researcher to identify possible solutions and agree with the set member possible actions. Minutes record the actions to review in later meetings.

7.3.12 PART SUMMARY

The research is generally inductive and qualitative by nature expanding the current knowledge base and applying it to practice. There is no attempt by the research to offer scientific generalisations, which associate to the positivist philosophical viewpoint. Although the second phase of the research offers transferability to similar phenomena. Table 38 (p.168) shows an overall method for data analysis and collection. Data collection is from a variety of sources. The purpose of undertaking data collection of a number of sources is to offer improved validity to the findings of the research. Deviations will also provide the research with a discussion surrounding the field of study. Data analysis is undertaken using thematic and summative analysis, which is successful in previous studies.

7.4 CHAPTER SUMMARY

This Chapter sets out and justifies a rigorous research approach to DBenv study, which associates to insider research. The work in philosophy, methods and methodology provide for an element of insider research alongside offering transferability of the findings.

SECTION D PRIMARY DATA

CHAPTER 8 PRIMARY DATA SECTION INTRODUCTION

8.1 CHAPTER INTRODUCTION

Section B Literature provides a framework from literature that includes three maturity models under the heading of implementation, motivation and risk. The purpose of the framework is to assist practitioners analyse collaborative features. The aim of Section D Primary Data is to test and develop the Framework Deliverable of the DBenv research by relating it to an organisational case study. This Chapter establishes how Section D Primary Data will achieve its aim. The Chapter: establishes a format for the Section; selects a suitable case study; and relates Section C Research Design to the case study to select suitable data sources. The ethical approval process is set out in Section C Research Design and not in this Chapter.

8.2 SECTION FORMAT

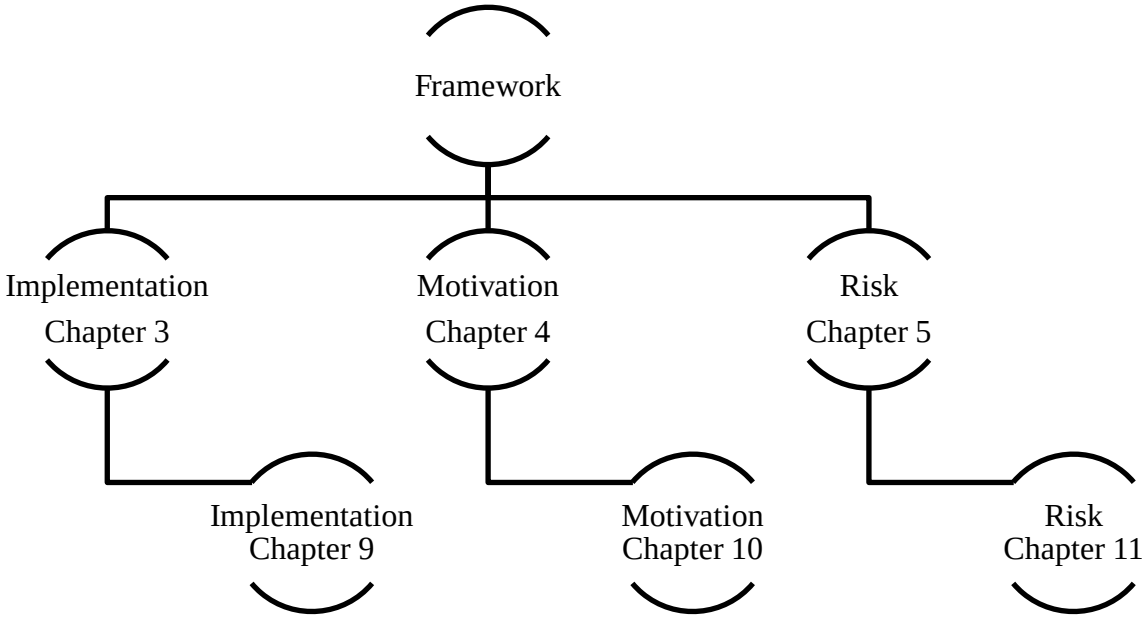

Figure 28: Format of Data Section

Section D Primary Data of the DBenv thesis is split into three Chapters. The chapters align with chapters from Section B Literature (see Figure 28). There is a chapter in both Section B Literature and Section D Primary Data relating to the themes implementation, motivation and risk. The themes or maturity models come together to provide an overall framework that is the deliverable and aim of the DBenv study. This Section relates a case study's use of

collaborative features to the three maturity models. The purpose of doing this is to test and develop the models. Table 40 sets out the format of the headings for this section of the thesis.

Table 40: Primary Data Section Heading Format

Heading Level	Example	Purpose
I	3 CH….	This heading identifies Chapters within the DBenv thesis. Chapters differentiate data between the three themes of the DBenv study. This section of the thesis aligns with the themes in the Section B Literature.
II	3.1 CH…	The sub-heading identifies parts within the Chapters differentiating such things as Chapter introductions, sub themes and summaries. The sub-themes relate to levels in the maturity models.
III	3.2.2 P…	The sub-sub-heading divide is used for part introductions, sub-sub-themes and summaries. Sub-sub-themes relate to collaborative features.

8.3 PRIMARY CASE STUDY SELECTION AND FOCUS

The work requires a case study to test the framework including three maturity models from Section B Literature. The pragmatic basis for selecting the organisational case study is that the researcher has the ability to undertake insider research offering a deep understanding of the phenomenon. The prolonged involvement of the practitioner with the organisation offers the research findings validity (see Table 39 p.169). In addition, the Primary Case Study fits within the criteria set out in Section A Introduction. The higher education Institution makes a broad contribution to teaching and research. A 2010/11 review (M1/05/01/001, p. 17) identifies that: 25% percent of income originates from funding council grants; 31% tuition fees and educational contracts; 24% research grants and contracts; 18% operating income; and 2% from endowment and investments. Organisational funds originate from sources from both the public and private sector. The organisation develops and maintains a broad spectrum of buildings on one of the largest estates in the higher education sector.

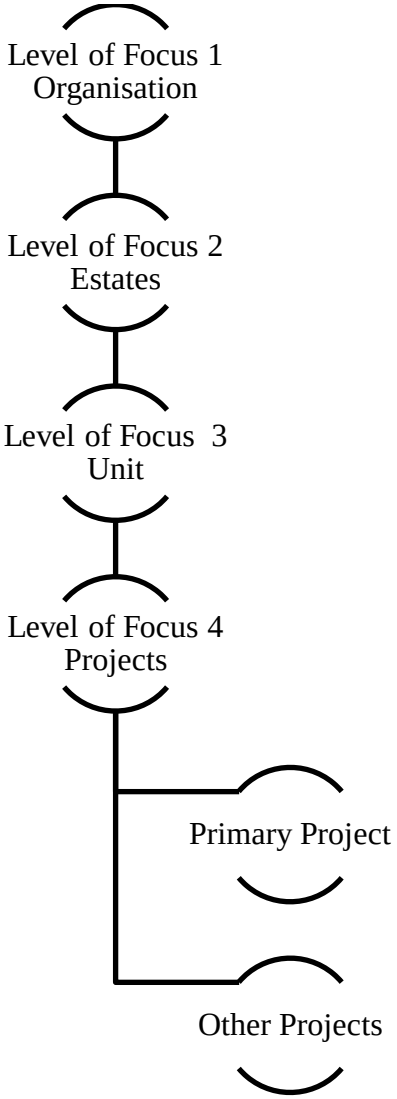

Figure 29: Level of Focus in Primary Case Study

Figure 29Figure sets out levels of focus during data collection of the primary case study. Focusing on particular levels of the organisations ensures data meets the needs of DBenv thesis. The first level of focus is the organisation as a whole. The second (departmental) level of focus is the Directorate of Estates and Facilities. The third level of focus is on the Unit, which undertakes construction and refurbishment work between the values of £25,000 to £2,000,000 (M1/06/02/002, p. 2). The fourth level of focus examines projects. The primary project's deliverable is to reduce energy consumption, in a listed building, while remaining operational. The project has a final account sum that falls between the values of £800,000 and £1,000,000 (M1/04/02/001). In addition, there is further data collection from other projects undertaken by the organisation.

8.4 DATA

In order to test the framework from Section B Literature the work requires data identifying organisational collaborative features. The purpose of the investigation is not to undertake a microscopic inspection of the organisation instead to collect enough data to test and develop the framework. The first stage of the research uses exploitative interviews to explore the organisation and its artefacts. The interviews are semi structured and discuss a framework of collaborative features from Section B Literature. Interviewees are chosen from decision makers as guides based on their unique perspective of the organisation. The participants have an organisational and project level perspective. The organisational participants have senior management positions within their respective institutions. The project level participants directly involve themselves with construction and refurbishment works. Interviewee selection is not on a theoretical replication basis instead has a purpose to guide the research around the organisation.

Table 41: Primary Case Study Interviews

M1/02/	Interview Data
M1/02/OR/	Organization Viewpoint
ADE	Associate Director of Estate
MC1	Director; contractor, national organisation with an international parent company
MC2	Director; contractor; small to medium enterprise
PM1	Director; project manager; national consultancy
M1/02/PR/	Project Viewpoint
CM1	Construction manager; small to medium sized enterprise
EPM1	Estates project manager
SUB1	Director; sub-contractor; small to medium sized enterprise
USR1	User; department representative receiving benefit of works

The interviews guide the participant researcher around organisational artefacts. Artefacts include documents at each level of focus (see Figure 29, p.180). The use of more than one data source offers the work validity through triangulation and literal replication (see Table 39 p.169). Appendix II summarises the data sources that form part of the DBenv study. For confidentiality reasons data is not in the Appendices. The work uses two forms of data analysis, namely thematic and summative. The work uses thematic analysis to guide the participant observer around the artefact, which in this Section's discourse has an audit trail

reference, for example ‘M1/02/PR/EPM1, ref.74’. To align data analysis with that undertaken Section E Transferability, Chapter 11 Risk includes summative analysis.

8.5 CHAPTER SUMMARY

This chapter sets out how the DBenv’s framework will be tested using an organisational case study that receives validity through participant observation. The case study aligns with the type of organisation that the DBenv study’s deliverable seeks to assist (see Section A Introduction). The organisation is also significant in relation to the diversity and size of its output and buildings. To offer relevance the data collection approach includes four levels of focus.

CHAPTER 9 IMPLEMENTATION

9.1 CHAPTER INTRODUCTION

The aim of this chapter is to assess and develop the maturity model for Implementation theme. The work: assesses the presence of collaborative features from Implementation within the primary case study, for the purpose of this and later chapters; develops Implementation maturity model; and assesses collaborative features using the maturity model. The work also introduces collaborative features for the purposes of later themes within the research. There is limited attempt to identify the overall population of collaborative features within the organisation. Within the case study, data emerges at organisational, department, unit and project level. Each level represents a particular focus that associates to the retrofit criteria.

9.2 MATURITY LEVEL I PROJECT LEVEL COLLABORATION

9.2.1 PART INTRODUCTION

The aim of this part of the thesis is to test to see if project level collaboration occurs in the primary case study and if it does, to see if it is possible to review the performance of collaborative features. To achieve the aim the work: carries forward the project level collaborative features from Chapter 3 Implementation (see Table 5, p.42); relates the project case study to the collaborative features; and identifies a number of achievements for collaborative features suitable for testing as part of later research.

9.2.2 INTERPERSONAL CONTRACT

To integrate operation into the design and construction of the project, a representative of the building operators attends regular project team meetings (M1/04/03/003; 004). The ADE supports this stance, by recognising the importance of building User (stakeholder) involvement (M1/02/OR/ADE, ref. 41). The Directorate of Estates and Facilities provides professional support services though a number of Units (M1/05/04/002). The building Users are from a different part of the organisation than the Units. Therefore, there is a requirement for inter-departmental/directorate collaboration. The building that the Primary Project is undertaken, houses collections of historical value. In addition, the Users are keen to protect the building as it forms part of the offering that is made to visitors (M1/02/PR/USR1, ref. 7). The works are undertaken in "public areas of the museum" (M1/04/01/001, p. 11, cl. A13/130A). The project specific preliminaries provide for "logging in and logging out of all

contractors personnel and that of sub-contractors from site" (M1/04/01/001, p. 11, cl. A12/200A).

Working within the University organisation involves interpersonal contact. With the EPM1 identifying that "everything you do there's 10, 20 people that have an opinion here, and it gets done despite senior management because it's overly bureaucratic, overly rigid processes" (M1/02/PR/EPM1, ref.155). Due to personality conflicts, collaboration does not always occur within the employer organisation (M1/02/PR/CM1, ref.183). Collaboration is a way "to get the job done; no, it doesn't make life better; it's the only way that you can get the job done; well yeah...sorry, I suppose if you were adversarial with everyone, it would be really bad, wouldn't it?; it would be awful situation, to come in and face that all the time" (M1/02/PR/EPM1, ref.158). With relationships either "you force somebody to work with you, or you have a relationship which makes them want to work with you, and which is to do with attitude and to do with personalities" (M1/02/PR/EPM1, ref. 65).

During the execution of the works project members met up on a few occasions informally in a social setting to discuss the works (M1/02/PR/CM1, ref.17-19). However, the changing employment status of managers makes it difficult to form relationships (M1/02/PR/CM1, ref.27). Soft skills are important in the modern construction environment (M1/02/PR/CM1, ref.21). EPM1 identifies on the Project that Estates develop an initial difficult relationship with the Users into a productive one through interpersonal contact (M1/02/PR/EPM1, ref.89-98). With the CM1 identifying during construction, it is important to build relationships for the time you are there (M1/02/PR/CM1, ref.43). Information in emails needs supporting with face-to-face contact (M1/02/PR/CM1, ref.89). The director working for an international organisation (MC1) indicates that regular formal and informal meetings starting at an early stage with sub-contractors, consultants, clients and stakeholders are important, for investigation into innovative solutions and the management of the project, along with the expectations of the deliverable (M1/02/OR/MC1, ref. 59-62).

When discussing collaboration ADE identifies that "the softer side is more about generating those relationships at a senior level away from the site team, away from the consulting team" (M1/02/OR/ADE, ref.17). PM1 indicates that for clients to receive the benefits of collaboration, senior management support is required throughout the supply chain, preventing disputes from passing up the ladder (M1/02/OR/PM1, ref. 74-78). Senior management is important to ensure that subordinates undertake their work efficiently (M1/02/PR/CM1,

ref.61); and to work effectively (M1/02/PR/USR, ref. 39). The MC1 extends this to say how senior management support was particularly important in relation to the selection of sub-contractors on a different basis than cost. The method to achieve senior management support relates to resourcing. Senior management support is also inter-organisational.

9.2.3 Design Integration and Project Integration - Procurement Autonomy

The two stage tendering procedure provides the opportunity to integrate the supply chain's knowledge, which undertakes the construction and refurbishment work into design. During Primary Project, the two-stage tendering procedure provides continuity of contractors on different sub-projects (M1/02/PR/EPM1, ref.74). The project is undertaken in a live environment within a listed building (M1/04/01/002, p. 4). Parts of the design could not be undertaken, until elements of the building fabric are opened up. There are four phases of works to the Project, of which the first phase represents 15% of the final account sum (M1/04/03/001). As part of a stage one tender, the contractor provides rates and a sum for undertaking the phase 1 works (M1/04/01/001); the design for the later phases is not complete at this stage. In the stage one tender document, the contractor also prices for items that associate to later phases including preliminaries, day work rates, overheads and profit (M1/04/01/001). There is a requirement to demonstrate value for money and conform to the University's financial regulations (M1/02/PR/EPM1, ref.75; M1/05/01/005). At this point, the design for later phases is not complete, and as such, the contractor is unable to provide rates for the later works.

The stage one tender provides an auditable open-book approach to price later phases. Between tender and entering into the contract, the employer decides to include additional phase 1A works. Therefore, the contract sum includes phase 1A as tender rates/amounts from a successful sub-contractor bid, along with main contractor adjustments from the stage one tender (M1/04/02/001). In summary, the contract let prior to start on site includes phase 1 and 1A works, and a basis to calculate future works in an auditable manner, with phase 2 works at this point comprising of provisional sums. As the works proceed, tender sums from successful sub-contractors bids replace the provisional sums. During the works, the employer decides following an informal value engineering exercise to add a final phase 3 to the works. A similar auditable approach to that of earlier phases forms the basis of the inclusion of the final phase into the final account. During the execution of the Project's work, the two-stage

approach offers the integration of the contractor knowledge into the design, even though a contractors' design approach to procurement is not undertaken.

9.2.4 VALUE MANAGEMENT AND ENGINEERING

The Associate Director of Estates (ADE) of the case study organisation provides data as part of the DBenv research. On the Project, the design team undertakes limited formal life cycle costing. The ADE identifies lifecycle costing being "not something that's been effective in the whole business case of having a project approved" (M1/02/OR/ADE, ref.75). In contrast, a project requirement is to offer energy savings over the life cycle of the estate, therefore the rational for the project includes a consideration of life cycle costs (M1/04/01/002, p. 1). Life cycle costing is undertaken as part of a value engineering and/or management process.

The Primary Project's Construction Manager (CM1) works for the contractor and understands that value engineering is best undertaken as a formal process (M1/02/PR/CM1, ref.116-117). However, similar to life cycle costing, value engineering is undertaken as an informal process for the purposes of the Project. The MC2 indicates that in instances value engineering achieves savings using unfair contractual practice (M1/02/OR/MC2, ref. 99). The Director of an International Contractor (MC1) is a supplier to the case study and provides data for this research. The MC1 further indicates that true value engineering is a collaborative tool, whereas cost cutting gets more towards the adversarial way of working (M1/02/OR/MC1, ref.132). A Project Management Director (PM1), working as a supplier for the case study organisation provides data for this research. The PM1 recognises the importance when using tools such as value engineering and value management, to link users with the supply chain through relevant control mechanisms (M1/02/OR/PM1, ref. 44).

The ADE indicates that projects with a value over £1,000,000 operate a formal change management process. The University undertakes an organisational approach to change control (M1/03/06/001). The Estates' Project Manager (EPM1) provides data for this research. The EPM1 identifies that change control "is just a bit of a safeguard with a client that doesn't, isn't very...isn't an experienced client or is one that is notorious for actually denying everything at the end of the job, like, 'I didn't tell you to do this. Or I didn't approve that you change that.' So with some clients you've got to have a change management system, simply so that they understand and that it's recorded that they have given X, Y or Z

instructions" (M1/02/PR/EPM1, ref.189). Therefore, change management is used to manage risk.

The EPM1 however also identifies risks associated to the use a change management process. In that, change management "is an adversarial way of going about things, and I do try and steer clear of adversarial stuff" (M1/02/PR/EPM1, ref.196). In addition, change management "really slows it down, really, really slows it down, and you get the contractor that needs, you know, within a couple of days, a yes or a no, for some things, and with a formal change management system where you have to get the client to sign it off, that would never happen" (M1/02/PR/EPM1, ref.192). Therefore, EPM1 has always leaned towards informal change management combined with an effort to create an audit trail for decisions (M1/02/PR, EPM1, ref.186-187). For this reason there is no formal change management process undertaken on the Primary Project. Informal change management reduces risk, empowers people and makes the construction process easier (M1/02/PR/CM1, ref.82-95).

"Collaboration and working partnerships is about everyone understanding they're not to take advantage of you, they're not to take advantage of your goodwill because you're bending to accommodate them, then they've got to bend to accommodate you" (M1/02/PR/EPM1, ref. 67). Both MC1 and MC2 identify the importance of informal mechanisms to manage sub-contractors and risk (M1/02/OR/MC1; MC2). Formal risk management is a good route to collaboration (M1/02/PR/CM1, ref.80-81) and "fosters a really good sense of working together" (M1/02/PR/EMP1, ref.179). The approach to risk depends on size of Project with a formal approach being suited to large items that could cripple the project, and a more informal approach to smaller risks (M1/02/PR/USR1, ref.52). Risk management is undertaken on the Primary Project informally, in contrast to a formal register process. The ADE identifies that risk management is "about the context of all those competing risks and making sure the experience and understand of the team brings that together; it's about good judgement rather than the hard output of a risk register". "So it's not a...risk management isn't telling anyone, really, anything new; it just may smooth the waters in that the contractor doesn't think everything's going to be his fault" (M1/02/PR/EMP1, ref.185).

9.2.5 PART SUMMARY

Table 42 uses the discussion in this part to relate the collaborative features from 3.2 Maturity Level I Project Collaboration to the primary case study. In addition, a column identifies what

the collaborative features achieve for the organisation. There is limited reference to a number of the collaborative features as consideration of them is given at later levels of the maturity model.

Table 42: Primary Case Study Project Level Collaborative Features

Literature		Primary Case Study	
Category	Collaborative feature	Collaborative Feature	Achieves
Performance Based Contracting; Performance Management	incentivisation; performance; performance based contract; performance management; performance indicators procurement route; and target contracts.	organisation deals with contracts at organisational level	
Interpersonal Contract	acting: in good faith; in an open and trusting manner; in a cooperative manner; continuity of relationships; integration of other stakeholders; lessons learned meetings; shared office spaces; soft skills; teambuilding processes; and training.	user interface; interpersonal contact/relationships; and senior management support.	inter-departmental collaboration; protect building; protect public; and bureaucracy; and senior management support restricts disputes from passing up ladder.
Legal Framework & Tendering	fair payment; simplification of contracts; legislative compliance; overarching collaborative agreement; charters; facilitation; contractor selection; non-competitive tendering; and sub-contractor relationships.	decisions generally made concerning legal framework and tendering at organisational level. However, there is flexibility in the system with an element of procurement autonomy.	design/construction integration.
Design and Project Integration	design-construction integration; design and build; engagement of the private sector into design, construction and maintenance; integrated project insurance; private finance initiative; prime contracting; project partnering contract; and two stage open book.	decisions generally made concerning procurement framework and tendering at organisational level. However, there is flexibility in the system with an element of procurement autonomy.	design/construction integration.

Literature		Primary Case Study	
Category	Collaborative feature	Collaborative Feature	Achieves
Value Management and Engineering	change control; risk management; value engineering and management; and whole life cycle costing.	informal life cycle costing; informal change and risk management; and life cycle consideration not part of whole business case.	change management is client safe guard; formal risk management fosters feeling of working together and removes blame culture; informal nature avoids cost cutting and formal change management which is adversarial; limited life cycle consideration; and savings facilitate unfair contractual practice.
Initiatives	Considerate Constructors Scheme; CSCS; health and safety co-operation; and health and safety risk reduction.	decisions generally made concerning initiatives at organisational level.	
Information Technology	BIM; electronic meeting systems, web 2.0-based collaboration technologies; and telepresence.	decisions generally made concerning informational technology at organisational level.	

9.3 MATURITY LEVEL II ORGANISATIONAL COLLABORATION

9.3.1 PART INTRODUCTION

The aim of this part is to identify if organisational level collaboration occurs in the primary case study and if it does, to see if it is possible to review the performance of collaborative features. To achieve the aim the work: carries forward the organisational level collaborative features from Chapter 3 Implementation (see Table 6 p. 49; develop the features using information from the previous part (see 9.2 Maturity Level I Project Level Collaboration); relates the project case study to the collaborative features; and identifies a number of collaborative feature achievements suitable for testing as part of later research.

9.3.2 PERFORMANCE BASED CONTRACTING; PERFORMANCE MANAGEMENT - APPROVAL GATEWAYS

The Directorate's project communication procedure provides notification of building and engineering services to key members within the estates team (M1/06/02/001). The university's internal project monitoring is undertaken through meetings and scrutiny is via the Directorate of Estates review process. The Directorate's review process is monthly, where project managers present their projects to senior management (M1/06/02/002, p. 2). For future works, there is a proposal for an internal peer review process (M1/06/02/002, p. 2).

The Unit's Procedures Manual in a finance section sets out an organisational approval process (M1/03/01/001 p 2). The finance section is divided into: financial flow charts; fee statement template and final account; quote recharge request form; spend profile including funding requirement template; and iProc(urement). iProcurement is a self-service requisitioning software application that employees log-in and use to make organisational purchases that are authorised by a central purchasing department (Oracle, n.d.). Purchase requisition is raised in iProcurement where reference is to the form of agreement on purchase order and not the University's terms and conditions (M1/03/01/001 p. 3). The basis for other sections of the Unit's Procedures Manual is the RIBA (2008) work stages: Feasibility A-B; Design C-F; Tender G-H; and Construction J-L. There is client and stakeholder approval at each of these stages (M1/03/01/002).

The feasibility section (RIBA A-B) includes (M1/03/01/001 p. 1): internal resource allocation; providing an internal filing system; seeking client brief; assess team requirements;

design; and project execution plan. The process to assess team requirements includes (M1/03/01/001, p. 1): produce project programme; prepare fee calculation; create spend profile including funding requirement; seek financial approval via project management system; and identify need for site waste management plan. The design (up to stage B) includes: holding design team meetings; working up concept; budget ratification; checking for existing health and safety files and asbestos management surveys; and stakeholder review meetings.

The deliverable and approval point of the Feasibility section (RIBA Stage A-B) for large/complex projects (or if required by a client) is a stage B report. The Design (RIBA C-F) section (M1/03/01/001 p. 2) includes two significant approval points, namely stage C and to proceed to tender. The deliverables to achieve before the stage C report include (M1/03/01/001 p 2): preparation of outline proposals; determine procurement route/form of contract; cost plans and waste minimisation plans. The deliverables before approval to tender include (M1/03/01/001 p 2): stage C report; asbestos survey; produce production information; application for statutory development controls (planning etc.); preparation of design risk assessments; prepare risk register; update cost plans; project quantity surveyor to recommend form of contract.

The construction (RIBA J-L) section of the procedures manual is subdivided into: mobilisation / construction and completion / practical completion. The mobilisation / construction section of the procedures manual is further divided into: holding pre-contract meetings; issue of waste management information to contractor; contractor to provide draft site waste management plan prior to start on site; construction phase plan; prepare meeting matrix; agenda for site progress meeting; permit to work; certificates; agree compound location with stakeholders; contractors non-performance notice; and variation orders register.

9.3.3 Performance Based Contracting; Performance Management - Incentivisation

The MC2 relates collaboration to pre-construction when discussing a two stage tender for a design and build project with a guaranteed maximum price (M1/02/OR/MC2, ref.79-81). The Primary Project's contract does not include provision for a guaranteed maximum price or target (M1/04/02/001), which may operate alongside incentivisation. The MC2 identifies incentives as an option to encourage contractors to achieve clients' requirements

(M1/02/OR/MC2, ref. 124-125). In contrast, the MC1 indicates supply chain integration is achievable during design, without payment, with incentivisation coming through trust associating to long-term relationships (M1/02/OR/MC1, ref. 17-20). The Primary Project's contract is traditional and lump sum with no inclusion for financial incentivisation such as shared savings (M1/04/02/001).

At project level the University "would not be offering financial incentives" (M1/02/OR/ADE, ref. 12), with it being "more about repeat work" (M1/02/OR/ADE, ref. 12; /PR/CM1, ref. 73); achieving the employers performance requirements and making the employer happy (M1/02/PR/CM1, ref. 67-71; 02/PR/EPM1, ref.208). With the EPM1 indicating that "it is customer care, and it comes down to it; if you were serving in a shop or, you know, if you were in a call centre or if you were, you know, looking after them as tenants; it's all about customer care; and I mean all jobs, every single job, stuff goes wrong, doesn't it?; and to come out the other end, with those things going wrong, and having a client that smiles is great" (M1/02/PR/EPM1, ref.214). With the USR1 stating that "I think if the senior management of the contractor were to be aggressive and not collaborate with you, then there would be some serious, serious issues with the project and you would not use that contractor again; it would be such a bad experience; once they were off-site, they would be gone" (M1/02/PR/USR1, ref. 41).

9.3.4 Performance Based Contracting; Performance Management - Performance Measurement

PM1 identifies performance management as important to undertake on every project (M1/02/OR/PM1, ref. 52-54). Project review meetings are an opportunity to receive feedback (M1/02/PR/CM1, ref.43) and make improvements (M1/02/OR/MC1, ref.76-82). EPM1 identifies that post project reviews "always throw up interesting things to do with perception of the project" (M1/02/PR/EPM1, ref. 115). Client organisations appear to lean toward offering feedback in one direction and move away from a reciprocal organisational improvement process (M1/02/OR/MC1, ref.77-78). On the Primary Project there is no review meeting (M1/02/PR/EPM1, ref.110-111; /CM1, ref.43). With EPM1 indicating, they are "a bit too much work to do for me and I sort of avoid them simply because it takes days to do these" (M1/02/PR/EPM1, ref. 115). Performance review meetings are undertaken on other projects (M1/02/PR/EPM1, ref.110-111). I have attended a couple of these on different

projects for the organisation. The reviews are undertaken in a qualitative, interpretive fashion using reflective practice to form lessons learned.

The ADE indicates, "we don't have key outputs in terms of KPIs (Key Performance Indicators) hard data metrics" (M1/02/OR/ADE, ref. 69). A formal key Performance indicator process is not used on the project. MC2 indicates that quantitative performance management was often unfair, as it does not take into account all factors (M1/02/OR/MC2, ref. 49). With CM1 identifying that key performance indicators are not really a form of motivation, the contract itself is a form of motivation (M1/02/PR/CM1, ref.100-101). In contrast, ADE identifies that "the way that this organisation approaches the formal contract situation is we would much rather work in a partnering type environment and leave the contract behind" (M1/02/OR/ADE, ref. 17). Hard data in instances may not consider the wider implications of performance; with EPM1 indicating, "I think a project is successful if the client is, at the end, is smiling" (M1/02/PR/EPM1, ref.210). However, the framework manager is starting to introduce key performance indicators with the new framework (M1/02/PR/EPM1, ref.204), with the University having a duty under the framework agreement to provide and receive performance data from its suppliers (M1/03/05/005, p. 4).

9.3.5 PRACTICE, PROCEDURES, INFORMATION TECHNOLOGY

The organisational case study operates procedures manuals to implement on projects undertaken by the Unit (M1/03/01/001) and Directorate (M1/06/02/003). The university allocates projects depending on size and complexity. Projects with a value of less than £2,000,000 are allocated to the Unit. Projects with a value over £2,000,000 are allocated to the Capital Projects (M1/06/02/002, p. 2). The DBenv study focuses on the Unit, in it fits the requirements of the retrofit agenda. The Unit's manual is split into sections based on the RIBA (2008) work stages: Feasibility A-B; Design C-F; Tender G-H; and Construction J-L. In addition to the work sections there are also 'feedback', 'risk & health & safety' and 'finance' sections. The manual is online with limited use of Web 2.0 technology. The manual is shared with the organisations supply chain, for example, with consultants through a web-based, password-protected portal.

Table 43: Project Documentation

Description	M1/03/05/006 Generic Prelim Ref.	M1/03/05/020 SBC/XQ Prelim Ref.	M1/03/05/021 Project Prelims
Design Integration			
Contractor Design Portion		Cl. 6.12	9th & 11th Recital
Operation Integration			
Building Health and Safety File	A12/180A, A37/120A		A37/120A
Building manual	A37/110A-160		A37/110A
Rectification period (12 months)		Cl. 2.38	
Deliverable Focus			
Project Specific Preliminaries (M1/03/05/016; 03/05/017; 03/05/018; 03/05/019; 03/05/020)	Throughout		
Drawings	A11/110-180A		
Pre-tender health and safety plan	A11/160		A11/160A, A36/280H
Details of demolitions/removal works during tender			A12/130A
Access to the works			A12/200A
Hazardous material report			A12/240A
Asbestos Survey	A12/240A		A12/240A
Clean Air Certificates	A12/240A		
Biohazard clearance certificate	A12/240A		
Permit to Work	A12/240A		
Preparatory works by others			A13/110A
Works concurrent with the project			A13/130A
Completion of work by others			A13/140
Site Waste Management Plan	A30/155J		
Programme	A30/480		A35/130A
Outline Construction Phase Health and Safety Plan	A30/570A		
Tender information for listed sub-contractors	A30/652A		
Method Statements	A32/140C		
Record photographs	A32/140H		
Cash flow forecast	A32/320A, 410A		
Daywork vouchers	A32/450		
COSHH dated data sheets	A33/710, A37/140		
Construction Phase Health and Safety Plan	A34/110, 140		

Description	M1/03/05/006 Generic Prelim Ref.	M1/03/05/020 SBC/XQ Prelim Ref.	M1/03/05/021 Project Prelims
Permit to work (works information)	A34/220K, A35/135A		
Service Information from Statutory Undertakers	A34/510		
Recorded stoppage time/ Working Hours	A35/170A		A35/170A
Location of contractors site compound			A35/160B
Meeting room for site meetings			A36/210B
Preliminaries breakdown	A40/105, A41/105, A42/105, A43/105, A44/105		

The procedures manual is not shared with other higher education institutions and therefore the system is not inter-organisational. The manual refers to project level documents that are in Table 43. The practice and procedures manual stores and distributes adaptable standard organisational documents for use on projects. Tender and contract documents refer to the organisational guidance (see Table 44). General organisational documents include agenda for design team meetings (M1/03/08/001) and prestart meetings (M1/03/08/002); terms and conditions of purchase, form of contract variations (M1/03/08/007); and a project directory (M1/03/02/003). Organisational documents for use at design stage include a stage report (M1/03/03/002). Organisational documents for use at tender stage include construction works framework contract issue letter (M1/03/05/003); tender return labels (M1/03/05/002); invitation to quote addendum letter (M1/03/05/008); invitation to tender named sub-contractor (M1/03/05/009); letter advising unsuccessful tenders (M1/03/05/010); main contractor invitation to quote tender report (M1/03/05/013); and pro forma schedule of work and form of tender (M1/03/05/015).

Table 44: Organisational Guidance

Description	M1/03/05/006 Generic Preliminaries Ref.	M1/03/05/020 SBC/XQ Prelim Ref.
Organisational		
University's Code of Practice relating to Construction Waste (M1/05/02/001)	A30/155J	
Volume 4 of Procedures Manual Health and Safety (M1/06/01/)	A34/220A	
Permit to Work System (M1/06/01/016)	A34/220K	

Multiple organisations manage health and safety as part of a collaborative process. The USR1 identifies the importance as part of the organisation to "protect our public and protect our staff", while the contractor looks after operations on site (M1/02/PR/USR1, ref. 25). The risk & health & safety section of the procedures manual (M1/03/01/001, p. 2) is divided into: operational risk assessments; health and safety, fire, working and RIDDOR notes; management of fire alarm systems, project emergency contact details; project completion, obtain health & safety file / building manual; fume cupboard clearance form; Health & Safety files to PSU procedure for receiving; Documents added to CDM library; and room clearance form. The Directorate of Estates' Quality Manual Design Team Guide (M1/03/02/001, p. 20) includes reference to internal policy document including: Asbestos Management Plan (M1/06/01/019); and Procedures and informational manual Asbestos Management Operational Procedure (M1/06/01/025).

The Asbestos Management Operational Procedure (M1/06/01/025) document is no longer available from the University external or internal document management system (audit check 3 May 2013). A number of the health and safety documents are well beyond their revision date. The projects tender documents include an asbestos report, but not a hazardous materials report (M1/04/01/001, p. 11, cl. A12/240A). The generic preliminaries (M1/03/05/006, cl. A12/240A) set out that "Where details of an asbestos survey have been issued to the Contractor, the Contractor must not rely on it being entirely accurate". In addition, the "Client will not accept responsibility for losses, injury or breaches of the Health & Safety Regulations and all associated legislation which might result from the Contractors reliance on the asbestos survey report" (M1/03/05/006, cl. A12/240A). Part of health and safety management is to comply with legislation, for example with in the manual there is specific reference to RIDDOR, which is an abbreviation for The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (UK Parliament, 1995a). The CM1 indicates in order to manage risk it is preferable to employ sub-contractors with experience of working on the estate of the employer organisation (M1/02/PR/CM1, ref.166-169).

The University undertakes works in a prescriptive traditional manner with specifications for particular elements of work (M1/02/PR/EPM1, ref.20-21). The specifications manage the university's corporate identity, for example Signage Strategy (M1/03/02/001, p. 20; M1/06/03/001). Other documents manage quality of works, for example: the Specification for the Design and Installation of Structured Cabling, Fibre Optic and Voice Cabling

(M1/03/03/001); Standard Electrical Specification (M1/06/02/006); and Standard Lift Specification (M1/06/02/007). In addition, the practice and procedures manual contains a list of approved technologies (M1/03/08/005). The university provides the specifications to the contractors, limiting the supply chains ability to integrate knowledge into design. The provision of the specifications to the supply chain indicates organisational approach to develop the supply chain over longer term. The university uses an electrical clerk of works that guides sub-contractors (M1/02/PR/EPM1, ref. 41-46), indicating a further commitment to the long-term development of the supply chain. In addition to specifications, the University employs other bespoke documents, for example, the form of professional appointment (M1/03/02/002); form of sub-consultants collateral warranty (M1/03/02/004) and schedule of services (M1/03/02/005). The provision of organisational standard specification documents allows the University's supply chain to become familiar with ways of working.

9.3.6 Practice and Procedures Manual - Communications Protocol

The Primary Project's consultants issue drawings in a two dimensional portable document format. The information is to either level 0 or early level 1 of Bew and Richards 2008 BIM Evolutionary model. The ADE indicates that the University did not have an implementation plan for BIM (M1/02/OR/ADE, ref. 188). There is no formal process to share information between the project and other similar projects within the organisation, for example, for the purposes of costing. However, consultants and employees on the project also work on other projects within the University allowing data to be shared informally. The electronic internal filing system includes electronic and hard copy files as well as email storage. When working with the organisation I noted that the filing system is internal to the organisation, the system does not allow, supply chain members, working for the organisation to access the electronic files. Correspondence with the supply chain is undertaken in many instances using the postal service, for example, tender documents (M1/03/01/001 p 1, 3); and consultant appointment letters (M1/03/01/001 p 1).

9.3.7 Legal Framework & Tendering - Frameworks

The Tender section (G-H) (M1/03/01/001 p 3) provides guidance for four different types of procurement, specifically: non-construction projects; projects under £50k; projects with a value between £50k and 3.9million; and projects over the value of £3.9million. Procurement of construction projects with a value between £50k and 3.9million are through a works

framework. The framework is for use with demolition, new build, refurbishment, decoration and landscaping/external works and any sub element (M1/03/05/005, p. 1); for example mechanical and electrical. Mechanical and electrical has a significant contribution to make to the retrofit agenda.

Within the framework there are three levels (M1/03/05/001): specifically: (lot 2) £50,000 - £199,999; (lot 3) £200,000 - £999,999; and (lot 4) £1m - £4m. There are operational guidelines for the framework (M1/03/05/005). There is a legal requirement for the University to use frameworks (M1/02/PR/EPM1, ref. 11-13). With the failure to "operate the Construction Works Framework in accordance with these operational guidelines will result in a breach of The Public Contracts Regulations 2006" (UK Parliament, 2006) "and a breach of the Framework Agreement" (M1/03/05/005, p. 1). Frameworks develop relationships with repeat business suppliers (M1/02/PR/EPM1, ref. 13). The university brings together suppliers in framework meetings (M1/02/PR/EPM1, ref. 251). "There's a high level framework meeting, where all the directors and contractors are invited too, on a quarterly basis" (M1/02/OR/ADE, ref. 24). There are benefits of inter-peer collaboration including that relating to: standardisation (M1/02/OR/PM1, ref. 147); and health and safety (M1/02/OR/MC1, ref. 145-6).

During phase 1 and 1A of the Project, works are simultaneously undertaken by the main contractor and a client direct contractor (M1/04/01/001, p. 11, cl. A13/130A). The main contractor, being the principle contractor under the CDM Regulations (UK Parliament, 2007) manages the health and safety of the client direct contractor (M1/04/01/001, p. 11, cl. A13/130A; /02/PR/EPM1, ref. 99). For example, the main contractor provides personal protective equipment to the client direct contractor (M1/02/PR/EPM1, ref. 99). The involvement of the client direct contractor in the Primary Project's work area brought with it an element of risk (M1/02/PR/CR1, ref.9). The client direct contractor had no contractual relationship with the Project's contractor creating difficulties in the management of health and safety (M1/02/PR/CM1, ref.71). There is a requirement for a formal contractual relationship to understand "what you are going to get out of" sub-contractors (M1/02/PR/CM1, ref.25).

The framework in operation during the execution of the Project provides for the use particular sub-contractors (M1/02/PR/CM1, ref.31). The Primary Project's mechanical and electrical sub-contractors are from a tender list owned and managed by the University. In the case of where a trade is not on a tender list, for example, joinery works, the contractor and the

consultants create and agree a list. There is provision in the Universities generic preliminaries for listed sub-contractors (M1/03/05/006, cl. A30/645A). In the Project's Preliminaries, there is a list of mechanical, electrical and joinery sub-contractors (M1/04/02/001, p. 9-10). The main contractor selects sub-contractors from the list to complete works (M1/03/05/006, cl. A30/645A).

The ADE indicates that in the past, sub-contractor selection was made from a university managed sub-contractor framework (M1/02/OR/ADE, ref. 62). However, the PM1 indicates that it is difficult to manage the complete supply chain due to the social constraints during tender. The EPM1 indicates that the use of the select list creates an environment capable of incubating collusion (M1/02/PR/EPM1, ref. 25-27). There is a requirement that inter-competitor communication needs careful implementation to remove any concern of collusion (M1/02/OR/MC1, ref.148-150; /MC2, ref. 117). Under the current framework, the contractors "use their own supply chain arrangements" (M1/02/OR/ADE, ref. 62). The MC1 identifies how his organisation formally manages sub-contractors into three categories, namely: one, 'used on a regular basis'; two, 'used but not quite ready for category one'; and three, 'those worked with in the past but do not have a relationship with the organisation' (M1/02/OR/MC1, ref. 85-86).

The framework agreement is the Joint Contracts Tribunal's Framework Agreement 2005 Edition (Non-binding) (M1/03/05/006). "It is not intended that this Framework Agreement should in any way be legally or contractually binding or enforceable or of any other legal or contractual effect or consequence" (JCT, 2005b, p. 3 cl. 6). The agreement (JCT, 2005b, p. 3 cl. 4) provides that "Project Participants in an open, co-operative and collaborative manner and in a spirit of mutual trust and respect with a view to achieving the Framework Objectives". The generic preliminaries state, "the Contractor is to adhere to the principles of collaborative working contained within the Construction Framework Agreement and all other requirements contained therein" (M1/03/05/006, A30/155). Where generic preliminaries incorporate into the contract, this clause sets out a requirement for the contractor and not the client to collaborate.

A new framework agreement is put in place during the construction phase of the Primary Project. The new framework includes rates and percentage additions for application at project level (M1/03/05/005, p. 2). The standard rates include (M1/03/05/005, app. 2): overheads percentage; profit percentage; sub-contractor overheads and profit; rates for preliminaries;

percentage addition for collateral warranties; and percentage additions for retention bonds. In contrast, the University's standard preliminaries do not set a requirement for contract guarantee bonds (M1/03/05/020). The framework rates are from a tender process and are suitable for a two-stage approach, similar to that on the Primary Project

9.3.8 LEGAL FRAMEWORK & TENDERING - CONTRACTOR ADJUDICATION

There are checks of supplier organisations at pre-qualification stage in (M1/03/05/005, p. 4): health and safety; economic, legal and financial standing; quality assurance; references and experiences. In addition, there are annual checks of framework contractors' financial status (M1/03/05/005, p. 4) along with confirmation that there has not been a breach of regulation 23 of the Public Contracts Regulations (UK Parliament, 2006). Regulation 23 (UK Parliament, 2006) relates to such items as fraud, bribery and money laundering. Annual competence checks of suppliers on the framework (M1/03/05/005, p. 4) include: health and safety competence; financial status of suppliers; confirmation that suppliers are signed-up and not in breach to the 'Halving Waste to landfill commitment'. When tendering for works, contractors return a bid that includes information under the headings of (M1/03/05/007, app 1): commercial; resources; programme; health and safety; and waste. The headers do not align to the wider social expectations of the Public Services (Social Value) Act (UK Parliament, 2012).

9.3.9 LEGAL FRAMEWORK & TENDERING - PERFORMANCE MANAGEMENT - PUNISHMENTS

The construction project contract deals with non-performance; in addition, there is a certificate to deal with persistent or serious concerns (M1/03/05/005, p. 4-5). Liquidated damages are a contractual mechanism to levy damages that the employer incurs, onto the contractor. The Project Specific Preliminaries include provision for liquidated damages with the Minor Works Contract (M1/03/05/021, s. 3, cl. 2.6); intermediate building contract (M1/03/05/021, s. 3, cl. 2.25.2); and Standard Building Contract without Quantities (M1/03/05/021, s. 3, cl. 2.25.2).

Punishments implement through the mechanisms in construction contracts. Where the contract sum does not exceed £100,000, contracts are under hand by the Director of Estates (M1/03/05/021, s. 5b). The signing of the contract under hand provides under section 5 of the Limitation Act (UK Parliament, 1980) a time limit for actions to the period of 6 years. Where

sums exceed £100,000, contracts are entered into as a deed (M1/03/05/021, s. 5a) and section 8 of the Limitation Act (UK Parliament, 1980) provides a time limit from cause of actions of twelve years. In addition to the contract with the main contractor, in the Unit's project specific preliminaries there is provision for third parties rights and collateral warranties (M1/03/05/021, s. 3, pt. 2, cl. 7, 3.7 & 3.9). There is no provision to integrate project insurance. Construction contracts offer the university the ability to punish

9.3.10 Design and Operation Integration - Risk Allocation

The PM1 describes traditional procurement as a process where: the designer incorporates their interpretation into the specification; the contractor sends their interpretation to the supply chain; and finally the "supply chain if they don't comply they are non-compliant" (M1/02/OR/PM1, ref. 128). The Unit procedures manual includes generic preliminaries that apply to every project (M1/03/05/006). In addition, there are contract and project specific preliminaries (M1/03/05/021). Contract preliminaries options are for use with the Joint Contracts Tribunals 2011 suite of contracts (M1/03/05/016-20); specifically the: intermediate building contract (JCT, 2011p), intermediate building contract with contractor's design (JCT, 2011q), minor works building contract with contractor's design (JCT, 2011o), minor works building contract (JCT, 2011n) and standard building contract without quantities (JCT, 2011). There are individual and separate sections of preliminaries for use with each contract (M1/03/05/016-20, ref. A20). Therefore, the standard approach undertaken by the Unit is traditional, with provision for contractor design of discrete parts.

9.3.11 Design and Operation Integration - Maintenance services agreements

There is no provision in the Unit's Procedures Manual for the use of 'design, build and operate' and 'private finance initiative' forms of contract (M1/03/05). The Primary Project was let using the Joint Contracts Tribunal's (JCT's) Standard Building Contract without Quantities 2005 revision 2 (JCT, 2009h). The Project contract is traditional in that the consultant team including architects, surveyors and engineers provide the design information to the contractor, in contrast to the contractor undertaking the design (M1/04/01/001, p. 9; /02/008). Design development occurs for phase 1A, 2 and 3 at formal and less formal meetings, which both the contractor and consultants attend (M1/04/03/002; 003; 004).

The primary case study's contract (M1/04/02) is the one set out in the practice and procedures manual which is a standard from with minimal amendments. The contract includes collaborative features (JCT, 2009h, p. 108 sch 8) also present in the 2011 suite of contracts (JCT, 2011, p. 118 sch 8). There is provision to include maintenance services in the Generic Preliminaries (M1/03/05/006, cl. A37/190), which refers to the Project Specific Preliminaries (M1/03/05/21), which complete the blanks in the contract. In contrast, in the Project Specific Preliminaries pro-forma (M1/03/05/21), available from the Unit's Procedures Manual, there is not a box to complete for maintenance services; suggesting not normal procedure. However, amendments are easily made to the Project Specific Preliminaries with them being in Microsoft Excel format (M1/03/05/21).

9.3.12 PART SUMMARY

Table 45 summarises this Part to provide a summary of the organisation's approach to collaboration. The starting point for the summary is Table 6 (see 3.3 Maturity Level II Organisational Collaboration, p.49) from Section B Literature. The organisational collaborative categories from the previous part (see 9.2 Maturity Level I Project Level Collaboration) are merged into the table. To keep the Table simple a number of the categories are merged together, for example the category of framework is merged in with legal framework and tendering; and design integration and operation integration are merged together.

Table 45: Primary Case Study Organisational Collaborative Features

Literature		Primary Case Study	
Category	Collaborative feature	Collaborative Feature	Achieves
Performance Based Contracting; Performance Management	incentivisation; performance; performance based contract; performance management; performance indicators procurement route; and target contracts.	approval gateways; electronic approval system; and incentivisation through long term relationships.	client and stakeholder approval at key stages; cost certainty; customer care; health and safety; internal peer review; waste management; and less aggression.
Initiatives	Considerate Constructors Scheme; CSCS; health and safety co-operation; and health and safety risk reduction.	although provision for initiatives is set out in the procedures manual, initiatives by nature relate to higher levels of the maturity model.	
Practice, Procedures, Information Technology	BIM; organisational level documents; inter-operability of systems; electronic meeting systems, and web 2.0-based collaboration technologies.	organisational guidance; standard project level documentation; standard specifications; standard tender and contract documents	design integration; Health and safety; operation integration; waste management; and out of date documents.
Legal Framework & Tendering	contractor selection; fair payment; simplification of contracts; legislative compliance; overarching collaborative agreement; charters; facilitation; framework agreement; integrated supply chain; non-competitive tendering; and sub-contractor relationships.	autonomy in sub-contractor selection; collateral warranties; frameworks; contractor adjudication at framework and project level; contractual damages; framework rates; legal and contractual framework implements through practice and procedures manual; and two stage procurement.	health and safety; inter-peer collaboration; collusion/bribery mitigation; solvent supply chain; standardisation; statutory compliance; project completion on time; sub-contractor warranties; and waste management.

Literature		Primary Case Study	
Category	Collaborative feature	Collaborative Feature	Achieves
Design and Operation Integration	design-construction integration; design and build; engagement of the private sector into design, construction and maintenance; frameworks; integrated project Insurance; private finance initiative; prime contracting; project partnering contract; management agent contracting; organisational standard procurement; soft landings; and two Stage Open Book.	traditional approach with contractor's design; two-stage approach possible with framework; and provision for maintenance service agreements in contracts.	design integration; and life cycle consideration of maintenance during construction.
Estates Strategy	condition of the estate; space efficiency; carbon reduction; environmental performance; affordability; and institutional sustainability.		

9.4 MATURITY LEVEL III INTER-ORGANISATIONAL COLLABORATION

9.4.1 PART INTRODUCTION

The aim of this part is to identify if inter-organisational level collaboration occurs in the primary case study and if it does, to see if it is possible to review the performance of collaborative features. To achieve the aim the work: carries forward the inter-organisational level collaborative features from Chapter 3 Implementation (see Table 8, p.58); develops the features using information from the previous Part (see 9.3 Maturity Level II Organisational Collaboration); relates the project case study to the collaborative features; and identifies a number of achievements for collaborative features suitable for testing as part of later research.

9.4.2 INTER-ORGANISATIONAL KNOWLEDGE AND INITIATIVES - PROFESSIONAL NETWORKS

Due to the small nature of the Manchester construction industry, many contractors and consultants know each other and informally provide each other with information (M1/02/PR/EPM1, ref.248-9). There is potential benefit to inter-contractor collaboration (M1/02/PR/CM1, ref.120-125). The market nature of the UK Economy results in suppliers that work for the University also working for other Universities; creating an informal pathway for the inter-organisational sharing of knowledge. Inter-organisational occurs where two or more Universities come together for the purposes of developing their supply chain. The ADE has made an offer to help a smaller university. "Their head of estates is, he comes from a softer background and he doesn't really understand capital projects and doesn't understand a lot of issues around high maintenance and that sort of thing; I've said to his boss, the chief operating officer, that I'm happy to provide support from our office to support you in the delivery of capital or whatever, for free, I'm not saying I'm going to charge them for it, just to help them out and they've never taken us up on that" (M1/02/OR/ADE, ref. 171). The case study organisation is a member of the Association of University Directors of Estates (AUDE, 2013a).

9.4.3 INTER-ORGANISATIONAL KNOWLEDGE AND INITIATIVES - INITIATIVES

The ADE indicates that he had been "tasked with looking into understanding what the carbon impact is both from an embedded carbon and operational perspective". Sustainability is a key feature in the universities estates strategy (M1/05/04/001, p.1). The University's high-level target as part of a 2020 strategy commitment is to reduce its carbon footprint (from a 2009

baseline) by 40% (M1/03/08/008). The 2020 strategy is a strategic plan for the university (M1/05/01/004). The University approval process requires that the business case for each project include a section on carbon impact/reduction methods, with energy consumption being a factor in the decision for project approval at key stages (M1/05/04/001, p. 19). The University expects its suppliers to support the approach to complying with legislation in minimising omissions (M1/05/01/003, p.2). However, internally it is a different story; with USR1, identifying the benefit of being environmentally conscious during the works, however, also that the detached nature of procurement makes it difficult to monitor/manage those concerns (M1/02/PR/ USR1, ref. 69-71).

The Directorate of Estates' Quality Manual Design Team Guide (M1/03/02/001, p 23) identifies that the planning authority (local council) expects all new planning applications to include a waste management strategy. Reference is made and links provided to: the councils Waste Storage (07/001); and Collection Guidance for New Developments and Strategy Template (07/002). One link from the organisational document did not work when tested (23 April 2013). An internet search found a link for the document on the council's web site, which also did not work. A further search identifies that the document is currently updating. Further collaboration with the local council is evident in The Directorate of Estates Quality Manual Design Teams Guide (M1/03/02/001), when referring to the Design Household Waste Recycling Act 2003 (UK Parliament, 2003). The manual (M1/03/02/001, p. 24) identifies that the local council confirms that waste from university operations is treated as household waste in accordance with Environmental Protection Act (UK Parliament, 1990).

The University undertakes a strategic approach to waste management (M1/05/04/001, p. 8). In 2009 the Director of Estates for the University signed up to WRAP's 'halving waste to landfill' commitment (M1/03/08/008; /05/02/001; /04/001, p. 8) that concludes at the end of 2012 (WRAP, 2013). University's monthly magazine outlines commitment to WRAP. The magazine "is sent to every member of staff as well as an external audience including MPs, journalists, business people and community representatives" (M1/05/01/002). The WRAP process requires supply chain collaboration (WRAP, 2011, p. 5) that includes: clients setting procurement requirements for good practice and measurement; designers identifying opportunities to reduce waste and use more recovered materials; contractors to implement good practice and measure performance; manufacturers to offer low waste recyclable and higher recycled content opinions; and waste contractors to collect and recover more waste,

recording with robust data. Annual competence checks of suppliers on the framework check the suppliers are signed up to the 'Halving Waste to landfill' (M1/03/05/005, p. 4). Contractors and consultants adopt on projects with a value in excess of £300,000 (M1/05/02/001), the University's Code of Practice relating to construction waste (M1/05/02/003). The appendix of 'Code of Practice Relating to Construction Waste' refers to a number of third party guidance notes (M1/05/02/003).

The University expects suppliers to support the approach to statute compliance by reducing waste and minimise omissions (M1/05/01/003, p.2). The practice procedures manual includes an organisational standard 'waste reporting form' for construction projects over the value of £300k (M1/03/08/009). The form collects data concerning the contractor, project and person completing the form. The form also collects data concerning, the amount in tonnes of construction, demolition or excavation waste: sent to land fill; recovered or recycled; and used on site.

The University use Building Research Establishment Environmental Assessment Method (BREEAM, 2013) to assess the environmental performance of new and refurbishment projects with targets set waste reduction for projects over £300,000 (M1/05/02/003). The Directorate of Estates Quality Manual refers to the legal obligations of 2050 and sets out an aspiration of BREEAM with 'very good' on all projects (M1/03/02/001, p. 5). The UK Parliament (UK Parliament, 2008a) has set 2050 targets for carbon reduction. The Secretary for State for Innovation, Universities and Skills transfers the requirement to make reductions to the Higher Educations Funding Council for England. The Higher Educations Funding Council for England transfers the requirement to record and make carbon reductions to higher education institutions though their funding (Universities UK; GuildHE; HEFCE, 2010).

9.4.4 Inter-organisational Knowledge and Initiatives - Competence checks

The framework operating guidelines use external organisations to audit the health and safety competence of suppliers working on site. Named resources managing on site activities have (M1/03/05/005, p. 9): CSCS card for manager; IOSH (2013) or CITB (2013) 5 day 'managing safely' course; first aid course; and asbestos awareness training within last 3 years. Mechanical contractors register with Gas Safe (HSE, 2013) (M1/03/05/005, p. 9). Electrical contractors register with ECA (2013) or NICEIC (2013)(M1/03/05/005, p. 9). Electrical contractor's Lead Engineer is on site at all times where electrical works are on-going and as is

a JIB (2013) approved electrician (M1/03/05/005, p. 9). Paint resources have a CSCS (2013) Blue Card (M1/03/05/005, p. 9). Resources using a roped access have a Level 2 IRATA (2013) certification and a Level 3 (M1/03/05/005, p. 9). Principal contractor and listed disciplines must have CHAS (2013) accreditation (M1/03/05/005, p. 9).

9.4.5 INTER-ORGANISATIONAL KNOWLEDGE AND INITIATIVES - STANDARDS

The generic preliminaries are in the National Building Specifications format with organisational adaptations. The generic preliminaries (M1/03/05/006) are 69 pages long and include clauses. Pricing is either on a fixed or time related basis. Specification includes: A10 Project Particulars; A11 Tender and Contract Documents; A12 The Site/Existing Buildings; A13 Description of the Works; A20 Form of Contract; A30 Tendering/Subletting; supply; A31 Provision, Content and Use of Documents; A32 Management of the Works; A33 Quality Standards/Control; A34 Security/Safety/Protection; A35 Specific Limitations on Method/Sequence/Timing; A36 Facilities/Temporary Work/Services; A37 Operation/Maintenance of the Finished Building; A40 Contractor's General Cost Items: Management and Staff; A41 Contractor's general cost items: site accommodation; A42 Contractor's General Cost Items: Services and Facilities; A43 Contractor's general cost items: mechanical plant; A44 contractor's general cost items: temporary works; A 50 Work Products by/on Behalf of the Employer; and A53 Work by Statutory Authorities/Undertakers. Throughout the generic preliminaries (M1/03/05/006), there is reference to Project Specific Preliminaries in places where there is a requirement for project specific information. In the preliminaries, there is reference to Legal Publications, Online Platforms, Guidance and Standards (see Table 46).

The Directorate of Estates Quality Manual Design Team Guide also refers to relevant publications (M1/03/02/001, p 6) including: Part L2 Building Regulations (1st April 2002); EU Building Performance Initiative; HEFCE M16/96: Energy Management Study in the Higher Education Sector; CIBSE (2013) Guides; and BS 1387. There is a later version of Part L2 of the Building Regulations available (HM Government, 2010a; HM Government, 2010b) along with amendments (HM Government, 2010c; HM Government, 2013). EN 10255:2004 (BSI, 2004) replaces BS 1387: 1985. In addition, the practice and procedures manual refers to third part guidance notes including: the Health and Safety Executive's Safe work in confined spaces (M1/03/08/004); The Safe work in confined spaces (HSE, 2011) guidance note makes specific reference to statutory mechanisms (UK Parliament, 1997; UK

Parliament, 1999b; UK Parliament, 2002a; UK Parliament, 1992; UK Parliament, 1998; UK Parliament, 1989; UK Parliament, 1992a). The organisational document the 'Specification for the Design and Installation of Structured Cabling, Fibre Optic and Voice Cabling' (M1/03/03/001), includes reference to British Standards (BSI, 2011a; BSI, 2012b; BSI, 2011). Finally, the Waste Minimisation and Management procedure (M1/03/08/008) refers to the National Federation of Demolition Industry's guidelines for the measurement and reporting of construction waste.

Table 46: Inter-Organisational Collaboration

Documentation	M1/03/05/006 Generic Preliminaries Ref.
Legal Publications	
Framework Agreement (Non-binding). (JCT, 2005b)	A30/155
Practice Note 6 (Series 2) 'Main Contract Tendering' (JCT, 2002)	A30/145
Intermediate Building Contract 2005 (JCT, 2005)	A32/265A
Online Platform	
Interim Certificate	A32/410A
Guidance	
Non-Statutory Guidance for Site Waste Management Plans (08/01/001)	A30/155J
European Waste Catalogue (European Commission, 2000)	A30/155J
Definition of Prime Cost of Daywork Carried Out Under A Building Contract (RICS, 2007)	A32/450C
Construction Skills Certification Scheme	A33/120A
Standards	
Standard Method of Measurement of Building Works (RICS, 1998)	A30/210A – 290A
BS EN 336 Structural timber (BSI, 2003a)	A31/260
BS EN 1008:2002 Mixing water for concrete. (BSI, 2002a)	A33/180
BS 5228-1:2009 Code of Practice for Noise and Vibration Control on Construction and Open Sites (BSI, 2009a)	A34/330A
Fire Prevention on Construction Sites (RISC Authority; Fire Protection Society; Contractors Legal Group, 2012)	A34/380
BS EN 60825-1:2007 Safety of Laser Products. Equipment Classification and Requirements (BSI, 2007)	A34/450
BS 5975:2008+A1:2011 Code of practice for temporary works procedures and the permissible stress design of falsework (BSI, 2011b)	A34/630
BS EN 12812 Falsework. Performance Requirements and General Design (BSI, 2008)	A34/630
BS 5837:2012 Trees in Relation to Design, Demolition and Construction. Recommendations (BSI, 2012a)	A36/320A-330A
BS EN 397:2012+A1:2012 Industrial Safety Helmets (BSI, 2012)	A36/570A

Documentation	M1/03/05/006 Generic Preliminaries Ref.
BS EN 471:2003+A1:2007 High-visibility Warning Clothing for Professional use. Test Methods and Requirements (BSI, 2007a)	A36/570A
BS EN 149:2001+A1:2009 Respiratory protective devices. Filtering half masks to protect against particles. Requirements, testing, marking (BSI, 2009)	A36/570A
BS EN 166:2002 Personal Eye Protection. Specifications (BSI, 2002b)	A36/570A
BS EN 352-1:2002 Hearing Protectors. Safety Requirements and Testing. Ear-muffs (BSI, 2002c)	A36/570A
BS EN 352-2:2002 Hearing Protectors. Safety Requirements and Testing. Ear-plugs (BSI, 2002d)	A36/570A
BS EN 388:2003 Protective Gloves against Mechanical Risks (BSI, 2003b)	A36/570A
BS EN 407:2004 Protective Gloves against Thermal risks (Heat and/or Fire) (BSI, 2004a)	A36/570A
BS EN 420:2003+A1:2009 Protective Gloves. General requirements and Test Methods (BSI, 2003)	A36/570A
BS EN 511:1994 Specification for Protective Gloves against Cold (BSI, 1994)	A36/570A

9.4.6 Legal Frameworks and Tendering - Standardised Legal Documents

The institution provides consultants with access to an electronic system where there is guidance for members of the design team (03). The online system also provides access to standard documents including preliminaries and contract amendment schedules (M1/03/05/006, 016-021). The estates general guide on procurement states letters of intent are only for use in exceptional circumstances (M1/03/01/001 p. 3). Let contract documents include a schedule of amendments opposed to a copy of the Joint Contracts Tribunal's publication (M1/03/05/021). Due to timescales in procurement the Joint Contracts Tribunal's 2011 suite is a later edition than the contract in which the Primary Project is let. Schedules of amendments are available from the University's online system for the minor works (JCT, 2011n; JCT, 2011o), intermediate (JCT, 2011p; JCT, 2011q) and standard without quantities (JCT, 2011) forms of contract. With the minor works and intermediate forms there is the option for design portions (JCT, 2011o; JCT, 2011q). Minimal amendments are made to the standard forms of contract. The supply chain does not amend the standard contract terms (M1/03/05/005, p. 3). The use of standard contracts with minimal amendments for construction works, is an inter-organisational approach to working, using a third party, namely the Joint Contracts Tribunal.

There is no reference in either the contract preliminaries (M1/03/05/006; M1/04/02/; M1/04A/02/), schedule of amendments (M1/03/05/020) or project specific preliminaries (M1/03/05/021), to the collaborative features under the Eighth Recital and Schedule 8; therefore, all apply by default. Items that associate to collaboration include: collaborative working; health and safety; cost savings and value improvements; sustainable development and environmental considerations; performance indicators and monitoring; and notification of disputes (JCT, 2011, p. p. 8 Eighth Recital and Schedule 8). Contract documents include (M1/03/05/021, s. 3): a form of agreement; drawings; generic and project specific preliminaries; and pricing document. The documents for the Standard Building Contract include (M1/03/05/021, s. 3, rt. 3nd): option A, a priced specification or work schedule; or Option B, contract drawings and specification. The project QS completes the form of agreement (M1/03/01/001 p. 3).

The procedures manual sets out to obtain pro-forma contract certificates (including notification of defects) from an inter-organisational shared contract administration system (NBS, 2013). From working with the organisation, I note external consultants do not have access to the contract administration software. Instead, certificates such as a valuation a pro-forma are available from my employing organisations practice and procedures manual. My employing organisation provides pro-forma certificates to employees and sub consultants. Certificates are industry standard forms with corporate branding added to them. The university pays for works through monthly payments under 30 day payment terms (M1/03/08/002; /02/002, cl. 9.5). The appointment (M1/03/02/002, cl. 9) documents have been amended to take into account the fair payment procedures set out in the Construction Acts (UK Parliament, 1996; UK Parliament, 2009). The University does not offer its supply chain a project bank account facility.

In contrast to the works contracts and framework agreement, the case study's Contracts Governance Policy indicates the form of consultants' appointment is bespoke (M1/05/01/005, p. 5). Table 47 compares the collaborative characteristics of the appointment document, works contract and framework agreement. Although there is availability under the contract, the client does not use financial incentivisation. In comparison to the contracts, the appointment includes a limited amount of collaborative characteristics. The appointment includes collaborative clauses such as consultants (and their sub-consultants) shall "act fairly and impartially when exercising its power to issue certificates and award extensions of time

under the Building Contract" (M1/03/02/002, cl. 3.1). The document however also uses negative phraseology such as the word "failure" when referring to co-operation and co-ordination. Mediation is a way to bring people back together, away from an adversarial situation (M1/02/PR/EPM1, ref. 232). Unlike the construction contract, the consultant appointment does not include a provision for mediation.

Table 47: Collaborative Characteristics Thematic Analysis

Collaborative Characteristics	SBC/XQ (JCT, 2011)	Consultant Appointment (M1/03/02/002)	Framework (JCT, 2005b)
Collaborative working	Yes s 8	Yes cl 3.1	Yes cl 5, 9
Ditto supply chain	Limited	Yes cl 3.1	Yes cl 10
Enhanced sharing information	Limited	Limited	Yes cl 8, 11
Communications protocol	Yes cl 1.7	Yes cl 22	Yes cl 12
Risk assessment/allocation	Limited	Limited	Yes cl 14
Enhanced Health and safety	Yes s 8	Limited	Yes cl 15
Environment and sustainability	Yes s 8	Limited	Yes cl 16
Value engineering	Yes s 8	Limited	Yes cl 17
Financial Incentivisation	Yes s 8	Limited	Yes cl 17
Change control/Quotation	Yes s 2	Limited	Yes cl 18
Performance indicators	Yes s 8	Limited	Yes cl 21
Dispute ladder/negotiation between senior executives	Yes s 8	Limited	Limited
Mediation	Yes	Limited	Not applicable

9.4.7 ESTATE STRATEGY

The university funds its capital works through a number of streams including that from the (M1/05/04/001, p. 27): Higher Education Funding Council; disposal or sale of its assets; grants; private partnerships; and through organisational operations. Grant funding arising from such organisations as Cancer Research UK (2009) and The Wolfson Foundation (2012). Between 2008-2011, the university receives an allocation of £97million from the Higher Education Funding Council, meeting approximately one third of the funding required for the estate strategy. The university meets the requirement of Capital Investment Fund 2, as such receives capital allocations (HEFCE, 2011a): for learning and teaching 2012-13; and for research 2011-12 to 2014-15. The Primary Project receives funding from an external organisation. In the proposed submission form for HEFCE's Investment Framework

(HEFCE, 2012), there is a requirement for an organisational (institutional) viewpoint. The organisation undertakes an estate wide viewpoint, which is seen in its estates strategy (M1/05/04/001). In the strategy there is a commitment to health and safety; space efficiency; functional suitability; carbon reduction; and institutional sustainability.

9.4.8 PART SUMMARY

The starting point for the summary is Table 8 (see 3.4 Maturity Level III Inter-organisation Collaboration, p.58) from Section B Literature. The collaborative categories from the previous part (see 9.3 Maturity Level II Organisational Collaboration) are merged into the table. To keep the Table simple a number of the categories are merged together, for example the category of inter-organisational knowledge is merged in with initiatives; and standardised legal framework is merged with legal framework and tendering. Table 48 summarises the inter-organisational collaboration of the primary case study.

Table 48: Inter-organisational Level Collaboration Primary Case Study

Literature		Primary Case Study	
Category	Collaborative Feature	Collaborative feature	Achieves
Inter-organisational Knowledge and Initiatives	benchmarking; Considerate Constructors Scheme; CSCS; forward programme; research and development; health and safety co-operation; health and safety risk reduction; and professional networks.	associations; BREEAM; competence checking associations etc.; informal networks; estates strategy; procedures manual; standards, publications and guidance; and WRAP.	carbon reduction; knowledge sharing; legislative compliance; adequate specification; and waste management.
Legal Framework and Tendering	adjudication; change control; charters; contract simplification; contract completeness; contractor selection; enhanced health and safety conditions; CSCS; collaborative working clauses, collaborative/integrated supply chain; communications protocol; design, build, operate contract; dispute ladder; enhanced sharing information; environment and sustainability; facilitation; incentivisation; fair payment; risk assessment and allocation; financial incentivisation; legislative compliance; overarching collaborative agreement; non-competitive tendering; performance indicators; multi part contracts; pre-construction services agreement; simplification of contracts; standard pre-qualification; standardisation contracts and frameworks; sub-contractor relationships; mediation; and value engineering.	online contract administration; and standard legal documents.	collaboration; communication; health and safety; cost savings; environment and sustainability; fair payment; health and safety; resource competence; value improvements; and dispute ladder.

Literature		Primary Case Study	
Category	Collaborative Feature	Collaborative feature	Achieves
Estates Strategy	condition of the estate; space efficiency; carbon reduction; environmental performance; affordability; and institutional sustainability.	Estate strategy.	Health and safety; space efficiency; functional suitability; carbon reduction and institutional sustainability.

9.5 MATURITY LEVEL IV INTEGRATED COLLABORATION

9.5.1 PART INTRODUCTION

The aim of this part is to identify if integrated level collaboration occurs in the primary case study and if it does, to see if it is possible to review the performance of collaborative features. To achieve the aim the work: carries forward the integrated level collaborative features from Chapter 3 Implementation (see Table 10, p. 61); relates the project case study to the collaborative features; and identifies a number of achievements for collaborative features suitable for testing as part of later research.

9.5.2 SHARED SERVICES

Integrated procurement is where two or more organisations come together to procure the services of a supply chain. AUDE identifies the North Western Universities Consortium (2013), which operates in the same location as the case study. The web site of the consortium indicates that the case study is not a member. The ADE however indicates, "We're just tendering our waste contract as a shared service" (M1/02/OR/ADE, ref. 107). In addition, to undertaking procurement through a third party organisation there is also the availability of shared staff. The ADE indicates that the case study undertakes limited sharing of staff (M1/02/OR/ADE, ref. 114-115). In relation to consultants, the ADE identifies that the University has "moved away from an internal framework arrangement to using OGC, which is a framework arrangement" (M1/02/OR/ADE, ref. 142). The OGC is an abbreviation for Office of Government Commerce. The OGC's buying solutions is the 'Government Procurement Office', which is an executive agency of the Cabinet Office (Government Procurement Service, 2013). In contrast to this integrated method of working, ADE indicates the organisation recently starts their "own contractor framework for projects up to the OJEU threshold" (M1/02/OR/ADE, ref. 25, 83).

9.5.3 PART SUMMARY

The starting point for the summary is Table 10, (see 3.5 Maturity Level IV Integrated , p.61) from Section B Literature. Table 49 summarises the integrated collaboration of the primary case study. The primary case study undertakes limited integrated level collaboration.

Table 49: Integrated Level Collaboration Primary case Study

Literature		Primary Case Study	
Category	Collaborative Feature	Collaborative Feature	Achieves
Shared Services	iBIM; lead buying; piggy backing; shared services; third party advisory; third party outsourcing; shared frameworks; and third party purchasing	shared purchasing; and shared consultants framework.	
Grants	Grants	Not applicable to the case study.	

9.6 CHAPTER SUMMARY

This Chapter of the DBenv found that the collaborative features are not exclusive to a particular level within the maturity model. For example, collaborative features the literature section identifies to Maturity Level I also implement at organisational Maturity Level II. Therefore, when tested against the primary case study, it was found that collaborative features relate to more than one level of the maturity model. Table 50 summarises the primary case study's collaborative features against the three levels of the maturity model in a matrix. It is easy to see how the table would be of use to a director of estates when making decisions concerning the implementation of collaborative features.

Table 50: Implementation Primary Case Study

Category	Collaborative Feature	Maturity Level I Project	Maturity Level II Organisational	Maturity Level III Inter-organisational	Maturity Level IV Integrated
Interpersonal Contract	acting: in good faith; in an open and trusting manner; in a cooperative manner; continuity of relationships; integration of other stakeholders; lessons learned meetings; shared office spaces; soft skills; teambuilding processes; and training.	user interface; interpersonal contact/relationships; and senior management support.			
Value Management and Engineering	change control; risk management; value engineering and management; and whole life cycle costing	informal life cycle costing; informal change and risk management; and life cycle consideration not part of whole business case			
Performance Based Contracting; Performance Management	incentivisation; performance; performance based contract; performance management; performance indicators procurement route; and target contracts.	deals with contracts at organisational level	approval gateways; electronic approval system; and incentivisation through long term relationships.		

Category	Collaborative Feature	Maturity Level I Project	Maturity Level II Organisational	Maturity Level III Inter-organisational	Maturity Level IV Integrated
Practice, Procedures, Information Technology	BIM; organisational level documents; inter-operability of systems; electronic meeting systems, and web 2.0-based collaboration technologies.	decisions generally made concerning informational technology at organisational level	organisational guidance; standard project level documentation; standard specifications; and standard tender and contract documents.		
Design and Operation Integration	design-construction integration; design and build; private sector engagement into design, construction and maintenance; frameworks; integrated project Insurance; private finance initiative; prime contracting; project partnering contract; management agent contracting; organisational standard procurement; and soft landings; two stage open book.	decisions generally made concerning procurement framework and tendering at organisational level; however, there is flexibility in the system with an element of procurement autonomy.	traditional approach with contractor's design; two-stage approach possible with framework; provision for maintenance service agreements in contracts.		
Inter-organisational Knowledge and Initiatives	benchmarking; Considerate Constructors Scheme; CSCS; forward programme; research and development; health and safety co-operation; health and safety risk reduction; and professional networks	decisions generally made concerning initiatives at organisational level	although provision for initiatives is set out in the procedures manual, initiatives by nature relate to higher levels of the maturity model.	associations; BREEAM; competence checking associations etc.; informal networks; estates strategy; procedures manual; standards, publications and guidance; and WRAP.	

Category	Collaborative Feature	Maturity Level I Project	Maturity Level II Organisational	Maturity Level III Inter-organisational	Maturity Level IV Integrated
Legal Framework and Tendering	adjudication; change control; charters; contract simplification; contract completeness; contractor selection; enhanced health and safety conditions; CSCS; collaborative working clauses, collaborative/integrated supply chain; communications protocol; design, build, operate contract; dispute ladder; enhanced sharing information; environment and sustainability; facilitation; incentivisation; fair payment; risk assessment and allocation; financial incentivisation; legislative compliance; overarching collaborative agreement; non-competitive tendering; performance indicators; multi part contracts; pre-construction services agreement; simplification of contracts; standard pre-qualification; standardisation contracts and frameworks; sub-contractor relationships; mediation; and value engineering.	decisions generally made concerning legal framework and tendering at organisational level. However, there is flexibility in the system with an element of procurement autonomy.	autonomy in sub-contractor selection; collateral warranties; frameworks; contractor adjudication at framework and project level; contractual damages; framework rates; legal and contractual framework implements through practice and procedures manual; and two stage procurement.	online contract administration; and standard legal documents.	

Category	Collaborative Feature	Maturity Level I Project	Maturity Level II Organisational	Maturity Level III Inter-organisational	Maturity Level IV Integrated
Estates Strategy	condition of the estate; space efficiency; carbon reduction; environmental performance; affordability; and institutional sustainability.			Estate strategy	
Shared Services	iBIM; lead buying; piggy backing; shared services; third party advisory; third party outsourcing; shared frameworks; and third party purchasing.				shared purchasing; and shared consultants framework.
Grants	Grants				Not applicable to the case study.

CHAPTER 10 MOTIVATION

10.1 CHAPTER INTRODUCTION

Within any organisation, there is an element of internal collaboration, for example between employees. This chapter focuses on supply chain procurement and how the mechanisms motivate on an inter-organisational basis. The relationship between the case study and other organisations includes a contract between the organisations. The contract or agreement provides each party with a benefit and a detriment, with one party being a supply chain organisation. Performance of the supply chain organisation is dependent on the employees that work for the organisation. After all, employees (or people) act as part of a socially constructed phenomenon, to operate and provide the services of supply chain organisations. Employees form part of the culture of the organisation. In Chapter 4 Motivation, four regularity styles emerge to motivate people, namely (1) external regulation; (2) introjection; (3) identification; and (4) integration. Chapter 10 Motivation relates the collaborative features from Chapter 9 Implementation to regularity styles.

10.2 MATURITY LEVEL I EXTERNAL REGULATION

10.2.1 PART INTRODUCTION

At Maturity level one, there is a salience of extrinsic rewards or punishments, which relies on compliance and reactance. This part of the chapter explores the presence of external regulation within the primary case study organisation, which applies to employees as well as the supply chain. Regulation sits close to employees in relation to the operation of frameworks, contractor adjudication and estates strategy; as such, exhibits low external regulation of supply chains. Certain features relate to informal ways if working. Similarly, project level, (see Chapter 9 Implementation) features exhibit a limited amount of external regulation, which emerges at organisational level and above. This section explores the organisational, inter-organisational and integrated levels of external regulation.

10.2.2 PRACTICE, PROCEDURES, INFORMATION TECHNOLOGY

The statutes, ordnances and general regulations (M1/05/01/006, ap. 1), which are the "constitution and supporting structures of the University" implement through policies. Policies are "principles that staff and / or students must follow" (M1/05/01/006, ap. 1), "Policies have pre agreed arrangements for communication, review, the monitoring of

compliance, as well as explicitly stated consequences for non-compliance" (M1/05/01/006, ap. 1). For example, where inadequacies are found in respect of the Dignity at Work and Study Policy, the university will "use the disciplinary procedure to take action against those found responsible for harassment, discrimination or bullying or those whose allegations are vexatious" (M1/05/03/002, p.3). Therefore, at least in relation to direct employees, policy documents incorporate regulation and avoid introjection. The organisational policy documents develop competence. For example, the offer of training or other interventions "where appropriate to staff and students who have been found to be responsible for using unacceptable behaviour; the aim being to foster a healthy working and learning environment; and provide training for all managers and appropriate student support staff in the operation of this policy and procedure" (M1/05/01/007, p.3). Therefore, there is an organisational approach to improve practitioner competence, which relates to 10.5 Maturity Level IV Integration.

There is a requirement for contractors to "deal with our [the University's] colleagues and customers in a polite and professional way" (M1/06/02/005, p. 4). Furthermore, "Contractors must be well presented and approachable at all times" (M1/06/02/005, p. 5). Therefore similar to employees, there is a policy to prevent negative introjection in relation to the way contractors deal with stakeholders. However, there is evidence of negative introjection by the University with its supply chain. "This only happens with the smaller companies that have now forced their way onto the lists of the councils and universities, because they're cheaper to operate and they can be bullied easier by the client; the bigger builders won't be bullied, will they, they can't be pushed; but they do tend to drive you [the sub-contractor] more" (M1/02/PR/SUB1, ref.17).

"Procedure supports a Policy not vice versa" (M1/05/01/006, ap. 1). "A Procedure is an official way of doing something which must be followed, i.e. a mode of proceeding or a method of conducting business" (M1/05/01/006, ap. 1). The practice and procedures manual (M1/03/, 06/), similar to the construction contract (M1/03/05/006; 16-21; 04/02/008) contains automated ways of working that restricts the effect of introjection in decision making for example: auditable contractor selection; open book tendering and rotational contractor selection. The practice and procedures manual (03,06) and construction contract (M1/03/05/006; 016-21; 04/02/008) also include what the University's management perceives

as the correct way of working. Performance in relation to the correct way of working in instances links to introjection.

> *"if the, I'm going to put this in not a nice way now, if the person, the consultant, that's looking after it is user-friendly, if he's interested in being helpful to you; and what I will find is, we'll start a job doing it the way the consultant has set it out on his drawing, and we'll find it's not feasible or not physically possible; or, in some cases, it would cause him some embarrassment because he didn't know the university specification when he set this design to work. So we will then go back to him and say, 'look, we need to do this, this and this, but if we do it this way it'll still work, it'll stop you being embarrassed and it'll save us money'; and I've just done exactly that on the university…" (M1/02/PR/SUB1, ref. 35).*

The University's imposes procedures on the supply chain, with a limited forum for feedback (M1/02/PR/SUB1, ref.104), causing issues with relatedness. For example, the management of health and safety on site can be made more difficult for the contractor by being more onerous than required by the situation (M1/02/PR/CM1, ref.132-133). The University's Code of Practice for Contractors on Campus states, "failure to comply with the Code of Practice may result in removal from the University premises and affect future work with the University" (M1/06/02/005, p. 3). In this instance, the Code provides external regulation to ensure compliance with its policies; for example, the Dignity at Work and Study Policy (M1/06/02/005, p. 6) and Asbestos Management Policy (M1/06/02/005, p. 8).

10.2.3 Legal Framework and Tendering

The case study organisation applies external regulation to other organisations through a set of standardised construction documents that include contracts. The Unit uses standard forms of contract, with minimal amendments (M1/03/05/006). The University imposes the contracts, (similar to the rest of the practice and procedures manual) on the supply chain, therefore limiting organisational autonomy support. The standard forms of contract include the Joint Contracts Tribunal's Minor Works (JCT, 2011n; JCT, 2011o), Intermediate (JCT, 2011p; JCT, 2011q) and Standard Without Quantities (JCT, 2011). A recent survey (RICS & Davis Langdon, 2012) indicates (based on the sampled data) that lump sum contracts are the most popular form of procurement; specification and drawings being the most popular lump sum contract. In addition, the survey indicates JCT contracts as the most popular suite of contract

(RICS & Davis Langdon, 2012). Therefore, the university relates to industry standard ways of working, indicating relatedness and an understanding of supply chain competence. For example, (as far as generalisations can be made) by using an industry standard form the supply chain's employees will be relatively familiar with the contractual mechanisms and associated ways of working. Standard ways of working extends to contract administration that is undertaken using an inter-organisational portal. Other examples of relatedness include fair payment provisions in the contact, realising a legislative instrument (UK Parliament, 1996; UK Parliament, 2009).

Construction contract publications include prescriptive ways of undertaking activities, for example, the JCT Standard Build Contract Without Quantities (JCT, 2011) is 127 pages long and includes prescriptive ways to make contract sum adjustments, make payment, extend completion dates and comply with legislation. Therefore, the use of construction contracts restricts procedural autonomy, in that practitioners wishing to work intra vires must conform to the procedures set out in the contract. For example, the JCT Standard Build Contract Without Quantities has a clear allocation of risk in respect of: insurance; loss and expense; and extensions of time. There are other more flexible contracts (JCT, 2011a), however, they are less popular (RICS & Davis Langdon, 2012). Therefore, autonomy trades off against competence and relatedness.

In contrast, the ADE identifies that "the way that this organisation approaches the formal contract situation is we would much rather work in a partnering type environment and leave the contract behind" (M1/02/OR/ADE, ref. 17). Therefore, there is potential to achieve the integration maturity level with contracts. In addition, the bespoke nature of construction brings with it an element of procedural autonomy. With the SUB1 providing the thought pattern with subordinates "Right, this is how I want this job doing. If you can see a quicker way, a more economical way, a way you're happier doing that you think'll [sic] work better than that then, by all means, do it…because I know what I'm doing and I know they know what they're doing." (M1/02/PR/SUB1, ref. 55).

10.2.4 Legal Framework and Tendering - Punishments

The salience of punishment is an approach to motivate contractors. When managing complaints the majority are handled "informally but then there has to be some sort of formal structure to fall back on if the informal stuff is not working or if you're not getting results

from the informal side of it" (M1/02/PR/USR, ref. 62). Both the organisational (M1/03/05/020, A20, cl. 1.1) and project specific preliminaries (M1/04/02/008) refer to project completion. In addition, there is provision for extending the completion date (JCT, 2011). In the organisational standard contracts, there is provision for the deduction of liquidated and ascertained damages (M1/03/05/020, A20, cl. 2.32.2). There is an understanding within the English legal system that a court will not enforce a party to pay damages where they are deemed a penalty in place of a genuine covenanted pre-estimate of damage[1] [2]. The use of punishment associating to contractual damages represents a lack of relatedness.

Punishment is not a condition precedent of identification relating to the implementation of organisational documents. MC1 indicates the incorporation of softs skills into contracts is a positive move forward, with the NEC form of contract being a more of a collaborative than other forms (M1/02/OR/MC1 ref.72). Organisational documents establish a contractual obligation to collaborate (M1/03/05/006, A30/155). The Primary Project's construction contract is the JCT Standard Building Contract without Quantities 2005, Revision 2 (JCT, 2009c). The contract (JCT, 2009c) includes the collaborative features present in the 2011 edition of the contract (M1/04/02/008). The Unit's construction contracts refer to collaborative characteristics including (Table 47; SBC/XQ (JCT, 2011)): enhanced health and safety; environment and sustainability; value engineering; financial incentivisation; change control/quotation; performance indicators; dispute ladder; and mediation. The Technology and Construction Court[3] confirms the enforceability of collaborative contractual practice. The inclusion of the collaborative features in the contract along with reference to the documents (legal publications etc.) indicates a regularity style of external regulation along with the processes of compliance and reactance. Collaborative clauses in construction contracts reduce organisational, procedural and cognitive autonomy.

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[1] [1905] AC 6, (1904) 12 SLT 498, [1904] UKHL 3, (1904) 7 F (HL) 77

[2] [1915] AC 79, [1914] UKHL 1

[3] [2005] EWHC 1018 (TCC), [2005] TCLR 6

10.2.5 Legal Framework and Tendering - Risk Allocation

Both the MC2 and PM1 identify that the traditional procurement route may not offer the best solution for supply chain integration into design (M1/02/OR/PM1, ref. 128; MC2, ref. 178). The organisational contracts are not design and build contracts (JCT, 2011q, p.2; JCT, 2011, p.2; JCT, 2011o, p.2); although there is provision for contractor's design portion (M1/03/05/017-20). The use of traditional procurement reduces contractor's autonomy during the design phase to offer innovate and buildability solutions. In addition, restricting the contractors' buildability knowledge during design demonstrates a lack of relatedness by the University and a disregard of competence. In contrast, PM1 indicates there are contractors with a traditional mind-set he would be able to partner with, and contractor selection was more important than the procurement route (M1/02/OR/PM1, ref. 68). In addition, both MC2 and PM1 believe that design and build does not always associate with collaboration in respect of agreeing post-contract changes (M1/02/OR/MC2, ref. 69; PM1, ref. 22-24). Methods of working are changing in the organisation, with ADE indicating when referring to capital projects that "in the last couple of years" there has been a "move to D&B" by the organisation, and on a recent couple of "projects we've novated the architect and novated the M&E" (M1/02/OR/ADE, ref. 99). PM1 indicates that within the last ten to fifteen years there has been a shift in the design of works from client side consultants to contracting or sub-contracting organisations, possibly due to skills movement in the supply chain (M1/02/OR/PM1, ref.72).

10.2.6 Legal Framework and Tendering - Contractor Adjudication

The organisation's framework operational guidelines set out contractor selection on either a mini-competition or rotational basis (M1/03/05/005, p. 1), indicating a regulated approach to the management of the framework, including tendering. Legislation externally regulates the organisation; however, the construction works framework operational guidelines do not regulate employees (M1/03/05/005). External regulation with employees comes through contracts of employment, in the form of a disciplinary procedure. The selection of contractors on a rotational basis reduces capacity for introjection. In a number of instances, the University selects contractors as part of a mini competition (M1/04/01/001; 003; 04A/01/001-003). The auditable approach to contractor selection restricts the effect of introjection. Competition restricts supply chain profit, particularly in a market down turn, which demonstrates a lack of relatedness by the University. The peak and trough nature of

construction procurement means that sub-contractors feel like they need to take work on at less than preferable rates (M1/02/PR/SUB1, ref. 29). In contrast, restricting tender lists and auditable contractor selection demonstrates relatedness by the University, of supply chain tender costs. The tender process restricts procedural autonomy of the supply chain, where a bid is not in accordance with the tender documents it is non-compliant and a risk of bid rejection occurs (M1/03/05/006, ref.A30).

10.2.7 PART SUMMARY

Table 51 relates the collaborative features from Chapter 9 Implementation to the regularity style External Regulation from Chapter 4 Motivation (see 4.3 Maturity Level I External Regulation). The primary case study implements external regulation through a practice and procedures manual. The manual includes organisational standard contracts.

Table 51: External Regulation Regulatory Style Primary Case Study

Category	Collaborative Feature	External Regulation	Introjection	Identification	Integration
Practice, Procedures, Information Technology	BIM; organisational level documents; inter-operability of systems; electronic meeting systems, and web 2.0-based collaboration technologies.	consequences for not complying with policies; obligatory compliance with policies; and onerous policies.	approachable contractors; negative introjection with contractors; and contractors assist avoid embarrassment.		training to improve practitioner competence.
Legal Framework and Tendering	adjudication; change control; charters; contract and contract completeness; contractor selection; enhanced health and safety conditions; CSCS; collaborative working clauses, collaborative/integrated supply chain; communications protocol; design, build, operate contract; dispute ladder; enhanced sharing information; environment and sustainability; facilitation; incentivisation; fair payment; risk assessment and allocation; financial incentivisation; legislative compliance; overarching collaborative agreement; non-competitive tendering; performance indicators; multi part contracts; pre-construction services agreement; simplification of contracts; standard pre-qualification, contracts and frameworks; sub-contractor relationships; mediation; and value engineering.	standardised documents and contracts; contract facilitates external regulation with collaborative features; frameworks; contracts restrict autonomy support; prescriptive ways of working; and formal process to fall back on.		contracts include environment, sustainability, value engineering, performance measurement.	standard contracts relate to supply chain competence; fair payment provisions; focus on partnering instead of contracts; move towards design and build contracting with traditional contracting restricting relatedness – buildability; tender lists.

10.3 MATURITY LEVEL II INTROJECTION

10.3.1 PART INTRODUCTION

The maturity level relates to the regularity style of introjection as described by Ryan & Deci, (2000a, p.61), which relates to ego involvement and the focus of approval from self and others. Introjection may be positive, for example, enabling feelings of happiness and positive reinforcement; or negative, for example, attacking and restrictive narcissistic behaviour. The use of introjection is person specific, in that different practitioners employ different levels depending on their life experiences and training. However, within organisations cultural behaviour exists. In the previous section, organisational policies to restrict a culture of negative introjection emerge. The potential exists however for a deviation between organisational policy and practice within the organisation. In addition, collaborative features that associate to the regularity style of external regulation have the potential for introjection. This section seeks to establish from the data if introjection is present in the case study organisation.

10.3.2 INTERPERSONAL CONTRACT - SENIOR MANAGEMENT SUPPORT

The EPM1 indicates that "Well, internal senior management support doesn't really exist at the University; the way, the form any senior management functions here is to kick you; so it's not support at all; it's really a policing activity" (M1/02/PR/EPM1, ref.139). Therefore, there is a culture to a certain extent of negative introjection. With the EPM1 indicating "I wish they would take some responsibility for the projects because at the University the Project Manager is like the sole, almost the buck stops here; now, senior management say, 'No, the buck doesn't stop at you, [name] the buck stops at me'; but that isn't the case, you know, if my boss was talking to me; that just isn't the case because if anything went wrong it's me that's to blame" (M1/02/PR/EPM1, ref.145). Lack of relatedness extends also to contractors with the CM1 identifying that on occasions, timescales provided by the client can be "ridiculous for what you have got to do" (M1/02/PR/CM1, ref.137). Lack of senior management support in practice indicates a lack of relatedness and a negative effect on competence.

> *"I mean, with senior management on the client side, it is absolutely imperative that you work with them; so you have no option if you want to get the job done, and you have to give a lot, and they will take a lot; but eventually, maybe, they will come around and*

start helping you a bit. But you don't expect it. I don't expect it." (M1/02/PR/EPM1, ref.170).

The lack or relatedness extends to resources.

"You end up spending 50% of your time doing non-productive, administrative and bureaucratic things. We don't have any administrative support. We don't have really anyone that will do typing for us. We don't even, you know, we don't have anyone looking after our diaries. We have no admin. If you need drawings you have to go and print them yourself. You can't ask someone to go and do some photocopying or scanning if you can't do it. You can't even ask for a cup of coffee in a meeting room. They don't do it, it's not their job (M1/02/PR/EPM1, ref.155).

10.3.3 PART SUMMARY

Table 52 relates the collaborative features from Chapter 9 Implementation to the regularity style Introjection from Chapter 4 Motivation (see 4.4 Maturity Level II Introjection). The data indicates that there is an element of blame culture within the primary case study. Chapter 3 Implementation supports the finding of this Part and relates adversarial relationships to cost cutting and change management (see 3.2 Maturity Level I Project Collaboration).

Table 52: Introjection Regulatory Style Primary Case Study

Category	Collaborative Feature	External Regulation	Introjection	Identification	Integration
Interpersonal Contract	acting: in good faith; in an open and trusting manner; in a cooperative manner; continuity of relationships; integration of other stakeholders; lessons learned meetings; shared office spaces; soft skills; teambuilding processes; and training.		blame culture.		lack of senior management support; lack of admin support; and unrealistic project timescales.

10.4 MATURITY LEVEL III IDENTIFICATION

10.4.1 PART INTRODUCTION

Identification relates to where a practitioner (or person) has a conscious value of activity combined with a self-endorsement of goals (Ryan & Deci, 2000a, p.61). Grant, et al., (2007) identifies identification with contact with beneficiaries. The beneficiaries in construction are building operators and users. The case study procures construction and refurbishment works traditionally, in that the supply chain undertakes construction works, leaving the University to maintain the asset. Therefore, the estates team are also a beneficiary of the construction works. Collaborative features at this level, facilitate identification by the supply chain towards University and its employees' requirements. At this level, there is no requirement to achieve mutual relatedness, where the University would also identify with the supply chain's needs.

10.4.2 PERFORMANCE BASED CONTRACTING; PERFORMANCE MANAGEMENT

The University monitors performance of contractors against health and safety with "any deviations from agreed procedures or statutory requirements will be recorded, advised to the appropriate persons and where necessary, rectified immediately" (M1/06/02/005, p. 9). There is not a clear audit trail in the data to indicate how deviations are rectified. The monitoring process appears to relate more to external regulation and introjection. In addition, the University undertakes performance management using project reviews (M1/02/PR/EPM1, ref. 115; 02/PR/CM1, ref.43; 02/OR/MC1, ref.76-82). Again, there appears to be limited audit trail in the data to demonstrate the project reviews encourage identification and integration.

ADE indicates, "we don't have key outputs in terms of KPIs [Key Performance Indicators] hard data metrics" (M1/02/OR/ADE, ref. 69). Therefore, the supply chain's and University's employees are provided with cognitive autonomy in relation to self-referent standards, with limited external regulation. The project reviews are undertaken on completion of projects. PM1 and MC1 identify the importance of having regular review meetings with senior practitioners from organisations to reinforce that agreed at the initial meeting and avoid disputes (M1/02/OR/PM1, ref. 18; /MC1 ref.49-55). "The senior colleagues from each of the organisations get together so there's a clear understanding of what the expected output is" (M1/02/OR/ADE, ref.37). Performance measurement by its nature has the desired outcome to develop competence; however, is undertaken in one direction (M1/02/OR/MC1, ref.77-78;

02/PR/SUB1, ref. 139), and therefore does not achieve relatedness or Maturity Level IV integration.

10.4.3 KNOWLEDGE MANAGEMENT

The approach to construction contracts restricts supply chain's organisational autonomy support. The University is prescriptive in relation to its requirements (M1/03/; 06/), enabling an element of external regulation with the knowledge management process. The prescriptive detailing of specifications and way of working reduces procedural autonomy. However, the University builds relationships with manufacturers and promotes the use of their products through the specifications (M1/02/PR/EPM1, ref.238). The MC2 identifies an instance where a client's relationship with the supply chain had allowed his organisation to obtain competitive rates on high value equipment, with improved payment terms on the Project (M1/02/PR/MC2, ref.111).

At organisational level, the University facilitate the development of the supply chain by providing internal staff the procedural autonomy to improve the supply chain's competence. For example, the University employs an electrical clerk of works to assist the supply chain improve their product (M1/02/PR/EPM1, ref. 41-46) with not only the main contractor but also sub-contractors (M1/02/PR/SUB1, ref. 103). In addition to communication from the university, there is also communication between supply chain members (M1/02/PR/SUB1, ref. 10-13). The University's approach to knowledge management supports competence and demonstrates an element of relatedness.

10.4.4 LEGAL FRAMEWORK AND TENDERING - PROCUREMENT AUTONOMY

Three decision makers (directors) working for supplier organisations provide interview data as part of the DBenv study (M1/02/OR/MC1, MC2 and PM1). All three practitioners could see the benefit of collaborative integration of supply chain knowledge into the design (M1/02/OR/MC1, ref.87-90; MC2, ref.72; and PM1, ref.72); however, sometimes contractors feel disempowered or unable to provide input (M1/02/OR/MC2, ref.95-97). The director working for a small to medium sized enterprise (MC2) identifies that practitioners are more motivated to achieve client requirements when they are empowered by a process such as two-stage tendering (M1/02/OR/MC2, ref.71). The early involvement of the contractor in the design provides "appreciation of the contract itself" (M1/02/PR/CM1, ref. 11).

The MC2 reflects on a series of work that required careful health and safety management (M1/02/OR/MC2, ref.149). In the work, his organisation undertook (for a fee) pre-construction services that includes tours around facilities, providing a deeper understanding of the client's requirements. In contrast to this statement, he identifies a case where a contractor had a tender rate of minus five percent for their organisation's overheads and profit, which by the nature of businesses activity needed to utilise non-collaborative behaviour to recoup what would otherwise be an overall project loss (M1/02/OR/MC2, ref.75-77). Although the Primary Projects overhead and profit tender rate is below the normal expected value for overheads and profit, it was within acceptable margins for the market at the time (M1/04/02/001).

The practitioners working on the Project are not provided with organisational autonomy support, for example there is limited availability to amend the procedures manual (M1/03/; 06/). The procedures manual sets out a single stage tendering procedure (M1/03/05/006; 016-21). The project members however have procedural autonomy, for example by using the two stage tendering procedure they mould the procedures set out in the manual to apply to a practical situation. There rational for the procedure to be implemented, is so that the Project design continues through construction; facilitating identification with client's requirements. There is potential for the two-stage tendering to offer an element of relatedness, in that it provides the contractor with the ability to form a greater understanding of project risk. In addition a two-stage process facilitates a greater understanding of the contract (M1/02/PR/CM1, ref. 11), and clients requirements (M1/02/OR/MC2, ref.149). However, the two stage tendering procedure is not in the manual and is not used on a number of other similar projects undertaken by the university (04A/02/), therefore demonstrating a lack of relatedness.

10.4.5 PART SUMMARY

Table 53 relates the collaborative features from Chapter 9 Implementation to the regularity style Identification from Chapter 4 Motivation (see 4.6 Maturity Level IV Integration). The primary case study employ's staff to assist the supply chain understand the organisation. Knowledge management is however restricted by a lack of organisational procedural support with the supply chain.

Table 53: Identification Regulatory Style Primary Case Study

Category	Collaborative Feature	External Regulation	Introjection	Identification	Integration
Performance Based Contracting; Performance Management	incentivisation; performance; performance based contract; performance management; performance indicators procurement route; and target contracts.	health and safety performance measurement with reactive procedures	health and safety performance measurement with reactive procedures.	cognitive autonomy – performance standards relate to performance of the supply chain.	
Practice, Procedures, Information Technology	BIM; organisational level documents; inter-operability of systems; electronic meeting systems, and web 2.0-based collaboration technologies.	consequences for not complying with policies; obligatory compliance with policies; and onerous policies.	approachable contractors; negative introjection with contractors; and contractors assist avoid embarrassment.	dedicated university staff assist supply chain organisational specification; relationships with manufacturers	training to improve practitioner competence

Category	Collaborative Feature	External Regulation	Introjection	Identification	Integration
Legal Framework and Tendering	adjudication; change control; charters; contract and contract completeness; contractor selection; enhanced health and safety conditions; CSCS; collaborative working clauses, collaborative/integrated supply chain; communications protocol; design, build, operate contract; dispute ladder; enhanced sharing information; environment and sustainability; facilitation; incentivisation; fair payment; risk assessment and allocation; financial incentivisation; legislative compliance; overarching collaborative agreement; non-competitive tendering; performance indicators; multi part contracts; pre-construction services agreement; simplification of contracts; standard pre-qualification, contracts and frameworks; sub-contractor relationships; mediation; and value engineering.	standardised documents and contracts; contract allows for the use of external regulation with collaborative features; contracts restrict autonomy support; and prescriptive ways of working; formal process to fall back on.		contracts include environment, sustainability, value engineering, performance measurement; procedural autonomy facilitates identification; and lack of organisational autonomy support.	standard contracts relate to supply chain competence; fair payment provisions; focus on partnering instead of contracts; move towards design and build contracting with traditional contracting restricting relatedness – buildability; and tender lists.

10.5 MATURITY LEVEL IV INTEGRATION

10.5.1 PART INTRODUCTION

At level four, regulation integration becomes part of oneself (Ryan & Deci, 2000a, p.62) or internalisation. In self-determination theory, 'internalisation' is through relatedness, competence and autonomy (Ryan & Deci, 2000a, p.64). Relatedness occurs at maturity level three to an extent, for example, where supply chain's employees understand the importance of a particular achievement or way of working to the client. At level four, relatedness extends to include a mutual understanding of each other's requirements. Competence relates to the establishment of procedures around the supply chains employees competence; extending to include personal (or professional) development. Stefanou, et al., (2004) indicates three ways to achieve autonomy, namely organisational autonomy support, procedural autonomy, and cognitive autonomy. The project level collaborative features relate to high autonomy and low external regulation. There is project level provision for practitioner autonomy to mould organisational ways of working to collaborate. Relatedness is "a sense of mutual respect and reliance with others" (Baard, et al., 2004, p. 2046). The organisation has a number of policies that demonstrate the organisation relates to peoples life experiences (M1/05/03).

10.5.2 INTERPERSONAL CONTACT

EPM1 indicates relationships are important to communication (M1/02/PR/EPM1, ref.65). The nature of interpersonal contact and relationships means there is the potential for introjection. Evidence indicates feelings of introjection exist in meetings within the University (M1/02/PR/EPM1, ref. 63 & 65). With the CM1 indicating, "collaboration is happy in what you do and whom you are doing it with" (M1/02/PR/CM1, ref. 5) and EPM1 indicating, "Performance is having a happy client" on a project (M1/02/PR/EPM1, ref. 208). Interpersonal contact (M1/02/PR/EPM1, ref. 89-98; 155; 02/PR/CR1, ref.17-19; 02/PR/CM1, ref.89), informal communication and informal knowledge sharing enables relatedness, in that where practitioners have the opportunity to spend time together they can improve their understating of each other's situation (relatedness).

A form of interpersonal contact is project team meetings (M1/04/03/002 – 004). Interpersonal relationships where informational (not related to introjection) have the ability to improve competence, facilitate relatedness and where not rigidly regulated increase autonomy. During the execution of the Primary Project, work members exhibited autonomy, by meeting up on a

few occasions informally in a social setting to discuss the works (M1/02/PR/CR1, ref.17-19). The MC1 indicates that a good way to start relationships is with team building exercises, examples include events where participants build rapport with one another and share their objectives for a project (M1/02/OR/MC1, ref.30). The MC2 could see the benefit of such events, however, reflects on a particular case from a national contractor, where practitioners receiving entertainment at the start of the project, to induce a good relationship, breaks down by the end, due to an inconsistent approach to collaboration during the project (M1/02/OR/MC2, ref.135).

10.5.3 Interpersonal Contract - User Interface

The Users (including USR1) operate and work within the building where the Project is undertaken on a day-to-day basis and want to make their life easier in future (M1/02/PR/USR1, ref. 7, 9). The Project's Key contact with the Users provides data for the research (M1/02/PR/USR1). The integration of stakeholders into the design improves performance against and an understanding of project deliverables (M1/02/OR/MC1, ref.59-60). For example, the users that manage collections are keen to ensure the design does not create access routes for pests (M1/02/PR/USR1, ref. 9).

> *"Well, you've got to understand your client, haven't you? So some of the most important things about a client may be it finishes on time; And in that case...so, you've got to understand where they're coming from; so some clients, there's a drop deadline so you will do everything you can and you will make sure you hit the drop deadline; if quality suffers you'll sort that out on-going, and the client won't mind that because he's got his main objectives, so you must understand main objectives of the client" (M1/02/PR/EPM1, ref. 216).*

Change control is a way to share understandings. Sharing understandings is important to Users, that indicate "it is good to know why something has cost more, why it is running behind or why there has been a delayed" (M1/02/PR/USR1, ref. 54). The EPM1 indicates "at the end of the day it can run over and there's mitigation and the client understands; you can go over budget, but there's mitigation and the client would understand; quality issues, you know; mostly, you know, there are issues but as long as you can resolve them the client will understand" (M1/02/PR/EPM1, ref. 210). Clients in instances can appear to hinder the process, with the EPM1 indicating, "projects get done in spite of the client"

(M1/02/PR/EPM1, ref. 155). The USR1 identifies a particular issue where the contractor was not allowed to enter part of the building as not enough notice is given (M1/02/PR/USR, ref. 64). The Primary Project's building has an alarm and access to secure areas is with supervision from the User's staff (M1/02/PR/USR1, ref. 64).

The project specific preliminaries provide that the contractor "will need to meet prior to start on site and weekly basis, with the Museum staff to discuss and agree methods in respect of programme, health and safety" (M1/04/01/001, p. 11, cl. A12/200A). As part of the Primary Project, the contractor undertakes work in the same location as exhibits' displays. The Users are "always quite concerned to do with dust and vibrations and things like that, so it is good to know, so that you can warn them when that is going to happen" (M1/02/PR/USR1, ref. 20). The contractor manages the movement of exhibits that is undertaken by the museum staff (M1/04/01/001, p. 11, cl. A13/130A). During the works the user staff along with the contractor, protect displays from accidental damage, including from vibration (M1/02/PR/USR, ref. 29-31). Autonomy enables user interface that promotes relatedness and perceptions of competence.

10.5.4 VALUE MANAGEMENT AND ENGINEERING

There is a formal and an informal process to manage change. Informal ways of work by nature indicate organisational autonomy support, procedural autonomy and cognitive autonomy. "I do like to agree...work with a contractor to agree variations; you've got to; I don't think you should impose on it, it always goes wrong; so there is an informal bit; and then you have to, under the formal contract obviously, you have to then do what it says under the contract where you put it in writing and stuff; but I think you should always agree on it up front" (M1/02/PR/EPM1, ref. 189). The ADE indicates that the organisation operates a formal change management process for Projects with a value over £1million. "I think that the change management thing is just a bit of a safeguard with a client that doesn't, isn't very...isn't an experienced client or is one that is notorious for actually denying everything at the end of the job, like, 'I didn't tell you to do this, or, I didn't approve that you change that'; so with some clients you've got to have a change management system, simply so that they understand and that it's recorded that they have given X, Y or Z instructions" (M1/02/PR/EPM1, ref. 189). In addition, change management identifying with relatedness has importance further down the supply chain.

"In the past couple of years since the main contractor has now got his power again now, because he's the principal contractor, we have got to be very careful who we collaborate with without going through the principal contractor; we can make serious errors if, like, if you were, say, the project manager for the job for the university and you come up to me and said, 'I want another ten sockets over there, what do you think?' and if I said something to you like, "well, we can do them straightaway and it'll cost you £500; well then, I've totally gone, I can't have that discussion with you. I would have to say to you, 'okay, well I'll see if it fits in with the programme and then I'll let the main contractor know what the cost is'; otherwise, I could never get another job from him again, you know what I mean?" (M1/02/PR/SUB1, ref. 6).

In addition to cost certainty, change management employs lifecycle costing and value engineering to consider different specifications.

I said to [name] just the other day, this job I'm doing on the [name] Building, we're on the third floor, and he said his battery bank's on the fifth floor. And he's no access to it at the moment because they're doing roof alterations there. I said, "Well, I need to get in there, [name], to do it." He says, "I know, I can't get in myself because they won't let us in, it's restricted." And I said, "Well, why have you got a battery bank on the fifth floor and wires all the way down?" I said, "Why have you not got a sub-distribution for the emergency lighting on every floor? And then every floor's got its own point of view, so you're not running up and down risers that…?" He says, "You know, Ken, that's what we need." But like, again, they're held back with money, aren't they? (M1/02/PR/SUB1, ref. 118).

However it "depends how the individuals buy into it; if they do not see any worth out of it; for example change management; the contractor will buy into that and so will the client because they want that cost certainty; everybody wants that cost certainty as an outcome; It appeals to everybody" (M1/02/OR/MC2, ref. 31-32). At sub-contract level, emphasis is also placed on practitioner buy in.

"So we all have ideas for them, but every single idea, unless you're going to save money they won't be interested. Even though it might cost money in the beginning, it's like changing light fittings, isn't it, you know, to an LED fitting? It might cost you £300 to do it and you've got to prove to someone then that they're going to get that £300 back in

a very reasonable space of time, a short space of time. No good saying it's going to take 20 years, because in 20 years they'll have changed all the room again and chucked the fittings away." (M1/02/PR/SUB1, ref. 119).

The MC1 associates risk management to collaboration; with the team managing high-risk, "where people put their risks on to it and reviews what can be done with the risks, to see if the higher risks can be managed out" (M1/02/OR/MC1, ref. 154). The PM1 and MC1 indicate practitioners should move away from a defensive strategy towards more of a place where they feel empowered to discuss failures for continuous improvement (M1/02/OR/MC1, ref. 146; /PM1, ref.145). MC2 identifies risk management as a worthwhile tool often undertaken as a formal exercise abstract from the construction process, concurrent with an informal process with much more apparent value (M1/02/OR/MC2, ref. 30-32). The MC2 indicates (referring to formal risk management) that "with this it is just a paper exercise to tick a box; what you put in there is never referred to again; it can become a nonsense; it can become too abstract from the process; it can be a worthwhile tool; if it is done properly it is a very useful tool" (M1/02/OR/MC2, ref. 30-32); indicating in instances there is a lack of relatedness.

10.5.5 Performance Based Contracting; Performance Management - Incentivisation

The case study does not use financial incentivisation for purpose of reward; instead, incentivisation comes in the form of repeat business (M1/02/PR/EPM1, ref. 13; /02/OR/ADE, ref. 12; /02/PR/CM1, ref. 73; /06/02/005, p. 3). With the SUB1 indicating "I've got a problem at the moment on the university in as much as I'm running two sites, one across the road from the other; I've got half a mile apart and it's wearing the foreman out now, I'm going to have to get him a pushbike or something" (M1/02/PR/SUB1, ref. 21). There is similar incentivisation in the supply chain with a Director working for a sub-contractor suggesting low performance of temporary staff by his organisation will result in them being "sacked" (M1/02/PR/SUB1, ref. 50). Providing repeat business to the supply chain indicates relatedness (by the University) and facilitates supply chain competence. In addition, an element of organisational autonomy support emerges from long-term relationships. In contrast, to the University's position of not using financial incentivisation, the SUB1 identifies that, "there's only one way to motivate a mercenary, give him more money" (M1/02/PR/SUB1, ref.41; supported by /PR/SUB1, ref. 43); the statement is made in the

context of the peaks and troughs of workload (M1/02/PR/SUB1, ref. 46). The fluctuation of workload indicates a lack of relatedness.

10.5.6 Practice, Procedures, Information Technology - BIM

Members of the University's supply chain see the benefit of Building Information Modelling (BIM). MC1 identifies electronic portals that share information save time (M1/02/OR/MC1, ref. 138). PM1 adds by indicating electronic portals encourage people to act in an auditable manner (M1/02/OR/PM1, ref. 130). With communication emerges the risk of Practitioners using introjection. The MC1 indicates that BIM improves collaboration, yet is not a prerequisite; and needs upfront investment in the model to be started on day one. Both MC1 and MC2 see an investment in education as important (M1/02/OR/MC1, ref. 118; /MC2, ref. 61). Investment in education relates to competence.

There is some scepticism surrounding the initiative with a perception that "it is one of those things that will come in one year and be out the next" (M1/02/PR/CM1, ref.105; /OR/MC2, ref. 61-67). PM1 identifies some practitioners indicate BIM in instances over complicates things; and recalls a case, on a project where software compatibility between consultants causes issues (M1/02/OR/PM1, ref. 114-116). Both the compatibility issue and the previous failure of initiatives indicate a lack of relatedness by clients. Although there is no clear audit trail, there is the potential that the University only implements BIM to Bew & Underwood's (2009) level one in response to its own and supply chains concerns. The ADE indicates that the University did not have an implementation plan for BIM (M1/02/OR/ADE, ref. 188), which indicates a lack of intent to improve perceived competence. In contrast provides procedural autonomy.

10.5.7 Inter-organisational Knowledge and Initiatives - Professional Networks

The University's employees and supply chain are members of formal and informal professional networks. The networks provide opportunity to develop competence. Practitioners' membership of institutions is an organisational requirement (M1/05/05/002, p. 4; /06/04/001, p. 8, ref. 3.3). Therefore, reducing practitioners autonomy, nevertheless, reinforcing feelings of competence for practitioners through training. In contrast, there is a restriction of practitioners with less formal training that fail to become members of

institutions from employment, regardless of experience. The organisations are industry standard, for example, RICS and AUDE representing an element of relatedness.

AUDE is an organisation setup to assist inter-organisational collaboration during the strategic planning, management, operation and development of higher education estates and facilities; through provision of management tools, conferences, discussion forums and training events for members (AUDE, 2013a). Networking through such organisations as AUDE incubates informal peer relationships. There is inter-organisational communication between supply chain members (M1/02/PR/SUB1, ref. 73). The ADE indicates that such informal relationships are particularly useful with other professionals undertaking the same role within other universities (M1/02/OR/ADE, ref. 166). The market nature of the construction industry means different university organisations employ the same contractors. Informal relationships relate to autonomy, competence and relatedness.

10.5.8 Legal Framework and Tendering - Frameworks

Similar to the construction contracts there is a standard form of framework agreement (M1/03/05/006). The use of a framework facilitates the development of the supply chain relating to training and familiarity (M1/02/PR/SUB1, ref. 28, 126) (Competence). The framework agreement (JCT, 2005b) is approximately 15 pages long prescriptive document outlining how to undertake practice, which by its very nature restricts autonomy. However, the agreement is non-binding (JCT, 2005b, p. 3 cl. 6) indicating an element of autonomy. The MC1 indicates that frameworks and collaborative charters are not a prerequisite to collaborative working, with collaboration being present in other forms of contract, for example a traditional project, stating "where the team work well together, from an early stage, to me is collaboration". MC1 identifies, "if you have a group of people that really want to work collaboratively and together, then it does not matter that there is not a formal process in place".

The framework requires Contractors to show commitment “to their work, actively cooperate and work effectively with fellow contractors and University Representatives whenever and wherever the need should arise” (M1/06/02/005, p. 3). The framework includes collaborative characteristics similar to that included in the construction contract (Table 47; 03/05/006; /05/020; /05/021). The framework (JCT, 2005b) objectives include: zero health and safety incidents; teamwork and consideration for others; greater predictability of out-turn cost and

programme; improvements in quality, productivity and value for money; improvements in environmental performance and sustainability and reductions in environmental impact; right first time with zero defects; the avoidance of disputes; employer satisfaction with product and service; and enhancement of the Service Providers reputation and commercial opportunities.

The framework (JCT, 2005b) includes a number of features to promote identification including: collaborative working; supply chain integration; sharing information and know-how; communications protocol; confidentiality; risk assessment and risk allocation; health and safety; sustainable development and environmental considerations; value engineering; change control procedures; early warning; team approach to problem solving; and performance indicators. Supply chain integration includes design development; project planning; risk assessment and allocation; health and safety assessments and planning; assessing and improving upon environmental performance; sustainability and reduced environmental impact; value engineering and change control; quality control; early warning; and problem solving.

Mechanisms within the framework agreement also promote relatedness to issues important to the supply chain including organisational structures and decision making; collaborative working; sharing information and know-how; communications protocol; confidentiality; risk assessment and allocation; health and safety; sustainable development and environmental considerations; change control procedures; and team approach to problem solving. There are mechanisms in the framework agreement (JCT, 2005b) to promote competence including: organisational structures and decision making; sharing of information and know-how; and health and safety. Organisational structures and decision making includes educating both the employers and the supply chains personnel in relation to organisational procedures and conditions for intra vires. Sharing information includes the development of knowledge in an informal manner. The health and safety section relates to the training of the service provider's personnel, for example reference is made to the Construction Skills Certificate Scheme.

A change in the "past couple of years" is the University's move away from named sub-contractors (M1/02/PR/CM1, ref. 31), towards the main contractor having autonomy to procure sub-contractors from its own supply chain. With the CM1 indicating that "better relationships" between the contractor and sub-contractors form where the contractor has autonomy in the selection of works sub-contractors (M1/02/PR/CM1, ref. 31). Therefore,

providing contractors with autonomy in sub-contractor selection demonstrates relatedness. In addition, with the select list of sub-contractors, there is a perception at the University, that they were no longer being treated as a customer (M1/02/PR/EPM1, ref. 53-55). As such under the current framework, "the University does not manage relationships with suppliers, local or otherwise" (ADE; 02/PR/EPM1, ref. 23), indicating identification. Although the main contractors "will only use people that have been at the university for years" (M1/02/PR/SUB1, ref. 124), there is indication of feelings of a lack of relatedness within the supply chain.

> *"And in the days when we were nominated, we could go to the client and say, "Look, we're getting messed about here for money, you know, we've done three months now and not had our first valuation yet, they're probably on their fourth. Can you do something about it?" And the university would always step in. Not anymore, they're not interested. So we're losing interest, if you know what I mean" (M1/02/PR/SUB1, ref. 31).*

10.5.9 Part Summary

Table 54 relates the collaborative features from Chapter 9 Implementation to the regularity style Integration from Chapter 4 Motivation (see 4.6 Maturity Level IV Integration). The organisation uses training to develop practitioners. There is an organisational approach to provide information including that relating to design to the supply chain.

Table 54: Integration Regulatory Style Primary Case Study

Category	Collaborative Features	External Regulation	Introjection	Identification	Integration
Interpersonal Contract	acting in good faith; in an open and trusting manner; in a cooperative manner; continuity of relationships; integration of other stakeholders; lessons learned meetings; shared office spaces; soft skills; teambuilding processes; and training.		blame culture.	change control; and user contact.	lack of senior management support; lack of admin support; unrealistic project timescales; relationship building; and user interface promotes relatedness.
Value Management and Engineering	change control; risk management; value engineering and management; and whole life cycle costing.				upfront agreement - change management.
Performance Based Contracting; Performance Management	incentivisation; performance; performance based contract; performance management; performance indicators procurement route; and target contracts.	health and safety performance measurement with reactive procedures.	health and safety performance measurement with reactive procedures	cognitive autonomy – performance standards relate to performance of the supply chain.	
Practice, Procedures, Information Technology	BIM; organisational level documents; inter-operability of systems; and electronic meeting systems, and web 2.0-based collaboration technologies.	consequences for not complying with policies; obligatory compliance with policies; and onerous policies.	approachable contractors; negative introjection with contractors; and contractors assist avoid embarrassment.	dedicated university staff assist supply chain organisational specification; and relationships with manufacturers.	BIM autonomy; BIM training requirement; and training to improve practitioner competence.

Category	Collaborative Features	External Regulation	Introjection	Identification	Integration
Inter-organisational Knowledge and Initiatives	benchmarking; Considerate Constructors Scheme; CSCS; forward programme; grants; research and development; health and safety co-operation and risk reduction; and professional networks.	restriction - association members only			associations; and networks develop competence.
Legal Framework and Tendering	adjudication; change control; charters; contract and contract completeness; contractor selection; enhanced health and safety conditions; CSCS; collaborative working clauses, collaborative/integrated supply chain; communications protocol; design, build, operate contract; dispute ladder; enhanced sharing information; environment and sustainability; facilitation; incentivisation; fair payment; risk assessment and allocation; financial incentivisation; legislative compliance; overarching collaborative agreement; non-competitive tendering; performance indicators; multi part contracts; pre-construction services agreement; simplification of contracts; standard pre-qualification, contracts and frameworks; sub-contractor relationships; mediation; and value engineering.	standardised documents and contracts; contract allows for the use of external regulation with collaborative features; contracts restrict autonomy support; fluctuation of workload results in sub-contract financial incentivisation; prescriptive ways of working; formal process to fall back on; and lack of sub-contract relatedness – payment.		contracts include environment, sustainability, value engineering, performance measurement; procedural autonomy facilitates identification; and lack of organisational autonomy support.	standard contracts relate to supply chain competence; incentivisation thought repeat work; fair payment provisions; focus on partnering instead of contracts; non-binding frameworks; sub-contract procurement autonomy; move towards design and build contracting with traditional contracting restricting relatedness – buildability; and tender lists.

10.6 CHAPTER SUMMARY

Table 55 summarises this chapter's review of the Primary Case Study in respect of collaborative features. To make the table fit onto the page neatly the 'Collaborate Features' column is not on the table. The table includes recommendations. The table indicates that the hierarchy model for this theme of the research provides a basis for directors of estates to evaluate collaborative practice within their organisations. In line with Chapter 4 Motivation, the primary case study mixes regularity styles (see 4.7 Mixed Regularity Styles). The matrix is suitable for use as part of a reiterative management process, which is also available to form part of action learning research undertaken in future.

Table 55: Motivation Primary Case Study

Category	Maturity Level I External Regulation	Maturity Level II Introjection	Maturity Level III Identification	Maturity Level IV Integration	Recommendations
Interpersonal Contract		blame culture.	change control; and user contact.	lack of senior management support; lack of admin support; unrealistic project timescales; relationship building; and user interface promotes relatedness.	move organisation from blame to learning culture.
Value Management and Engineering				upfront agreement – change management	
Performance Based Contracting; Performance Management	health and safety performance measurement with reactive procedures.	health and safety performance measurement with reactive procedures.	cognitive autonomy – performance standards relate to performance of the supply chain.		
Practice, Procedures, Information Technology	consequences for not complying with policies; obligatory compliance with policies; and onerous policies.	approachable contractors; negative introjection with contractors; and contractors assist avoid embarrassment.	dedicated university staff assist supply chain organisational specification; and relationships with manufacturers.	BIM autonomy; BIM training requirement; and training to improve practitioner competence	move practice and procedures manual from being something to comply with to joint learning; and consider further web 2 technologies.
Design and Operation Integration					

Category	Maturity Level I External Regulation	Maturity Level II Introjection	Maturity Level III Identification	Maturity Level IV Integration	Recommendations
Inter-organisational Knowledge and Initiatives	restrictions - association members only			associations and networks develop competence.	
Legal Framework and Tendering	standardised documents and contracts; contract allows for the use of external regulation with collaborative features; contracts restrict autonomy support; fluctuation of workload results in sub-contract financial incentivisation; prescriptive ways of working; formal process to fall back on; and lack of sub-contract relatedness – payment.		contracts include environment, sustainability, value engineering, performance measurement; procedural autonomy facilitates identification; and lack of organisational autonomy support.	standard contracts relate to supply chain competence; incentivisation thought repeat work; fair payment provisions; focus on partnering instead of contracts; non-binding frameworks; sub-contract procurement autonomy; move towards design and build contracting with traditional contracting restricting relatedness – buildability; and tender lists.	stabilise workload to supply chain members; and consider further alternative methods of procurement and working that improve supply chain involvement in design.
Estates Strategy					
Shared Services					

CHAPTER 11 RISK

11.1 CHAPTER INTRODUCTION

Risk relates and develops a maturity model using the primary case study. The work: develops the collaborative features from Chapter 9 Implementation and Chapter 10 Motivation; develops the maturity model from Risk; relates the collaborative features to the maturity model. Content analysis from peer interviews identifies the presence of the challenges within the case study. A narrative then places the collaborative features at one of the three levels of maturity. The three levels being: (1) internal, (2) external, and (3) future risk challenges. Internal risk challenges relate to circumstances that occur at project level. External risk challenges impose on construction works from external influences. External risk challenges influence internal risk challenges. Internal risk challenges relate to programme, cost, quality, safety, overall performance and effectiveness. External challenges relate to politics, natural environment, available technology and organisational culture. Future risk challenges impact on the future activities of the case study organisation including asset utilisation, resource, human resource and operational effectiveness.

11.2 MATURITY LEVEL I INTERNAL RISK CHALLENGES

11.2.1 PART INTRODUCTION

The aim of this part is relate the sources, consequences and mitigation of risk from Chapter 5 to the primary case study. In order to achieve the aim the work: relates Table 24 (p.114) to the primary case study; and relates the collaborative features from the primary case study to risk mitigation in Table 35 (p.146).

11.2.2 RISK CONSEQUENCE RECONCILIATION

During data collection, interviewees talk for as long as they wish concerning ‘how’ and ‘why’ collaboration occurs in the organisation. Table 56 uses content analysis to identify the number of times words occur in interview transcripts. Table 56 includes factors that relate to Maturity Level I, specifically internal challenges. The factors include programme, cost, quality, safety, overall performance and effectiveness. The programme search includes the words ‘programme’, ‘time’, ‘complete’, ’completion’, ‘late’, ‘slow’, ‘delay’ and ‘schedule’. The cost search includes the words ‘cost’, ‘saving’, ‘conflict’ and ‘incentive’. Words that associate to cost that did not occur include ‘finance’, ‘accurate’ and ‘litigation’. The quality

search includes the words ‘quality’, ‘value’, ‘technical’ and ‘materials’. Words that associate to quality that did not occur include ‘defects’, ‘workmanship’, ‘buildability’ and ‘continuous improvements’. The safety search includes the words ‘safe’ and ‘accident’. The overall performance search includes ‘performance’, ‘profit’, ‘experience’, ‘deliver’, ‘benefit’, and ‘adversarial’. The effectiveness search includes ‘effect’ and ‘clarity’.

Table 56: Content Analysis Internal Challenges Participant

Risk Factor	Programme	Cost	Quality	Safety	Overall performance	Effectiveness	Total
ADE1	22	34	29	3	35	10	133
MC1	25	12	8	5	28	2	80
MC2	43	19	10	0	13	1	86
PM1	14	9	13	0	16	2	54
CM1	23	8	2	5	0	0	38
EPM1	32	4	5	1	16	0	58
SUB1	45	11	0	1	6	0	63
USR1	8	1	4	4	5	1	23
Total	212	98	71	19	119	16	535

Table 56 indicates significant occurrence of words that associate to programme (212nr), cost (98nr), quality (71nr) and overall performance (119nr); words that associate to safety (19nr) and effectiveness occur to a less of an extent (16nr). Use of words by practitioners indicates the presence of the internal challenges within the case study organisation. Table 56 excludes words from the interviewer. The interviews are conversations with a semi structure. The interviewer is an insider researcher with knowledge of the artefact. Table 57 identifies the number of times words by the interviewer occur. During the interviews, the interviewer refers to words that associate with each risk factor. The interviewer makes significantly less reference to the words than participants do. Using the words 167 times overall, versus the participants 535 times. The interviewer does not use a number of words the participants do, for example those words that relate to effectiveness.

Table 57: Content Analysis Internal Challenges Interviewer

Risk Factor	Programme	Cost	Quality	Safety	Overall performance	Effectiveness	Total
ADE1	5	8	4	0	13	0	30
MC1	3	5	5	1	3	0	17
MC2	2	5	6	0	7	0	20

PM1	5	1	1	0	6	0	13
CM1	10	5	5	4	7	0	31
EPM1	15	9	2	2	6	2	36
SUB1	3	3	0	1	3	0	10
USR1	2	0	1	4	3	0	10
Total	45	36	24	12	48	2	167

11.2.3 MITIGATION – PRACTICE, PROCEDURES, INFORMATION TECHNOLOGY

There is knowledge within the supply chain. The risk is that the knowledge may be lost where people leave the organisation. Chapter 9 Implementation and Chapter 10 Motivation identify a limited attempt to encapsulate supply chain knowledge. The emphasis is on the client organisation and its consultants providing the specification to the supply chain, evident by the organisational standard contracts, which this chapter explores elsewhere. The focus is on the supply chain meeting internal and external risks. The primary case study does however provide a standard specification for small elements of work, namely Design and Installation of Structured Cabling, Fibre Optic and Voice Cabling (M1/03/03/001); Electrical (M1/06/02/006); and Lift Specification (M1/06/02/007). The specifications only encapsulate a limited amount of supply chain knowledge.

The organisation does not make use of available technology in relation to communication. Chapter 9 Implementation and Chapter 10 Motivation establish that although the supply chain recognises the benefit of building information modelling, there is limited implementation within the primary case study. There are similar limits to project information management. Therefore, the case study organisation needs to develop further to achieve the external risk challenge of available technology.

11.2.4 MITIGATION – DESIGN AND OPERATION INTEGRATION

Implementation identifies that the Unit procures works using the Joint Contract Tribunal's lump sum contracts (M1/03/05/017-20). The contracts allow the client's representatives to design the works and the contractor organisation to construct the works (JCT, 2011p; JCT, 2011n; JCT, 2011; JCT, 2011q; JCT, 2011o). The exception is where an element of the works is a contractor's design portion. The traditional construction process separates construction and asset operation. Such separation limits the capacity of the supply chain to incorporate innovative knowledge into design, which relates to Maturity Level II (available

technology). The selection of the traditional procurement route manages certain external risks including those that associate to politics and the natural environment. The use of construction contracts on a project-by-project basis limits contractors' capacity to consider future challenges.

Chapter 9 Implementation identifies that the case study limits integration of the supply chain that undertakes construction works with the day-to-day maintenance of the asset. However, within organisational contacts and preliminaries there is provision for maintenance service agreements (M1/03/05/006, cl. A37/190). Provision for maintenance services do not form part of a number of projects undertaken by the organisation (M1/04/02/-; /04A/02/-). Data does not demonstrate the integration of the supply chain between construction and operation of assets.

11.2.5 PART SUMMARY

Table 56 and Table 57 relate the primary case study to the consequences of risk. Table 58 relates the discussion in this part of the thesis to risk mitigation in Chapter 5 (Table 35, p.146). The organisation uses contracts to compartment design, construction and operation. Knowledge transfer is one directional from the client to the supply chain. There is limited use of technology to support two-way transfer of knowledge at organisational level.

Table 58: Primary Case Study Internal Risk Mitigation

Category	Collaborative Feature	Risk Mitigation	Internal	External	Future
Practice, Procedures, Information Technology	BIM; organisational level documents; inter-operability of systems; electronic meeting systems, and web 2.0-based collaboration technologies.	knowledge management.	procedural document supplied to supply chain.	limited use of information technology to communicate; and procedural document deals with external risks.	limited encapsulation of supply chain knowledge.
Design and Operation Integration	design-construction integration; design and build; private sector engagement into design, construction and maintenance; frameworks; integrated project Insurance; private finance initiative; prime contracting; project partnering contract; management agent contracting; organisational standard procurement; soft landings; and two stage open book.	problem-solving process established; operation integration; and supply chain design integration.	Compartmentation of design and construction using traditional procurement; and contracts on a project by project basis.		Limited use of maintenance service agreements possible with standard contracts.

11.3 MATURITY LEVEL II EXTERNAL RISK CHALLENGES

11.3.1 PART INTRODUCTION

The aim of this part is relate the consequences and mitigation of risk from Chapter 5 to the primary case study. In order to achieve the aim the work: relates Table 29 (p. 130) to the primary case study; and relates the collaborative features from the primary case study to risk mitigation in Table 35 (p.146).

11.3.2 RISK SOURCE RECONCILIATION

Table 59 links external risk challenges to the case study by the number occurrences of words in the interview transcripts. The politics risk challenge search includes 'tax', 'regulation' and 'planning'. The search also includes 'politics', 'interest rate', 'insolvency', 'inflation', 'international', 'treaties', 'legislation', 'tax', 'building control', 'local' and 'approval' of which there are no occurrences. The 'natural environment' search includes 'environment', 'sustainability', and 'weather'. The search also includes the words 'site conditions', 'recycle' and 'waste management', which there are no occurrences. The risk challenge of 'available technology' includes 'technology', 'innovation', BIM and 'internet'. The search also includes 'lean construction', which there are no occurrences. The risk challenge of organisational culture includes 'stakeholder' and 'user'.

Table 59: Content Analysis External Challenges Participant

Risk Factor	Politics	Natural Environment	Available Technology	Organisational Culture	Total
ADE1	2	4	1	10	17
MC1	3	3	26	5	37
MC2	0	7	1	2	10
PM1	1	0	0	5	6
CM1	0	4	0	0	4
EPM1	4	0	1	0	5
SUB1	0	0	0	1	1
USR1	0	4	0	1	5
Total	10	22	29	24	85

The analysis includes eight participants. Four of the participants have an organisational perspective being senior management (M1/02/OR/ADE1; MC1; MC2; PM1) and four have more project-orientated roles within their organisations (M1/02/PR/CM1; EPM1; SUB1;

USR1). Participants with an organisational perspective use words that associate with external challenges more than those with a project-orientation do.

Table 60: Content Analysis External Challenges Interviewer

Risk Factor	Politics	Natural Environment	Available Technology	Organisational Culture	Total
ADE1	0	0	1	4	5
MC1	0	0	2	3	5
MC2	0	1	6	3	10
PM1	0	0	1	4	5
CM1	0	0	0	0	0
EPM1	2	1	0	3	6
SUB1	0	0	1	0	1
USR1	0	0	1	3	4
Total	2	2	12	20	36

Table 60 includes the number of times the interviewer uses the words. The interviewer makes use of words that associate to external challenges on fewer occasions than the participants do. In a number of instances, the participants make use of words that the interviewee does not; for example, the interviewee does not use words that associate to politics in all but one interview. In contrast, a number of interviewees use words associating to politics. In summary, the content analysis indicates practitioners within the organisation identify with external risk challenges.

11.3.3 MITIGATION – INTERPERSONAL CONTACT

Chapter 9 Implementation and Chapter 10 Motivation establish the presence of user interface. The external challenge of organisational culture readily applies to user interface. Table 61 indicates that participants use the words 'stakeholder' 14 and 'user' 10 times. Participants with an organisational perspective (M1/02/OR/ADE; MC1; MC2; PM1) use the words more than that with a project perspective (M1/02/PR/CM1; EPM1; SUB1; USR1). The lack of occurrences may relate to the use of different terminology with the EPM1 indicating, "Performance is having a happy client" (M1/02/PR/EPM1). Table 61 indicates the number of times the interviewer employs the words stakeholder and user. The occurrence of words aligns with that of participants; in that the occurrence increases with participant interviews with an organisational perspective. In summary, the content analysis identifies user interface to organisational culture that relates to external challenges.

Table 61: Organisational Culture Participant

Risk Factor	Participant		Interviewer	
	Stakeholder	User	Stakeholder	User
ADE1	7	3	1	3
MC1	3	2	1	2
MC2	2	0	1	2
PM1	2	3	2	2
CM1	0	0	0	0
EPM1	0	0	1	2
SUB1	0	1	0	0
USR1	0	1	0	3
Total	14	10	6	14

To mitigate consequences of risk sources that associate with organisational culture there is the Organisations Project Communication Procedure (M1/06/02/001), which includes a list of possible documents for project members to communicate. Table 62 relates the documents to risks that associate to levels of the maturity model. Similar to the procedural autonomy found in earlier parts of the DBenv thesis, the protocol provides autonomy for practitioners to consider other policies standards as appropriate, allowing consideration of all risk levels.

Table 62: Primary Case Study Communications Protocol - Risks

Document	Internal	Politics	Natural Environment	Available Technology	Organisational Culture	Future
electrical specification	✓					
data/structured cabling specification	✓					
environmental policy			✓			✓
contractors on site documents	✓					
other policies / standards as appropriate	✓	✓	✓	✓	✓	✓

11.3.4 MITIGATION – PRACTICE, PROCEDURES, INFORMATION TECHNOLOGY

Chapter 9 Implementation identifies the primary case study operates a practice and procedures manual accessible by staff and supporting consultants. The procedures manual refers to a

number of inter-organisational documents that relate to internal and external challenges (see Table 46, p.210. For example, eye protection relating to health and safety is an internal challenge.

Universities in the United Kingdom operate within a legislative framework. The (case study) University has an organisational approach to legislation compliance, for example, there is Equality and Diversity Policy, which is a requirement of The Equality Act (UK Parliament, 2010). The legislative compliance of consultants and professional staff is set out in the Directorate of Estates' Quality Manual Design Team Guide (M1/03/02/001), including legislative reference to: the requirement for carbon reductions in the Climate Change Act (UK Parliament, 2008a); and the Disability Discrimination Act 1995 (UK Parliament, 1995). Similarly, at tender stage "the Freedom of Information Act 2000 or other statutory or legal authority" (UK Parliament, 2000), limits the University's ability to maintain details of agreements with suppliers confidential (M1/05/01/003, p. 3). References to legislation are in contractors' documents including those for tender and the contract (see Table 63).

Table 63: Organisational Documentation & Legislation

Description	Generic Prelim Ref 03/05/006	SBC/XQ Prelim Ref 03/05/020
Statute		
CDM regulations (UK Parliament, 2007)	A11/160A	
Health and safety regulations generally	A12/240A	
The Income Tax (Construction Industry Scheme) Regulations 2005 (UK Parliament, 2005) The Income Tax (Construction Industry Scheme) (Amendment) Regulations 2013 (UK Parliament, 2013a) Construction Industry Scheme		A20 Fourth Recital
Contracts (Rights of Third Parties) Act (UK Parliament, 1999)		A20, s. 7
The Site Waste Management Plans Regulations (UK Parliament, 2008)	A30/155J	
Environmental Protection Act (UK Parliament, 1990)	A30/155J	
Byelaws or Regulations of the relevant Statutory Authority.	A33/410	
Hazardous to Health Regulations 2002 (UK Parliament, 2002a) Control of Substances Hazardous to Health (COSHH)	A33/710	

During construction work, legislation restricts access to works undertaken in buildings in student occupation, for example, there is a protocol for entry to student's rooms (M1/03/08/006). The protocol states, "Residents have a right enshrined in law to have quiet

enjoyment of their rooms" (M1/03/08/006 p. 01). The organisation recognises the external challenge of health and safety legislation (M1/06/01/17-18) and makes use of third party specifications, which are inter-organisational documents. In relation to the Health and Safety legislation (UK Parliament, 1974; UK Parliament, 2007) the university operates a permit to work scheme that is "used to certain types of works that are potentially hazardous" (M1/03/05/006, cl. A34/220K). Permits are required for (M1/03/05/006, cl. A34/220K): roof works (access control by key); hot works; confined spaces; excavations; electrical substations; works in asbestos contaminated area; and fire alarm systems. The same person authorises and cancels permits (M1/03/05/006, cl. A34/220K) which include a risk assessment; a method statement; time limit; and extension/handover procedures. The CM1 identifies the importance of the permit to work process, also recognises that the system changes every year and time restrictions make it difficult to implement (M1/02/PR/CM1, ref.155 & 157). Under the new framework, main contractors assist sub-contractors to comply with the permit to work system (M1/02/PR/EPM1, ref. 28-38).

The unit's pro-forma (M1/03/03/002) for stage reports includes: introduction & Project Team; Design; Cost; Programme and Phasing; Planning and Building Regulation Approval, Health and Safety; Procurement and Risk; which associate to maturity level I internal challenges. The pro-forma also refers to Planning and Building Control associating to maturity level II external challenges. Supporting this, the Primary Project stage C report (M1/04/01/002, p. 4-5) confirms the buildings status on the Statutory List of Buildings of Special Architectural or Historic Interest (English Heritage, 2013). There is no reference in the unit's pro-forma to sustainability. In contrast, the department's procedures manual refers to sustainability at each approval phase of a project (M1/06/02/003); indicating inconsistencies relating to organisational documents and risk challenges.

11.3.5 Mitigation – Legal Framework and Tendering

The PM1 and MC2 consider practitioner management during poor economic conditions has an effect on motivation levels to work collaboratively. The MC1 indicates that with the "old adversarial approach the price may be lower, but, due to all the disputes the prices ends up being higher because of delays, disputes, claims" (MC1/02/OR/MC1, ref. 178). In contrast, the MC1 indicates that a project undertaken in a collaborative and less adversarial manner tends to finish on time, to a better quality, with a more satisfied client and practitioners happier in their job (M1/02/OR/MC1, ref. 177).

The ADE indicates that tendering is "not something we would then start a Dutch auction about". The invitation to quote evaluation procedure (M1/03/05/004) includes two stages. The first stage involves the evaluation of contractors' submissions using a matrix, which includes criteria receiving a score or mark on a scale. The criteria includes commercial; resources and quality; time; health and safety; and waste and environment. There are a number of questions in each criterion. The scoring is undertaken in a prescriptive format, for example with a maximum score. Certain questions receive a pass or fail. The second stage applies weightings to the scores and concludes with auditable contractor selection. The invitation to quote (M1/03/05/004) evaluation mechanism selects contractors on a basis wider than cost alone. However, the Unit's Procedures Manual Flow Chart sets out a requirement for written justification to the Director/Deputy Director of estates for approval where the lowest tender is not acceptable (M1/03/01/001 p. 3); indicating a tendency towards competitive tendering and contractor selection on cost.

Competitive bidding restricts knowledge transfer between competing organisations (M1/02/OR/MC2, ref.115; 02/PR/EPM1, ref.255). The framework operational guidelines set out that contractor selection is on either a mini-competition or rotational basis (M1/03/05/005, p. 1); with the mini-competition using an invitation to quote (M1/03/05/005, p. 1). Dividing work on a rotational basis increases knowledge transfer between organisations. The invitation to quote procedure initiates when the organisational standard form (M1/03/05/007) is sent out to all contractors in the relevant lot (M1/03/05/005, p. 1). The invitation to quote form (M1/03/05/007) provides reference to the: project; works to be carried out; tender documents; invitation to quote weightings; call off terms and conditions; quote return date; post tender communication; and a request to confirm receipt.

The MC1 identifies that "you will always have your formalised stuff in terms of your sub-contracts, payments, tax and standard things that need to be put in place with sub-contractors, insurances, etc. there is a place for that". The case study organisation specifies construction contracts along with amendments that set out the allocation and management of risk (M1/03/05/006; /016-020). There are contract provisions to insure the risk that associate with external challenges. The contractor provides insurance in respect to personal injury, death and damage to property (JCT, 2011, pp. 66-67, cl 6). The case study being an employer opts with the standard building contract's insurance option C (M1/03/05/020, cl. 6.7). The employer provides for terrorism cover as part of the clause 6.7 insurance. Option C provides

for the employer to take out joint names insurance for reinstatement cost of existing structures and contents following a specified event and an all risks policy for the works (JCT, 2011, pp. 87-91 Sch. 3).

The contract documents, whether inter-organisational or not, requires works to be undertaken and communicated in accordance with external regulation. Where the specification is not met, the organisational contracts (based on industry standard contracts) set out contractual recourse, in other words perform in accordance of the requirements or we will see you in court. The organisations contracts provide for: project documents (Table 43; M1/03/05/006; /05/020-021); organisational documents (Table 44; 03/05/006; /020); risk allocation (M1/03/05/017; /018; /020); maintenance (M1/03/05/006, ref. A37); danages (M1/03/05/016-020); legislative compliance (Table 63); competence checking (M1/03/05/020, A20, Fourth Recital & cl. 4.7); initiatives WRAP (M1/03/05/006, p. 12, ref. A30/155J) and inter-organisational standards, guidance and the likes (Table 46).

The contracts sets out that specified perils include "fire, lightning, explosion, storm, flood, escape of water from any water tank, apparatus or pipe, earthquake, aircraft and other aerial devices or articles dropped therefrom, riot and civil commotion, but excluding Excepted Risks" (JCT, 2011, p. 69 cl. 6.8). Excepted risks include radioactivity, pressure waves from aeroplanes and acts of terrorism (JCT, 2011, p. 69 cl. 6.8). Where the specified perils occur there is provision for terminating the employment of the main contractor (JCT, 2011, p. 79 cl. 8.11.1). There is also provision for other external factors to terminate the contractors employment including force majeure, negligence of statutory undertakers, civil commotion and terrorism; any act by the "United Kingdom government of any power which directly effects the execution of the works"; and insolvency (JCT, 2011, p. 79 cl. 8).

11.3.6 PART SUMMARY

Table 59 and Table 60 relate the primary case study to the sources of risk. Table 64 relates the discussion in this part of the thesis to risk mitigation in Chapter 5 (Table 35, p.146). The organisation manages external risks using an organisational procedures system that includes construction contracts. There are tendencies towards lowest price tendering, however, there are signs that the organisation is starting to move away from transactional to relational contracting.

Table 64: Primary Case Study External Risk Mitigation

Category	Collaborative Feature	Risk Mitigation	Internal	External	Future
Interpersonal Contract	acting: in good faith; in an open and trusting manner; in a cooperative manner; continuity of relationships; integration of other stakeholders; lessons learned meetings; shared office spaces; soft skills; teambuilding processes; and training.	conflict identification; personnel development; and top management supported teamwork.	organisational communications procedure promotes autonomy.	organisational communications procedure promotes autonomy	organisational communications procedure promotes autonomy.
Practice, Procedures, Information Technology	BIM; organisational level documents; inter-operability of systems; and electronic meeting systems, web 2.0-based collaboration technologies.	knowledge management.	procedural document supplied to supply chain.	limited use of information technology to communicate; procedural document deals with internal and external risks; and reference to legislation in organisational documents.	limited encapsulation of supply chain knowledge; lack of relatedness in the implementation of organisational procedures; limits to consistency in procedural documents; and element of procedural autonomy.

Category	Collaborative Feature	Risk Mitigation	Internal	External	Future
Legal Framework and Tendering	adjudication; change control; charters; contract simplification; contract completeness; contractor selection; enhanced health and safety conditions; CSCS; collaborative working clauses, collaborative/integrated supply chain; communications protocol; design, build, operate contract; dispute ladder; enhanced sharing information; environment and sustainability; facilitation; incentivisation; fair payment; risk assessment and allocation; financial incentivisation; legislative compliance; overarching collaborative agreement; non-competitive tendering; performance indicators; multi part contracts; pre-construction services agreement; simplification of contracts; standard pre-qualification; standardisation contracts and frameworks; sub-contractor relationships; mediation; value engineering	previous work experience; relational contracting; fair profit assumption	standard contract and tender documents and process	standard contracts and documents manage external risks	tendencies towards lowest cost tendering - lack of fair profit assumption; feedback to contractor's following tender; competitive bidding restricts knowledge transfer; possible to let tenders on a rotational basis enabling knowledge transfer

11.4 MATURITY LEVEL III FUTURE RISK CHALLENGES

11.4.1 PART INTRODUCTION

The aim of this part is relate the consequences and mitigation of risk from Chapter 5 to the primary case study. In order to achieve the aim the work: relates Table 33 (p. 144) to the primary case study; and relates the collaborative features from the primary case study to risk mitigation in Table 35 (p.146).

11.4.2 RISK CONSEQUENCE RECONCILIATION

In Table 65, participants identify with future risk challenges by the occurrence of words in the interview transcripts. The 'asset utilisation' search includes the words 'asset', 'return', 'maintenance', 'operation' and 'emergency'. The search also includes 'occupy', 'occupier' and 'yield', of which there are no occurrences. The 'resource' risk challenge search includes the words 'supplier', 'suppliers', 'supply chain', 'relations', 'relationship', 'relationships', 'trust' and 'together'. The search also includes 'alliance', of which there are no occurrences. The 'human resource' search includes 'human', 'train', 'employ', 'employee', 'employer', 'competence', 'competent' and 'ability'. The search also includes 'chaperon', of which there are no occurrences. The 'Operational Effectiveness' search includes 'product', 'research', 'public', 'image' and 'social'. The search also includes 'teach', of which there are no occurrences.

Table 65: Content Analysis Future Challenges Participant

Risk Factor	Asset Utilisation	Resource	Human Resource	Operational Effectiveness	Total
ADE1	11	28	8	1	48
MC1	0	53	1	10	64
MC2	2	15	2	3	22
PM1	2	44	3	3	52
CM1	0	11	1	3	15
EPM1	1	27	2	4	34
SUB1	2	4	2	1	9
USR1	1	5	2	5	13
Total	19	187	21	30	257

The participants use the words 257 times overall (Table 65), and the interviewer 99 times (Table 66). Both the participants and the interviewee use words that associate to resource

most frequently. The interviewees with an organisational perspective use the words more frequently (186nr) than the ones with a project orientation (71nr). In summary, the interviewees and the researching practitioner identify with all of the risk factors that associate with future challenges.

Table 66: Content Analysis Future Challenges Interviewer

Risk Factor	Asset Utilisation	Resource	Human Resource	Operational Effectiveness	Total
ADE1	0	13	3	3	19
MC1	0	6	1	2	9
MC2	4	3	5	2	14
PM1	0	9	1	1	11
CM1	0	8	0	0	8
EPM1	10	17	0	0	27
SUB1	1	3	0	1	5
USR1	0	3	0	3	6
Total	15	62	10	12	99

11.4.3 MITIGATION – INTERPERSONAL CONTRACT

Chapter 5 Risk relates a lack of senior management support to: slow decision-making; inappropriate organisational structure to support collaboration; associate of estates with operation costs; and as a barrier to knowledge management. The PM1 supports this when suggesting that where the client wishes a project to be collaborative they need to go further than instructing the team to act in that nature, to a position of where they are leading the supply chain by example, rather than searching for every contractual remedy open to them (M1/02/OR/PM1, ref. 42). Similarly the MC1 indicates that the client needs to set the tone in order to achieve collaboration on projects "if the client is hardnosed and is more concerned with the bottom line and is not particularly bothered of what he considers to be fluffy stuff, he just wants the project done the quickest time shortest period you may not get that spirit of collaboration" (M1/02/OR/MC1, ref. 100). The existence of procurement autonomy indicates an element of senior management support in relation to collaborative practice; providing programme, cost, quality and governance requirements are met.

The case study organisation's estate strategy (M1/05/04/001) demonstrates senior management support relating to the development of the estate. In contrast, in Chapter 10 Motivation, evidence emerges to suggest there are limitations to senior management support

within the organisation. The limitations relate to negative introjection that associates to external regulation. One way to improve relationships is though teambuilding. The MC1 indicates, "I think team building is a really good idea. I think certainly to kick off relationship with groups of people that have not necessarily met each other before having a team building event can be very beneficial" (M1/02/OR/MC1, ref. 30). The CM1 indicates that the Project team met on occasions, outside work (M1/02/PR/CM1, ref. 17-19).

McDermott, et al.'s (2005, p. 24) study employs content analysis to explore trust in interviews. The content analysis explores the number of occurrences the certain words occur in transcripts. The words allocate to categories. Table 67 summarises similar content analysis of eight interviews from the case study. Content analysis is not perfect in relation to the case study data, for example the category 'reputation'. The 'reputation' category includes a search for the words of 'reputation', 'respect' and 'values'. Participants use the word 'respect' in a non-relatable context to McDermott, et al.'s (2005) work (M1/02/PR/SUB1, ref.7; /CM1, ref. 47; 141; 143; 147; 175; /OR/PM1, ref.58; /CM1, ref.130); representing eight out of eighteen occurrences of the word. Therefore, in relation to the word 'respect' a weakness is evident.

Table 67: Content Analysis Trust Participant

Category	ADE 1	MC1	MC2	PM1	CM1	EPM 1	SUB 1	USR 1	Total
Trust	0	8	0	2	0	1	2	0	13
Relationships	7	4	10	10	3	4	0	3	41
Value	16	6	10	10	2	3	0	0	47
Confidence	0	0	0	0	0	0	0	0	0
Competence	0	0	0	0	0	0	0	0	0
Professional	3	0	1	0	2	0	0	0	6
Promise keeping	4	0	0	1	0	2	0	0	7
Fairness / Reasonableness	0	0	0	0	0	0	3	0	3
Mutuality / Reciprocity	7	0	0	0	0	0	0	0	7
Honesty / integrity	1	0	0	0	0	1	0	1	3
Openness / communications	7	2	1	1	0	0	0	1	12
Values / Ethics	0	0	0	1	0	0	0	0	1
Reputation	4	2	0	1	9	0	1	0	17
Blame Culture	0	0	0	0	0	0	0	0	0

Source: Categories based on McDermott, et al. (2005)

The CM1, EPM1, SUB1 and USR1 (M1/02/PR/-) provide the research with a perspective from practitioners, without managerial positions working at project level. In contrast, ADE1, MC1, MC2 and PM1 (M1/02/OR/-) offer the research an organisational perspective. Participants with an organisational perspective, significantly use words that associate to McDermott, et al.'s (2005, p. 24) categories of 'relationship' and 'value'. During the interviews participants with an organisational perspective (M1/02/OR/ADE1; /MC1; /MC2; /PM1) mention words that McDermott, et al. (2005, p. 24) identify 119 times in total. Out of the 119 times, words that associate to the category 'relationships' occur on thirty-one and 'value' forty-two occasions. The frequent use of the words by the interviewees with an organisational perspective results in the same categories being the most popular overall. All participants use McDermott, et al.'s (2005, p. 24) words 157 times.

The ADE1 uses words that associate to the categories 'openness / communication' and 'Mutuality / Reciprocity' more than all the other interviewees together. McDermott, et al. (2005) identify the words 'partnering', 'relating', 'friendship', 'support', 'co-operation' to the category 'relationships'. ADE1 uses the word 'support' six times and the word 'partnering' one time. ADE1 uses the word 'expectations' seven times from the category 'mutuality / reciprocity'. ADE1 does not use other words from the category including 'mutuality', 'reciprocity', 'obligations' and 'duties'. During the interview with EPM1, the interviewer uses the word 'support' four times. In the same conversation, the interviewer uses the word 'support' eleven times.

Overall, the interviewer uses the forty-three words that McDermott, et al. (2005, p. 24) identifies, thirty-eight times in the same interview (M1/02/PR/EPM1). Therefore, the interviewer appears to influence the participant's use of words. The interviewer uses the word 'co-operation' 9 times; in contrast, the participant does not use the word once (M1/02/PR/EPM1). Indicating limits to the interviewers capacity to be lead. Value engineering is a topic that the interviewer brought to the interviews. The interviewees mention value engineering a significant number of times (M1/02/OR/MC1, ref. 130 x 2nr; 132; 134; /ADE, ref. 178 x 3nr; /MC2, ref. 93 x 2nr; 95 x 2nr; 99; 101; 163; /PM1, ref. 128; /PR/EPM1, ref. 234).

Table 68: Content Analysis Resource Participant

Risk Word	Supplier	Supply chain	Relation	Alliance	Trust	Together
ADE1	2	7	7	0	0	11
MC1	4	8	12	0	8	20
MC2	1	3	2	0	0	9
PM1	2	20	11	0	2	5
CM1	0	0	9	0	0	2
EPM1	4	0	12	0	1	9
SUB1	0	0	0	0	2	2
USR1	0	0	5	0	0	0
Total	13	38	58	0	13	58

The content analysis (Table 68) demonstrates the perceptions of interpersonal contact with participants using words such as ‘relations’, ‘relationship’, ‘relationships’ ‘trust’ and ‘together’. The word ‘alliance’ does not occur in interview transcripts; however, the words ‘trust’ occurs thirteen and ‘together’ fifty-eight times. The words ‘relations’, ‘relationship’, ‘relationships’ occur fifty-eight times. The words supplier and supply chain occur thirteen and thirty-eight times. The use of the words indicates an understanding of supply chain management. The interviewer (Table 69) uses the words ‘relationship’ and ‘relations’ twenty four times, however, only uses the word ‘together’ twelve times. The interviewer does not use the word ‘trust’ and ‘alliance’ at all.

Table 69: Content Analysis Resource Interviewer

Risk Word	Supplier	Supply chain	Relation	Alliance	Trust	Together
ADE1	1	6	3	0	0	3
MC1	1	2	1	0	0	2
MC2	0	1	2	0	0	0
PM1	1	3	5	0	0	0
CM1	2	1	5	0	0	0
EPM1	3	5	6	0	0	3
SUB1	0	0	1	0	0	2
USR1	0	0	1	0	0	2
Total	8	18	24	0	0	12

The organisational construction contracts contain a communications protocol (JCT, 2011, p. 32 cl. 1.7). The contract requires communication following the occurrence of certain events, for example prolongation of the completion date, making good defects, valuations and final accounts. Therefore, the communications protocol achieves Maturity Level I internal

challenges. In addition, there are collaborative features that relate to communication in the organisational construction contracts. Chapter 9 Implementation reconciles the collaborative features of the standard building contract without quantities, with that of the primary case study's consultant appointment and framework agreement (Table 47, p.213). The characteristics include: collaborative working; communications protocol; enhanced health and safety; environment and sustainability; value engineering; financial incentivisation; change control/quotation; performance indicators; and dispute ladder/negotiation. The use of the collaboration clause indicates the organisation reaches to achieve characteristics associating to maturity level III including supply chain management and relationships.

11.4.4 MITIGATION – VALUE MANAGEMENT AND ENGINEERING

The MC1 relates change management to contractual mechanisms (M1/02/OR/MC1, ref. 161-163). The case study organisation specifies the use of construction contracts along with amendments that set out the allocation and management of risk (M1/03/05/006; /016-020). For example, the contracts manage and allocate risk associating to adjustment of the contract sum (Table 70). One mechanism relates to relevant matters. In addition, there is a mechanism that relates to time that associates with relevant events (JCT, 2011, p. 43 cl. 2.29). Therefore, the case study organisation has formal contractual mechanisms to implement change to deal with internal risk challenges.

Table 70: Variations SBC/XQ

Clause	Description	CA Notification Precedent	Retention cl.4.16
4.3.1	ADJUSTMENT OF THE CONTRACT SUM		
5.2.1	CA Instructions including that associated with provisional sums	Yes	Yes
5.2.1	Work where an approximate quantity is included in the Contract Bills	No	Yes
5.3.3	Accepted Variation Quotation/s and/or Acceleration Quotation/s	Yes	Yes
6.10.2	Increase in the cost of Terrorism Cover insurance during policy extensions (option A insurance)	No	No
4.3.2	DEDUCTIONS FROM THE CONTRACT SUM		
2.10	Incorrect setting out where not rectified.	Yes	Yes
2.14.1	Inadequacy in employers requirements.	No	Yes

Clause	Description	CA Notification Precedent	Retention cl.4.16
2.38	Works notified by the CA not in accordance with the contract in the schedule of defects.	Yes	Yes
3.11	Costs associated to employing another where the contractor does not comply with an instruction.	Yes	Yes
3.18.2	Works notified by the CA not in accordance with the contract	Yes	Yes
4.3.2.1	All Provisional sums and Approximate Quantities.	No	Yes
4.21	Fluctuations.	No	No
5.6.2	Where the additional or substituted work is of similar character to work set out in the Contract Pricing Document but is not executed under similar conditions, for example quantities.	Yes	Yes
5.8.3	Where the additional or substituted work is of similar character to work set out in the CDP, but not executed under similar conditions, for example quantities.	Yes	Yes
5.9	Change in conditions for other contractor's design portion work following a variation, provisional sum for undefined work, or defined work where description differs from contract bills.	Yes	Yes
6.16.2	Breach of Joint Fire Code	No	Yes
4.3.3	ADDITIONS TO THE CONTRACT SUM		
2.6.2	Insurance for early use of the works by employer (Insurance option A).	No	No
2.14.1	Inadequacy in employers requirements.	No	Yes
2.18	Emergency compliance with Statutory Requirements, where works do not form part of a CDP.	No	Yes
2.21	Payment of statutory fees, where not already in Contract sum.	No	No
2.23	Infringement of copy right caused by CA Instruction.	No	No
3.17	Cost of opening up the works where instructed by CA and no defect is found.	Yes	No
4.14.2	Costs associated with the contractor suspending the works due to payment.	No	No
4.21	Fluctuations.	No	No
4.23-5	Loss and Expense associated to relevant matters.	Yes	No
5.3	Variation quotation (Schedule 2).	Yes	Yes
5.9	Change in conditions for other contractor's design portion work following a variation, provisional sum for undefined work, or defined work where description differs from contract bills.	Yes	Yes

Clause	Description	CA Notification Precedent	Retention cl.4.16
6.5	Insurance associated with injury or damage to property where instructed	Yes	No
6.10.3	Other Terrorism Cover insurance (option A insurance)	No	No
6.11.3	Increase in the cost of Terrorism Cover insurance due to non-availability. Notice provided by employer.	No	No
6.11.5.2	Remedial works when associated to terrorism where there is not availability of terrorism cover at renewal and the client has not terminated the contact.	No	No
6.17	Emergency measures in relation to the joint fire code, including amendments or revisions after the base date.	No	No
B.2.1.2	Contractor taking insurance out where the employer fails to take out insurance. Schedule 3	No	No
C.3.1	Ditto	No	No
B.3.5	Remedial works where insurance is provided by the employer (Schedule 3).	No	No
C.4.5.2	Ditto	No	No

The informal change management process occurs prior to contractual mechanisms, providing "clarity why is the cost, before people commit [sic]" (PM1, ref.104). The participants identify change management with internal challenges (M1/02/OR/ADE1, ref. 126; /MC2, ref.30-31; /PM1, ref. 104; /CM1, 82-92). Informal change management considers other things than internal challenges, which the ADE1 refers to as "reputational", which relates to future challenges (M1/02/OR/ADE1, ref. 126). The CM1 refers to the future challenges of asset utilisation and trust (M1/02/OR/MC1, ref. 180). Therefore, practitioners working for the organisation consider future challenges when considering change. However, there is limited auditability to link future challenges to informal change management.

Consideration of life cycle costs relates to the external challenge of asset utilisation, in particular maintenance and operational efficiency. Chapter 9 Implementation establishes the organisation undertakes life cycle costing informally. The informal nature makes it difficult to find evidence from within the organisation, that life cycle costing is undertaken to manage external and future challenges. Supply chain members can see the benefit to the client of life cycle considerations (M1/02/OR/CM1, ref. 180). The ADE indicates that that lifecycle

costing being "not something that's been effective in the whole business case of having a project approved" (M1/02/OR/ADE, ref.75). In future things may be different for the organisation with the ADE1 indicates that carbon reduction is making practitioners consider operational running costs (M1/02/OR/ADE, ref.75). The ADE1 confirms, "What's happening now is there's a need to think about operationally running costs from a carbon perspective as well as a cost from an energy consumption perspective" (M1/02/OR/ADE, ref. 75). Supporting this, one objective of the primary project is to offer energy savings over the life cycle of the estate. Therefore, the rational for the project includes a consideration of life cycle costs (M1/04/01/002, p. 1).

11.4.5 Mitigation – Performance Based Contracting, Performance Measurement

The Directorates' Procedure Manual sets out that the deliverable at stage A/B is to include Key Performance Indicators with benchmarking relating to environmental sustainability (M1/06/02/003). Similarly reports up to RIBA stage F, include an environmental sustainability project tracker (M1/06/02/003). In contrast, the design services procedures manual project flowchart (M1/03/01/001) does not refer to sustainability, indicating inconsistencies in the organisational approach. In addition, key performance indicators, benchmarking and tracking is not undertaken on a number of projects by the organisation (M1/04/02/-; /04A/02/-).

Failure to implement process relates partially to scepticism in the organisation, with MC2 indicating that hard collaborative tools, such as performance management, in many instances, do not appear to be what clients want and there is a lack of training in their use (M1/02/OR/MC2, ref. 25-28, 30-32, 43). With such systems making requests for contractors to produce documents that have little obvious effect (M1/02/OR/MC2, ref. 25-28, 30-32, 43). Another branch of thought is that data from the Directorates' procedures manual (M1/06/02/003) is slightly more recent than that from Unit's Manual (M1/03/01/001); therefore, the initiative is under implementation.

11.4.6 Mitigation – Inter-client organisational Knowledge and Initiatives

Chapter 9 Implementation (p.183) and Chapter 10 Motivation (p.224), identify the case study participates with professional networks. One such professional network includes the Association of University Directors of Estate. AUDE is an organisation setup to assist inter-

organisational collaboration during the strategic planning, management, operation and development of higher education estates and facilities; through provision of management tools, conferences, discussion forums and training events for members (AUDE, 2013a). Chapter 10 Motivation identifies the relationship between the professional institutions and professional development. Therefore, professional networks achieve the future risk challenge of human resource. AUDE (2013c) also provides discourse and guidance concerning space management and carbon emissions. Therefore, professional networks also assist with the future challenge of asset utilisation.

Chapter 9 Implementation identifies a number of initiatives the case study organisation adopts including: WRAP; 'halving waste to landfill' (M1/03/08/008; /05/02/001; /04/001, p. 8); and BREEAM (M1/05/02/003). The case study's estates strategy refers to BREEAM Higher Education (M1/05/04/001, p. 19). The Association of Directors of Estate and BRE, along with the educational funding councils provide the initiative BREEAM for higher education (AUDE, 2009). The university sets out an aspiration to achieve BREEAM 'very good, (M1/03/02/001, p. 5), on all projects over the value of £300,000 (M1/05/02/003). The Estates Strategy 2010-2020 sets out that all new building capital developments are to comply with a BREEAM 'excellent' rating (M1/05/04/001, p. 19). Refurbishments are to achieve a BREEAM 'very good' rating (M1/05/04/001, p. 19).

To achieve a very good rating there is a requirement to score between 55% and 70% (Barlow, 2011, p. 14). An excellent rating requires a score between 70% and 85% (Barlow, 2011, p. 14). Although the requirement to undertake a BREEAM method to assess the environment is set out in the contract documents, the process is not undertaken on a number of projects by the organisation (M1/04A/02/-, /04/02/-). The researching practitioner notes however that the Organisation undertook BREEAM assessment on a previous £30,000,000 scheme, on which he provides quantity-surveying services (CH/01/001). The BREEAM assessment includes a number of categories including 'management', 'health and wellbeing', 'energy', 'transport', 'water', 'materials', 'waste', 'land use and ecology' and 'innovation' (Barlow, 2011, pp. 11-13). Within the categories, the scheme includes reference to items that relate to both external and future risk challenges.

The case study measures the quality of the estate using the Higher Education Statistics Agency's (HESA) estates management statistics. The organisational objective is to increase the proportion of the estate that achieves A or B. Category A is as new condition and B

sound, operationally safe and exhibiting only minor deterioration (Higher Education Statistics Agency, 2013a). As the organisation seeks to improve the estate to A or B, there are parts of the estate that achieves C and D. Category C is operational but needs major repair or replacement in the short to medium-term and D being inoperable or serious risk of major failure or breakdown (Higher Education Statistics Agency, 2013a).

The case study aims to improve the functional suitability of the estate using the Higher Education Statistics Agency's functional suitability indicator. The organisation aims to achieve a category of 1 and 2. Grade 1 Excellent requires rooms/buildings to fully support current activities, with no negative impacts upon functions; and 2 Good the room/building "provides a good environment for the current function in all or most respect" (Higher Education Statistics Agency, 2013c). As the organisation seeks to improve to category 1 and 2, there are parts of the estate that achieve category 3 and 4. Category 3 is that rooms/buildings provide a reasonable environment for current functions in many respects, however have a number of shortfalls and 4 the room(s)/building(s) fail to support current functions and/or are unsuitable for current use the "room(s)/building(s) fail to support current functions and/or are unsuitable for current use" (Higher Education Statistics Agency, 2013c).

Chapter 9 Implementation identifies organisations the case study specifies to ensure competence of resources including CSCS; IOSH; CITB; HSE; ECA, NICEIC, JIB, IRATA and CHAS. The specification of the organisations promotes a competent workforce to undertake work on the estate. The selection of a competent workforce from the existing pool relates to an external challenge. However, undertaking an active role in the development of the workforce relates to a future challenge. IOSH is the chartered body for health and safety professionals. There are six categories to membership specifically affiliate, associate member, technical member, graduate member, chartered member and chartered fellow (IOSH, 2013). Membership of IOSH is subject to holding certain qualifications, from specific Universities that develop compliant courses. Therefore, the institutions capacity to develop future human resource is evident (IOSH, 2013). There is also a requirement for current members to continue professional development (IOSH, 2013), demonstrating capacity for future development of the workforce.

11.4.7 MITIGATION – LEGAL FRAMEWORK AND TENDERING

Table 47 indicates that both the organisational contract and framework agreement have provisions to manage sustainability. The use of the framework also facilitates the use of the same contracting organisations allowing relationships to form and the benefits of interpersonal contact. Tender documents include (M1/03/01/001 p. 3): letter, evaluation, generic preliminaries, project specific preliminaries; and return labels (M1/03/05/002); and form of tender with either bills of quantities or schedule of works. Tenders return in sealed envelopes to the Directorate of Estates and Facilities (M1/03/05/002). Unsuccessful tenderers receive information including (M1/03/05/012): the range of tender figures; score against criteria; and ranges of scores against criteria. The criteria align with the construction works framework's invitation to quote evaluation matrix (M1/03/05/004). The provision of feedback demonstrates consideration of future resource challenges. Supporting this Chapter 10 Motivation identifies that the case study's framework develops the supply chain.

Autonomy provides freedom for innovation. Chapter 9 Implementation (p.183) and Chapter 10 Motivation (p.224), establish that the case study organisation provides practitioners undertaking services with an element of procurement autonomy. During the Project, there is autonomy to procure the works using a two stage tendering process. The process facilitates contractor involvement during the design of work. Where there is autonomy, by nature, practitioners are working outside specific explicit regulation.

11.4.8 MITIGATION – STRATEGY

The primary case study has a strategic plan (M1/05/01/004) that includes three goals, namely: (1) world-class research; (2) outstanding learning and student experience and (3) social responsibility. The strategic plan's enabling strategy includes eight items namely: (1) quality people; (2) world-class estate; (3) managing information; (4) internationally competitive funding; (5) a reputation for excellence; (6) an international institution; (7) quality processes; and (8) environmental sustainability. The goals and challenges set out clear organisational future challenges including that relating to operational effectiveness. The Universities estates strategy (M1/05/04/001) aligns with the strategic plan including that relating to the quality of the state and sustainability. In Table 71 the Estates Strategy's aims and objectives reconcile with the challenges from Risk. A number of the external and future challenges reconcile with

the estates strategy. However, within the strategy (M1/05/04/001) there is limited provision in respect of external risk challenges associating with resources and human resources.

Table 71: Estates Strategy and Risk Challenges

Estates strategy aim/objective	Challenges	
To provide a physical environment to create a sense of place and through the medium of architecture and urban design reflect the University's academic ideals.	Future	Operational Effectiveness
To ensure that the estate meets all Health & Safety, statutory, regulatory and HEFCE requirements.	External	Politics
To ensure that all property comprising estate is properly maintained to an appropriate and agreed standard	Future	Asset utilisation
To obtain best value from and for estates assets	Future	Asset utilisation
To ensure that the estate and buildings meet the University's research, teaching and learning, academic, service and social needs	External	Organisational culture
	Future	Operational Effectiveness
To provide a basis for capital planning and to identify priorities for property investment	Future	Asset utilisation
To give the University the flexibility to adjust to changing circumstances and respond to external initiatives	External	Politics
	Future	Asset utilisation, operational effectiveness
To provide a development context and urban design framework to manage future developments	Future	Organisational culture
To complete development programmes to agreed time, cost and quality targets	Internal	Programme, cost, quality
To ensure the University achieves targets as set out in its carbon management plans	External	Natural Environment
To increase the quality of the estate measured by the proportion being in category A or B (HESA Estate Management Statistics)	Internal	Safety
	External	Politics
To improve the functional suitability of the estate measured by the proportion being in category 1 or 2 (HESA Estate Management Statistics)	External	Organisational Culture
	Future	Asset Utilisation, operational effectiveness

11.4.9 MITIGATION – SHARED SERVICES

Chapter 9 Implementation (p.183) and Chapter 10 Motivation (p.224), identify the case study shares frameworks for the procurement of consultants and waste contracts. However, does not share contracts for the purposes of the procurement of construction works. Inter-organisation collaboration of procurement has the potential to reduce peaks and troughs in workload, meeting the challenge of available resource.

11.4.10 PART SUMMARY

Table 65 and Table 66 relate the primary case study to the sources of risk. Table 72 relates the discussion in this part of the thesis to risk mitigation in Chapter 5 (Table 35, p.146). The organisation manages future risks, for example as evident in the estates strategy. However, there is limited attempt to consider future challenges in the organisational procedural documents.

Table 72: Primary Case Study Future Risk Mitigation

Category	Collaborative Feature	Risk Mitigation	Internal	External	Future
Interpersonal Contract	acting in good faith; in an open and trusting manner; in a cooperative manner; continuity of relationships; integration of other stakeholders; lessons learned meetings; shared office spaces; soft skills; teambuilding processes; and training.	conflict identification; personnel development; and top management supported teamwork.	organisational communications procedure promotes autonomy	organisational communications procedure promotes autonomy	autonomy organisational communications; informal teambuilding promotes relationships; and organisational communication procedure promotes relationships
Value Management and Engineering	change control; risk management; value engineering and management; and whole life cycle costing.	provisions for continuous improvement	contractual mechanisms manage change		carbon agenda is driving considerations of life cycle costs; informal change management considers future challenges; and limited life cycle considerations – budget approval.
Performance Based Contracting; Performance Management	incentivisation; performance; performance based contract; performance management; performance indicators procurement route; and target contracts.		scepticism of hard collaborative tools – process driven		environmental tracker under implementation; and requirement for training in processes.

Category	Collaborative Feature	Risk Mitigation	Internal	External	Future
Inter-client organisational Knowledge and Initiatives	benchmarking; Considerate Constructors Scheme; CSCS; forward programme; research and development; grants; health and safety co-operation; and health and safety risk reduction; and professional networks.		competence checking associations		associations, initiatives and shared data provide inter-organisational guidance and training on future challenges; and shared data.

Category	Collaborative Feature	Risk Mitigation	Internal	External	Future
Legal Framework and Tendering	adjudication; change control; charters; contract simplification; contract completeness; contractor selection; enhanced health and safety conditions; CSCS; collaborative working clauses, collaborative/integrated supply chain; communications protocol; design, build, operate contract; dispute ladder; enhanced sharing information; environment and sustainability; facilitation; incentivisation; fair payment; risk assessment and allocation; financial incentivisation; legislative compliance; overarching collaborative agreement; non-competitive tendering; performance indicators; multi part contracts; pre-construction services agreement; simplification of contracts; standard pre-qualification; standardisation contracts and frameworks; sub-contractor relationships; mediation; and value engineering.	previous work experience; relational contracting; and fair profit assumption.	standard contract and tender documents and process	standard contracts and documents manage external risks	tendencies towards lowest cost tendering - lack of fair profit assumption; frameworks develop contractors; feedback to contractor's following tender; competitive bidding restricts knowledge transfer; possible to let tenders on a rotational basis enabling knowledge transfer
Strategy	condition of the estate; space efficiency; carbon reduction; environmental performance; affordability; and institutional sustainability	corporate social responsibility			limited consideration of future risk challenges in estates strategy

Category	Collaborative Feature	Risk Mitigation	Internal	External	Future
Shared Services	iBIM; lead buying; piggy backing; shared services; third party advisory; third party outsourcing; shared frameworks; and third party purchasing.				limited shared procurement

11.5 CHAPTER SUMMARY

Table 73: Content Analysis Primary Case Study Risk

Risk Factor	Primary Case Study	
	Participant	Interviewer
Internal Risk	535	167
External Risk	85	36
Future Risk Challenges	257	99
Total	877	302

Table 73 summarises the content analysis in this Chapter, which identifies to each level of the maturity model. Table 74 summarises this chapter's review of the Primary Case Study in respect of collaborative features. To make the table fit onto the page neatly the 'Collaborate Features' column is not on the table. The table includes recommendations. The table indicates that the hierarchy model for this theme of the research provides a basis for directors of estates to evaluate collaborative practice within their organisations. In line with Chapter 4 Motivation, the primary case study mixes regularity styles (see 4.7 Mixed Regularity Styles). The matrix is suitable for use as part of a reiterative management process, which is also available to form part of action learning research undertaken in future.

Table 74: Risk Primary Case Study

Category	Risk Mitigation	Maturity Level I Internal	Maturity Level II External	Maturity Level III Future	Recommendations
Interpersonal Contract	conflict identification; personnel development; and top management supported teamwork.	organisational communications procedure promotes autonomy.	organisational communications procedure promotes autonomy	autonomy organisational communications; informal teambuilding promotes relationships; organisational communication procedure promotes relationships.	develop further the organisational approach to top management supported teamwork and personnel development.
Value Management and Engineering	provisions for continuous improvement..	contractual mechanisms manage change.		carbon agenda is driving considerations of life cycle costs; informal change management considers future challenges; limited life cycle considerations – budget approval.	amend budget approval process to consider life cycle considerations.
Performance Based Contracting; Performance Management		scepticism of hard collaborative tools – process driven.		environmental tracker under implementation; requirement for training in processes.	provide training in performance measurement.

Category	Risk Mitigation	Maturity Level I Internal	Maturity Level II External	Maturity Level III Future	Recommendations
Practice, Procedures, Information Technology	knowledge management	procedural document supplied to supply chain.	limited use of information technology to communicate; procedural document deals with internal and external risks; and reference to legislation in organisational documents.	limited encapsulation of supply chain knowledge; lack of relatedness in the implementation of organisational procedures; limits to consistency in procedural documents; and element of procedural autonomy.	reduce duplication in procedural documents; consider further use of inter-organisational documents to reduce; web 2.0 technologies – encapsulate supply chain knowledge.
Design and Operation Integration	problem-solving process established; operation integration; and supply chain design integration.	compartmentation of design and construction using traditional procurement; and contracts on a project by project basis.		maintenance service agreements possible with standard contracts.	consider alternative procurement process during budget approval.
Inter-client organisational Knowledge and Initiatives		competence checking associations	competence checking associations.	associations, initiatives and shared data provide inter-organisational guidance and training on future challenges; shared data.	

Category	Risk Mitigation	Maturity Level I Internal	Maturity Level II External	Maturity Level III Future	Recommendations
Legal Framework and Tendering	previous work experience; relational contracting; and fair profit assumption.	standard contract and tender documents and process.	standard contracts and documents manage external risks.	tendencies towards lowest cost tendering - lack of fair profit assumption; frameworks develop contractors; feedback to contractor's following tender; and competitive bidding restricts knowledge transfer; possible to let tenders on a rotational basis enabling knowledge transfer.	continue to develop organisation in relation to relational contracting; award more contracts on a different basis than lowest bid.
Strategy	corporate social responsibility.			limited consideration of future risk challenges in estates strategy.	develop estates strategy in relation to future risk consequences.
Shared Services				limited shared procurement.	take greater opportunity to share procurement process with other similar organisations.

CHAPTER 12 PRIMARY DATA SUMMARY

12.1 CHAPTER INTRODUCTION

The aim of this section of this Chapter is to provide a succinct summary to Section D Primary Data. The aim of Section D Primary Data is to test the framework by relating it to an organisational case study. The work identifies a particular case study, identifies collaborative features in an organisation; and then relates the collaborative features to the maturity model.

12.2 ORGANISATIONAL COLLABORATIVE FEATURES

Section D Primary Data develops categories of collaborative features from Section B Literature into the list in Table 75. The collaborative features are found to have a locus at different levels of the three maturity models. Each chapter explores the same collaborative features. The work avoids duplication, therefore to some extent the discussion of collaborative features is in the context of the same collaborative features in other Chapters; for example, Interpersonal contact occurs in Chapter 9 Implementation, Chapter 10 Motivation and Chapter 11 Risk.

Table 75: Collaborative Features Primary Case Study

Category	Collaborative Feature
Interpersonal Contract	acting: in good faith; in an open and trusting manner; in a cooperative manner; continuity of relationships; integration of other stakeholders; lessons learned meetings; shared office spaces; soft skills; teambuilding processes; and training.
Value Management and Engineering	change control; risk management; value engineering and management; and whole life cycle costing.
Performance Based Contracting; Performance Management	incentivisation; performance; performance based contract; performance management; performance indicators procurement route; and target contracts.
Practice, Procedures, Information Technology	BIM; organisational level documents; inter-operability of systems; electronic meeting systems, and web 2.0-based collaboration technologies.
Design and Operation Integration	design-construction integration; design and build; private sector engagement into design, construction and maintenance; frameworks; integrated project Insurance; private finance initiative; prime contracting; project partnering contract; management agent contracting; organisational standard procurement; soft landings; and two stage open book.

Category	Collaborative Feature
Inter-organisational Knowledge and Initiatives	benchmarking; Considerate Constructors Scheme; CSCS; forward programme; research and development; grants; health and safety co-operation; health and safety risk reduction professional networks.
Legal Framework and Tendering	adjudication; change control; charters; contract simplification; contract completeness; contractor selection; enhanced health and safety conditions; CSCS; collaborative working clauses, collaborative/integrated supply chain; communications protocol; design, build, operate contract; dispute ladder; enhanced sharing information; environment and sustainability; facilitation; incentivisation; fair payment; risk assessment and allocation; financial incentivisation; legislative compliance; overarching collaborative agreement; non-competitive tendering; performance indicators; multi part contracts; pre-construction services agreement; simplification of contracts; standard pre-qualification; standardisation contracts and frameworks; sub-contractor relationships; mediation; and value engineering.
Estates Strategy	condition of the estate; space efficiency; carbon reduction; environmental performance; affordability; and institutional sustainability.
Shared Services	iBIM; lead buying; piggy backing; shared services; third party advisory; third party outsourcing; shared frameworks; and third party purchasing

12.3 MATURITY MODEL

The review of collaborative features is more one to form an interpretive understanding opposed to quantification, which fits well with the nature of professional practice. The work analyses data using thematic data analysis to create a narrative and identify keywords that relate to levels in the maturity models. Summative content analysis is used in Chapter 11 Risk, to align it with the later Section E Transferability. The risk theme is the only theme that Section E Transferability investigates further. The other two themes have transferability from literature. The work uses matrices for each of the three maturity models to summaries the organisations approach to collaborative features. The Section confirms that it is possible to use the framework including the maturity model for its intended purpose, which is to review collaborative features.

12.4 CHAPTER SUMMARY

The Primary case study indicates that the three maturity models work and are suitable for an ongoing review and improvement process. Should a estates manager prefer to form a more statistical approach this would form part of future research. However, a statistical approach would not have the flexibility that practice requires.

SECTION E TRANSFERABILITY

CHAPTER 13 SECTION INTRODUCTION

13.1 CHAPTER INTRODUCTION

The aim of this chapter is to set out the process the DBenv research will undertake to improve the research's transferability. The motivation and implementation maturity models receive transferability from the Section B Literature. This Chapter establishes a format for the Section E Transferability; and using Section C Research Design develops a process to assess the transferability of collaborative features and risk maturity model. In line with the DBenv's research philosophy, there is a pragmatic approach to the selection of data. The ethical approval process is set out in Section C Research Design and not in this Chapter.

13.2 FORMAT

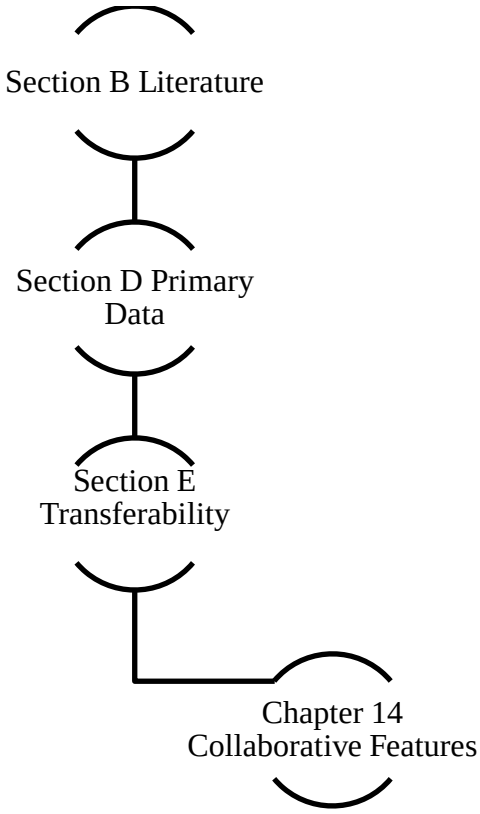

Figure 30: Validation of Collaborative Features

Figure 30 summarises the stages the DBenv theses uses to develop collaborative Features. The collaborative features emerge in the Section B Literature; and are found to occur in practice in the Primary Case study. Although the collaborative features emerge from literature and as such have transferability, there is potential (although small) that the

collaborative features could be unique, in the English Higher Education Sector, to the Primary Case Study. It is for this reason the work in this Chapter seeks to establish replication of the collaborative features categories to other estates.

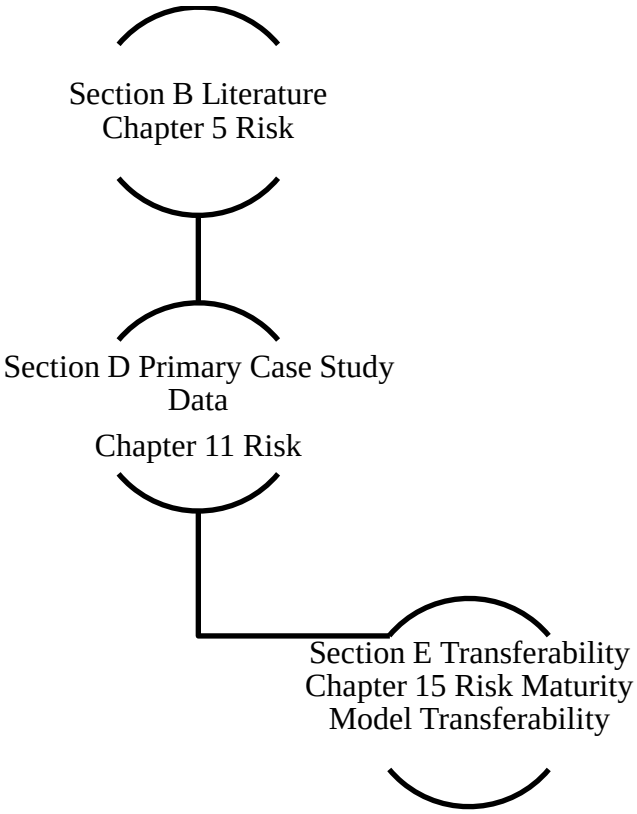

Figure 31: Validation of Risk Challenge Hierarchy

Figure 31 summarises the chapters that develop the Risk Maturity Model for the purposes of the DBenv's deliverable. The Model emerges from international peer reviewed work in Section B Literature; unlike for the other two themes, the literature section could not offer transferability of the risk maturity model to the wider population of English HE institutions. Therefore, this Section collects data to establish literal replication from Section D Primary Data (see Chapter 11 Risk) to the wider population. Similar to earlier sections to offer the validity to the discussions, there is an audit trail throughout the work referencing back to the data. Appendix II summarises the data sources that form part of the DBenv study. Data sources have an audit trail reference, for example 'M1/02/PR/EPM1, ref.74'. Table 76 sets out the format of the headings for this section of the thesis.

Table 76: Primary Data Section Heading Format

Heading Level	Example	Purpose
I	3 CH….	This heading identifies Chapters within the DBenv thesis. There is a chapter to test the transferability of the collaborative features and another for the risk maturity model.
II	3.1 CH…	The sub-heading identifies parts within the Chapters differentiating such things as Chapter introductions, sub themes and summaries. The sub-themes relate to collaborative features in Chapter 14 Collaborative Features Transferability; and increments in the risk maturity model in Chapter 15 Risk Maturity Model Transferability.

13.3 ESTATES STRATEGY DATA

The aim of this part of the thesis is to obtain data that can offer transferability of the risk maturity model to the overall population. In addition, the data will be of use to identify the collaborative features in other organisations than the primary case study. This part of the thesis: establishes the overall population of universities in England; and obtains available estates strategies from the overall population for data analysis at the next stage of the research.

Data concerning the overall population is available from the Higher Education Statistics Agency. The agency has been in existence since its formation in 1993 by agreement of UK Government Departments, the Higher Education Funding Council and the universities themselves following the publication of the White Paper "Higher Education: a new framework" (UK Government; Department of Education and Science, 1991; Higher Education Statistics Agency, 2013e). In addition, the Higher Education Statistics Agency (2013) publishes data concerning estates management. The statistics for 2011/12 became available 30 April 2013, which are the latest issue of the statics at the time of this work. The statistics concern 130 universities in England; 10 in Wales; 16 Scotland; and 4 in Northern Ireland. The DBenv study focuses on data from universities in England. Similarly, the Higher Education Funding Council for England (2013) also lists 130 universities in England.

This DBenv study undertakes an internet search for the estate strategy of every university in England, for example "The University of Surrey" +"estates strategy". From the overall population of 130 Universities, forty-two are available to download on 9 September 2013. Table 77 includes a list of the universities with available estates strategies. The search

identifies two other relevant strategies, namely Norfolk and Norwich University Hospitals, North Cumbria University Hospitals, which are also in Table 77 and increase the number of strategies that form part of the data from forty-two to forty-four. Reasons for being unable to download include password protection, network errors, network maintenance and availability. Availability includes lack of internet provision, no strategies in place and strategies under review. Lack of provision of strategies on the internet indicates limits to achieving the external risk challenge of available technology.

Table 77: Higher Education Institutions Estates Strategies

The University of Birmingham	Liverpool Hope University
Bournemouth University	The University of Liverpool
The University of Bradford	Loughborough University
The University of Brighton	The University of Manchester
The University of Bristol	The University of Nottingham
The University of Cambridge	Oxford Brookes University
The City University	University College Plymouth St Mark and St John
University of Durham	
The University of East Anglia	Queen Mary and Westfield College
The University of Exeter	The University of Reading
University College Falmouth	Royal College of Music
University of Gloucestershire	Royal Holloway and Bedford New College
Harper Adams University College	The Royal Veterinary College
University of Hertfordshire	St George's Hospital Medical School
The University of Hull	St Mary's University College, Twickenham
Imperial College of Science, Technology and Medicine	The School of Oriental and African Studies
	Sheffield Hallam University
Institute of Education	The University of Sheffield
The University of Keele	Southampton Solent University
King's College London	The University of Surrey
Kingston University	The University of York
The University of Leeds	North Cumbria University Hospitals
The University of Leeds	Norfolk and Norwich University Hospitals
The University of Leicester	

Table 78 includes a summary of data from Higher Education Statistics Agency (2013). The data does not include that from Norfolk and Norwich University Hospitals and North Cumbria University Hospitals. Estate strategies that form part of the study represent 32% of the overall population (Table 78); however represent 48% of total income, 51% of total buildings and 61% of capital expenditure on estates. In relation to the environment, Estate strategies forming part of the study represent 54% of energy consumption and 52% of energy omissions. Despite representing 61% of capital expenditure, the institutions represent 43% of

waste total construction. In addition, represent 91% of renewable on-site energy generation. Therefore, the data indicates that organisations forming part of the study perform better in relation to waste and renewable on-site energy generation. In addition, data indicates the summarising of the sample size by number is an over simplification.

Table 78: Higher Education Institutions Characteristics

Characteristic	Total Institutions	Estates Strategy Downloaded	Percentage
HEI Institutions	130	42	32%
HEI Income Total HEI (£)	23,277,292,000	11,121,810,000	48%
Student headcount Teaching & Research Total	1,683,485	645,095	38%
Number of Buildings	12,577	6,406	51%
Capital expenditure on estates Total (£)	955,103,797	580,257,672	61%
Energy consumption Total HE (kWh)	5,843,223,372	3,157,010,773	54%
Energy emissions Total HEI (Kg CO2)	1,945,086,912	1,012,861,685	52%
Renewable on-site energy generation Total HEI (kWh)	12,817,040	11,659,375	91%
Waste Total Construction (tonnes)	236,075	101,720	43%
Waste Total Construction - Recycled (tonnes)	216,327	91,254	42%

The estates strategies are analysed in two ways to suit the two requirements of this section of the research. There is a requirement to identify the collaborative features in other universities than the primary Case Study of which thematic analysis is suitable to achieve. There is a further requirement to identify the estates strategies levels of the maturity model of which summative analysis is more appropriate. There is a discussions in the Section concerning nodal trees, which make sure the words in the summative analysis relate to studies context. The size of the nodal tree restrict them from being in the Chapters, however a number of the nodal trees are in alphabetical order in Appendix I.

13.4 CASE STUDY DATA

To triangulate and enrich the studies data the work considers a further six case studies. One of the case studies is insider research as such access is available in a similar way as the Primary Case Study. The remainder of the case studies were established though the researching practitioner's business network. Case study selection is made based on a number

of criteria. The first criteria for selection is location, the primary case study is in a particular geographic location with England. The auxiliary university case studies are spread across England. Table 79 provides data concerning the auxiliary case studies, all of which have a large student population and a significant income. The auxiliary case studies are representative of the kind of organisation the DBenv's deliverable seeks to assist

Table 79: Secondary Case Studies Data

	Total (000s)	% Population	Low (000s)	Median (000s)	High (000s)
HEI Income	1,600,000	7%	200,000	200,000	400,000
Student Headcount	140,000	8%	20,000	20,000	40,000

The auxiliary case study investigation draws pragmatically from internal (including interview data), publically available and inter-organisational data, with similar lines of focus and protocols as the primary case study (see Figure 29, p.180). The aim in the use of the data is to identify literal replication of the collaborative feature categories from Primary Case Study in the Auxiliary Case Studies. Different organisations employ different collaborative features, therefore, thematic analysis is appropriate, as there is limited concern to offer generalizability over the entire population. The overall aim is to check the collaborative feature categories are not unique to the Primary Case Study.

13.5 TENDER NOTICE DATA

To offer further validity the study uses thematic analysis to explore tender notifications to establish literal replication towards the collaborative feature categories. Tenders Electronically Daily (2013) is the supplement to the Official Journal of the European Union and is an electronic source that provides details of projects currently under procurement. There are other sources (Businesslink, 2013). A search (17 September 2013) of All Current Notices that relate to Construction Work for University Buildings in the United Kingdom identifies relevant data (Tenders Electonic Daily, 2013). The data includes 18 relevant notices, of which seven are not in the England. Table 80 includes notices from England.

Table 80: OJEU Notices UK University Buildings

Ref. EU/	Description	Notice	Value	Framework	Procurement	Portal
01/	University of Birmingham Biomedical Innovation Hub	Contract Award	Below EU threshold	No	Architect design up to RIBA Stage D	Yes
02/	University of Bristol Framework	Prior information	Blank	Yes	Blank	Yes
03/	University of Liverpool Framework	Contract Award	Projects £500,000 - 1,000,000	Yes	Construction Work	Yes
04/	University of Liverpool Framework	Contract Award	Projects £1 - 500,000	Yes	Construction Work	Yes
05/	University of Liverpool Energy Company Limited Combined Heating and Power Plant	Contract Award	Blank	No	Construction Work	Yes
06/	University of Manchester National Graphene Institute	Contract Award	£800,000	No	Design and Build	Yes
07/	Manchester City Council	Contract Award	Total £250–1,000million Projects > £9million	Yes	Design and construct /construct only	Yes
08/	University of Nottingham New Amenities Building	Contract Award	Project £6.6million	No	Architect novated to builder	Blank
09/	University College London New Student Centre - Enabling Works Package	Contract	Project £4-5million	No	Blank	Yes
10/	University of Warwick WBS Phase 3b Construction Works.	Contract Award	Blank	No	Design and execution	Yes
11/	University of Wolverhampton	Contract Award	Project £12,333,961	No	Design and Build	Yes

13.6 CHAPTER SUMMARY

This chapter sets out how the DBenv's framework's transferability will be tested using a pragmatic approach to data collection. This section is split into two Chapters, which test the transferability of the deliverable from Section D Primary Data and Section B Literature. Chapter 14 tests the transferability of collaborative features. Chapter 15 tests the transferability of the Risk Maturity Model.

CHAPTER 14 COLLABORATIVE FEATURES TRANSFERABILITY

14.1 CHAPTER INTRODUCTION

The aim of this Chapter is to test the transferability of collaborative features from Section D Primary Data. The reason for this Chapter is to establish that the collaborative features are not unique to the Primary Case Study, which will in turn demonstrate that it is possible to apply the DBenv study's framework to other organisations. There is no attempt to create an exhaustive list of collaborative features, which is done in earlier studies, including early inductive work forming the foundations of the DBenv study. The work pragmatically relates data sources from Chapter 13 to the collaborative features from earlier sections of the DBenv study.

14.2 INTERPERSONAL CONTRACT

Table 94 (p.328) identifies a number of words in the forty-four estates strategies including 'collaboration', 'partner', 'partnership', 'partnerships' and 'trust'. Variations of collaboration include 'collaborate', 'collaboration', 'collaborative' and 'collaborations' that occur 184 times in 34 strategies. Table 89 (p.324) identifies words that associate to the external challenge of culture. The words also relate to collaborative features 'user interface' and 'interpersonal contact'. Therefore, indicate that communication is important to University organisations. The importance of interpersonal contact is evident in the Associate Director of Estate for the University of S1, that indicates:

> *"Organising and managing is absolutely pivotal. Make sure that they understand what the requirements are, what they should be delivering and when they should be delivering it, and how it fits into the big picture. Otherwise, if they do not understand what they are contributing too. You will just get bits of information that is not stitched together. The collaborative approach is sitting around and making sure that people understand the whole process from the consultant's, and the construction's point of view" Associate Director of Estates for the University of S1 (S1/04/01/ADE2, ref. 130).*

The DBenv study previously identifies that there is a communication protocol in construction contracts. Universities operate construction contracts on projects therefore employ communication protocols (H1/01/01/401, p. 3; MM/03/). In addition, universities operate specific communication protocols. The University of S1 operates a 'Project

Communications' framework for works over a value of £250k (S1/02/01/012). The communication framework's purpose is to improve communication between the Design Team and the In-House Maintenance Team (S1/02/01/012, p. 1), includes processes during the feasibility, design, construction and hand over stages. Similar to University S1, The University of S2 has organisational documents to assist with identifying users and define "the relationship between Consulting Engineer and the University Liaison Engineer in delivering Projects that meet the minimum and consistent standards required by the University" (S2/01/02/005; S1/02/03/001).

The University of B1 identifies inter-organisational guidance from the Health and Safety Executive (Health and Safety Executive, 2013) with the management of contractors (B1/01/02/003). The Guidance document identifies external challenge of ensuring employee health and safety during the execution of works. Other Universities identify with the risk challenge that exists between the supply chain and building users (L1/01/02/001; MM/01/02/001; S1/01/02/001; S2/01/01/001).

The term 'senior management' occurs 22 times in 14 of the 44 Estates Strategies. The role of senior management support is leadership. The use of Estates Strategies indicates direction and therefore demonstrates an element of leadership. The word leadership occurs 40 times in 16 Estate Strategies. The word tree for leadership is in Appendix I Content Analysis. Words and terms that occur before 'leadership' include 'good', 'future', strong', 'need for', 'decisive', 'visionary' and 'value'. The use of the words indicates that there are perceptions of leadership performance. The use of the words 'visionary' and 'value' relate leadership to future challenges, particularly in relation to 'asset utilisation' and 'operational efficiency'. Words and terms that occur after leadership include 'investment and operational change', 'management', 'training and support', 'development', 'operational' and 'working together'. The words that occur after leadership, relate senior management support, to the future challenge of human resource.

The MM University employs contracts that include items from JCT minor works supplemental provisions including: collaborative working; health and safety; cost savings and value improvements; sustainable development and Environmental considerations; notification and negotiation of disputes and employees nominee (MM/03/01/001, ref.1/11). Performance indicators and monitoring do not apply. The collaborative working clauses provide that "project team members" are to work "in a co-operative and collaborative manner, in good

faith and in a spirit of trust and respect" (JCT, 2011n, p.38 sch. 3); which indicates the relationship concerns reciprocity and identification, instead of compliance and external regulation.

14.3 VALUE MANAGEMENT AND ENGINEERING

The JCT minor works contract includes provisions for instructing works. There are also provisions for cost savings, value improvement and sustainable development, encouraging the contractor to propose changes to the design. This indicates an element of change control. The Associate Director of Estates for University S1 considers the importance of change control:

> *We had to change management in the early days in the pre-design. It is a client thing and we were to move on site. The contractor needs to know what has changed, however, I am thinking about changing this and there is no point in telling him when he has already done something else that they have to take down. It gives him an early warning; it gives him the opportunity to buy into it. I cannot do that. I can only request let me know by this date. Collaboratively, you cannot just keep issuing instructions and changing things, because without knowing what the effect is and without the contractor informing you, change control is absolutely paramount" Associate Director of Estates for the University of S1 (S1/04/01/ADE2, ref. 160).*

Change control can consider life cycle considerations. The word 'life' occurs 237 times in 38 estate strategies. Words and terms that occur before "life' include 'whole' (6 sources; 9 occurrences), 'extend the', 'extends the' (1 source; 1 occurrence), 'throughout the' (1 source; 2 occurrences). Overall, the words and terms in the previous sentence occur 18 times in 8 sources. Terms that relate to 'whole life' include 'Whole life costs', 'Whole life basis' and 'whole life operating costs'. The words and terms occur after include 'cycle' (6 sources; 19 occurrences),' 'cycles' (2 sources; 5 occurrences), 'long relationship' (1 source; 1 occurrence), and 'span' (2 sources; 2 occurrences). Overall, the words and terms in the previous sentence occur 27 times in 10 sources. Life cycle costing relate to both the cost of maintaining and running the asset, for example, in relation to heating and cooling an asset. The generation of heat has a cost in terms of purchasing assets and future carbon generation. Where savings occur in relation to carbon emission, there is also the potential to make financial savings.

The Association of Directors of Estates' Estate Strategy Good Practice Guidance (AUDE, 2013b), while identifying there is no ideal format for estate strategies, provides a number of headings. Headings include items that relate to future challenges, for example 'long term maintenance' and 'carbon management'. The inclusion of the heading of 'carbon management' in the Estates Strategies links to funding. "From 2011, HEFCE capital allocations will be linked to carbon reduction" with a requirement for "higher education institutions (HEIs) in England", "to develop individual carbon reduction strategies, targets and associated carbon management plans" (HEFCE, 2010a). Statistics from The Higher Education Statistics Agency (2013) provide that out of the 130 higher education institutions in England, 120 have Environmental Policies and 101 participate in the Carbon Reduction Commitment. Fewer than 65 organisations undertake environmental monitoring, even though 101 participate in the Carbon Reduction Commitment (2013).

14.4 PERFORMANCE BASED CONTRACTING; PERFORMANCE MANAGEMENT

The Education Reform Act (UK Parliament, 1988) places a requirement on Universities in England and Wales to have statutes and byelaws in place. The statues (also known as articles of government) provide powers to council members and the council members in turn approve authority levels to budget holders (H1/01/01/203; S1/01/03/003; MM/01/03/101; B1/01/03/002). The University of S1's financial regulations indicates budget holders include Executive Deans, Executive Directors of Professional Services and Heads of Schools (S1/01/03/005). The budget holders have authority to delegate up to the limit of their own authority level (S1/01/03/005). Expenditure outside budgets is an indication of employees working ultra vires. Therefore, there is a requirement within estates and facilities departments to have procedures in place to ensure employees work inter vires. Institutions have approval mechanisms in place including construction contracts (H1/01/01/102; 203; 401; S1/02/01/002; MM/03/01/).

Table 81: Performance Measurement Words

Word	Length	Count	Percentage
Indicators	10	72	0.02
Performance	11	482	0.13
Target	6	179	0.05
Targets	7	222	0.06
Total		955	0.26

Table 81 includes words in the 44 Estates Strategies that identify with performance measurement/management which include indicators, performance, target and targets. MM University does not make use of performance measurement (MM/03/01/). In contrast, ADE2 indicates, "we have a system of feedback and KPIs where we look at lessons learnt rather than actual performance measurements", "it is slightly different but it is related to performance but it is more about perception" (S1/04/01/ADE2, ref. 206). Similar to the University of H1, The University of S1's practice and procedures manual includes a post contract review form for both consultants and contractors (H1/01/01/202; S1/02/01/014; 015). The consultant's form includes twenty-three questions and a comments section (S1/02/01/014). Twenty-two of the questions receive a score using a likert scale. Possible answers to the remaining question "Would you recommend using this consultant again", include 'Yes', 'Possibly' and 'No'. The form is one directional in nature limiting capacity for the supply chain to offer reciprocal feedback. The form limits suggestions for future improvement, therefore the use of the form relates to introjection, or external regulation.

14.5 PRACTICE, PROCEDURES, INFORMATION TECHNOLOGY

The word knowledge occurs 242 times in 33 of 44 number Estates Strategies. Universities create and disseminate knowledge to supply chains. For example, make available on public accessible websites information and documents including that in relation to: estates and properties, health and safety; governance, equality and diversity; and sustainability (B1/; H1/; L1/; MM/ S1/; S2/). Using the internet achieves the external challenge of available technology and the future challenge of developing supply chain's human resource relating to further external and future challenges. Such future challenges relate to asset utilisation and operational efficiency. Organisations have different websites to deliver information and documents. The websites and in many instances the documents are organisation specific.

Health and safety documents include for example those that relate to asbestos (B1/01/02/002; /01/002; H1/01/01/601; L1/01/01/001); health and safety (B1/01/02/001; H1/01/02/001; L1/01/02/001; MM/01/02/001; 007; S1/01/02/001; S2/01/01/103; 104); and guidance concerning the contractors (B1/01/02/003; H1/01/01/602; L1/01/01/001; MM/01/02/002; S2/01/02/001); and legionella policy (S1/01/02/002). The University of S2's Health and Safety manual (S2/01/01/104) identifies 39 different headings including for example: accidents and incidents; lifting operations and equipment; and working alone. For each heading, there is text that refers to procedures and regulations. For example, the accidents

and incidents section refers to Reporting of Injuries, Diseases and Dangerous Occurrence Regulations (UK Parliament, 1995a). The section refers to the HSE Guide to the reporting of Injuries, Deceases and Dangerous Occurrences Regulations (1995) (L73 Rev1999). The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (UK Parliament, 2013b) replace The Reporting of Injuries, Diseases and Dangerous Occurrences, Regulations (UK Parliament, 1995a).

Other legislation and regulations the University of S2's health and safety manual (S2/01/01/104) refers to includes: The Health and Safety at Work Act (UK Parliament, 1974); The Control of Asbestos at Work Regulations 2002; The Asbestos (Licensing Regulations) 1983; The Confined Spaces Regulations 1997; The Safety Signs & Signals Regulations 1996; The Construction (Design & Management) Regulations 1994; The Construction (Health, Safety & Welfare) Regulations 1996; The Electricity at Work Regulations 1989; The Health and Safety (First Aid) Regulations 1981; The Management of Health and Safety at Work Regulations 1999; The Control of Substances Hazardous to Health Regulations 2002; The Lifting Operations and Lifting Equipment Regulations 1998; The Noise at Work Regulations 1989; The Control of Lead at Work Regulations 2002; The Personal Protective Equipment at Work Regulations 1992; The Construction (Head Protection) Regulations 1989; The Provision and Use of Work Equipment Regulations 1998; and The Dangerous Substances and Explosive Atmospheres Regulations 2002. Therefore, Universities freely provide information to the supply on the internet to overcome the external challenge of legislation.

The University of H1's 'Code of Practice for the Management of Asbestos in Buildings' (H1/01/01/601) refers to legislation (UK Parliament, 1999a; UK Parliament, 1999b; UK Parliament, 1987). The University of S2's Asbestos Policy also refers to legislation (UK Parliament, 2002; UK Parliament, 1974). With the University of H1 referring to the 1987, as amended in 2002, and the University of S2 referring to 2002 version of the Control of Asbestos at Work Regulations. Similarly S2's health and safety manual (S2/01/01/104) refers to the 2002 version. The Control of Asbestos Regulations 2012 is available (UK Parliment, 2012a) and prior to that, there is a 2006 version (UK Parliament, 2006b). In addition, The University of H1's 'Code of Practice for the Management of Asbestos in Buildings' (H1/01/01/601) refers to six sources of publications and guidance (HSE, 2002; HSE, 2004). Reference to publications and guidance is an inter-organisational approach. Out of the six sources, four of the codes of practice are unavailable from the publisher's website, indicating

they are out of date. Referencing out of date legislation identifies the external risk challenge of politics.

In addition to making knowledge publically available, higher education institutions have intranets only accessible by organisational members (L1/02/; MM/02/; S1/02/; S2/02/). The practice and procedures folder is available to employees through the internet and includes standard documents including that used for the purposes of contract administration (S1/02/01/) and specifications (MM/02/01/). Although other Universities make organisational specifications downloadable by the supply chain from the openly available internet (H1/01/01/401; L1/01/01/; S1/01/01/). Higher education institutions have specifications for elements of work including internal and external signage (L1/01/01/001; 006; 011); mechanical and electrical design and installation (H1/01/01/401; L1/01/01/005; 009; MM/02/01/001; 002; 003; 004; 007; S2/01/01/001; 002; 003;004); lift installations (MM/02/01/005; S2/01/01/006; 007); washrooms (S2/01/01/008); and specialist installations design (MM/02/01/006).

The University of H1 operates a 'Specification of Works and Materials' (H1/01/01/401) that includes the sections: Preliminaries; Race Relations Amendments Act 2000; Building Specification; Electrical Specification; Mechanical Specification; Approved Sub-Contractors; Final Summary Page & Breakdown; and Schedule Of Daywork Rates. The preliminaries refer to legislation including Sale of Goods Act 1979; Supply of Goods and Services Act 1982, Disabilities Discrimination Act; Building (Safety, Health & Welfare) Regulations; CDM regulations 2007. In contrast MM University does not have standard preliminaries, instead relies on the supply chain to provide their own organisational preliminaries that receive approval from the University's facilities and legal team (MM/03/01/). The basis for the preliminaries is a standard document available from the consultant's electronic system for more than one higher education institution. The preliminaries refer to inter organisational and organisational documents (MM/03/01/).

The University of S1 operates a permit to work (S1/03/01/009; 010; 017) for such things as: working with live electrical equipment; work on electrical installations; emergency lighting systems; fire alarms beam crane; ground excavations; roof access; confined spaces; work on high pressure hot water; freezing kit; compressed air; hot work; asbestos; kitchen areas; hazardous areas; and opening up ceiling voids. Other universities operate a permit to work system for hazardous areas (L1/01/01/007; MM/01/02/002). MM University's Head of Estate

Planning Services implements a permit to work process. "To obtain permits to work contractors are required to assess the hazards, produce risk assessments and method statements for the safe working procedure" and is "based on Health & Safety Executive best practice Guidance" (MM/01/02/002, p. 8, ref. 15).

In Table 78 (p.297) nearly all of the notices indicate electronic portals, demonstrating use of available technology. The University of Nottingham indicates that the process is undertaken in accordance with European legislation with specific reference to the Public Contracts Regulations 2006, The Public Contracts (Amendment) Regulations 2009 and the provisions of Directive 2004/18/EC (EU/08/). Further legislation notices refer to (EU/01/002) includes: the Equality Act (UK Parliament, 2010); Freedom of Information Act (UK Parliament, 2000); Bribery Act (UK Parliament, 2013). Therefore, there is a relationship between the framework process and the external challenge of legislation.

14.6 DESIGN AND OPERATION INTEGRATION

Table 80 (p.299) indicates project delivery with a design and build/construct procurement strategy (EU/06/;07/; 10/; 11). In contrast, The University of L1 indicates a traditional procurement process, with the contractor appointment being made after the design is complete, which follows the Royal Institute of British Architects Work Stages (L1/08/). The University of H1 makes use of the JCT Minor Works Building Contract 2005 as a traditional approach to construction (H1/01/01/401, p. 3). Similarly MM University make use of the Joint Contracts Tribunal's minor works contract to procure works. The different approaches demonstrate procurement autonomy in relation to risk allocation.

There is a requirement for procurement autonomy within organisations, with ADE2 indicating "we have a diverse range of business activities from a swimming pool, laboratory to an office space" and "we undertake a diverse range of activities that have different approaches collaboratively" (S1/04/01/ADE2, ref. 74). In the 44 estates strategies the word autonomy occurs just four times in two sources. The University College Falmouth identifies autonomy with the student union. The University of Exeter (p.11) relate 'autonomy' to dynamic leadership. The word freedom (4 sources; 5 occurrences) associates to autonomy. St Georges University in London is the only strategy that refers to 'freedom' in the context of the DBenv focus. The strategy relates freedom to space management (St Georges University, p. 11).

The 44 estates strategies make limited reference to terminology associating to the Private Finance Initiative including 'Private Finance Initiative' (3nr) and 'PFI' (0nr). Out of the forty-four Estates Strategies, the term 'private finance' occurs three times in three different strategies. Two of the references are made in the strategies of university hospitals. The University of Leeds undertakes work under a private finance initiative (UE/036/, p. 30). The University of Surrey (UE/043/, p. 88) considers using of the "private finance initiative to support new residential facilities". The University of Bradford undertook a pre-qualification for a "design, build, operate and possibly finance contract" (UE/25/); however, "at the Post Qualifying Questionnaire (PQQ) stage it was apparent that the designs being submitted did not meet the University's expectations" (UE/025, p. 18).

> *"The University took the decision to downsize its new build to 500 sustainable student bed spaces, financing this through bank borrowing and procure the additional bed spaces from a third party supplier through a nominations agreement. This would reduce its risk from a 1,000 bed spaces for a 35 year period to 500 for a 35 year period and another 500 bed spaces from a third party over a 5 to 10 year period" (University of Bradford, p. 18).*

MM University does not refer to Building Information Modelling as standard in contracts (MM/03/). There is limited reference to the terms of 'Building Information Modelling' and 'BIM' in the 44 estates strategies. The University of S1 is starting to implement Building Information Modelling on the new Arts building. "Intelligence tells me that it is nice to talk about but no one has vast skills in utilising it, and that is from the designers and contractors", "It is something that is going to come out over the next few years", At the moment, it is embryonic (S1/04/01/ADE2, ref. 326).

> *"Software purchase intellectual property rights and training on who owns the base model. At the moment, we have got the architects on the Arts building owning it. He is custodian of the base BIM model and the other engineers, structural and M&E, have to interpret that. We have got various software, we have got Revit, SketchUP, and are using different things. It is ensuring from the outset what we are trying achieve from an employer's perspective and I think that is the hard bit. You can talk about all this but what do you do with the model when you get it back. That is the bit that is missing. What does the client/employer do with it?" Associate Director of Estates for the University of S1 (S1/04/01/ADE2, ref. 334).*

14.7 INTER-ORGANISATIONAL KNOWLEDGE AND INITIATIVES

There are informal professional networks in higher education, that professionals join to communicate ideas (JISCMail, 2013; Linkedin, 2013). There are also more formal networks for example British Universities Finance Directors Group (2013). The representative body is Universities UK found in 1918 and represents 133 members (Universities UK, 2011, p.20). There are 160 universities in the United Kingdom. In addition to the 130nr Universities in England, the Higher Education Statistics Agency (2013) identifies 30 in Scotland, Wales and Northern Ireland. There are 156 institutional members of the Association of Directors of Estates (AUDE, 2013d). Therefore, most university organisations in the United Kingdom to an extent involve themselves in professional networks. In addition to attendance at institutional events, members also involve themselves with activates of the Association. Table 82 includes a list of organisations that the Association's web site indicates to have an active role (Association of University Directors of Estates, 2013a).

Table 82: Universities with Representatives AUDE

Anglia Ruskin University	London South Bank University
The University of Bradford	Loughborough University
The University of Bristol	The Manchester Metropolitan University
The University of Central Lancashire	The University of Nottingham
The University of East Anglia	Oxford Brookes University
Edge Hill University	The University of Reading
The University of Essex	Roehampton University
The University of Exeter	Southampton Solent University
The University of Huddersfield	The University of Surrey
King's College London	The University of Warwick
Leeds Metropolitan University	The University of Wolverhampton
The University of Leeds	Swansea Metropolitan University
The University of Leicester	Heriot-Watt University
The University of Lincoln	The Queen's University of Belfast
University of the Arts, London	Scottish Funding Council

The Association of Directors of Estates (2013a) has representatives in a number of professional networks including Environmental Association for Universities and Colleges (2013), Colleges Information Systems Association (2013), Association of University Administrators (Association of University Administrators, 2013), Building Education Forum (British Institution of Facilities Management, 2013), Code of Practice Student Accommodation (Universities UK, 2013a), Construction Clients' Group (Constructing

Excellence, 2013), English National Procurement (London Universities Purchasing Consortium, 2013a), Higher Education Design Quality Forum (Royal Institue of British Architects, 2013), HESA User Group (Higher Education Statistics Agency, 2013d), Higher Education Senior Management Forum (Association of University Directors of Estates, 2013b), Joint Contracts Tribunal (Joint Contracts Tribunal, 2013), RICS Public Sector Group (Royal Institution of Chartered Surveyors, 2013), SUPC Board (Southern Universities Purchasing Consortium, 2013), Sustainability Action Group (Association of University Directors of Estates, 2013), Sustainability Exchange Procurement Board, Sustainable Procurement Centre for Excellence (2013), AUDE Training Group, UCEA Health and Safety Committee (Universities and Colleges Employers Association, 2013), UUK GuildHE Rating Group (Universities UK, 2013).

The Association of University Directors of Estates also comes together with other associations as part of the Higher Education Estates Association Forum. The Forum (Association of University Directors of Estates, 2013b) includes: Association of University Chief Security Officers (2013), Association of University Directors of Estates, Association of University Engineers (2013); Association for Student Residential Accommodation (2013); British Association of Cleaning in Higher Education (2013); College and University Business Officers (2013); Environmental Association for Universities and Colleges (2013); Higher Education Business Continuity Officers (Higher Education Business Continuity Network, 2013); Standing Conference for Heads of Media Services (Standing Conference for Heads of Media Services , 2013); The University Caterers Organisation Ltd (2013); and Universities Safety and Health Association (2013).

HEFCE provides a sustainable development guide for construction (HEFCE, 2011), which refers to organisations and resources. Organisations include Association of Universities Directors of Estates, BRE and BRITA in PuBs. Resources include: a guide to Display Energy Certificates and advisory report for public buildings (Department for Communities and Local Government, 2012); The legacy of 1960's Buildings (Higher Education Funding Council for England; AUDE, 2008); GreenBuild; AUDESAT (AUDE, 2013); BREEAM (BREEAM, 2013); Energy concept advisor (Energy Concept Advisor, 2013); Building for the future: Sustainable construction and refurbishment on the government estate (National Audit Office, 2007); Sustainable property investment and management (Lorenz, et al., 2208); and Constructing Excellence in the Built Environment (Constructing Excellence, 2013a). The 44

estates strategies include words that associate with initiatives including 'initiatives' (152nr) and 'BREEAM' (Table 93). Both the University of Warwick and Nottingham refer to BREEAM during procurement (EU/08/; /10/).

In addition to construction, HEFCE (2011b) also identify organisations and resources to assist with carbon management. Organisations include the Carbon Trust; Energy Saving Trust (2013); and LivingRoofs (2013). A link for the 'Carbon Economy on the HEFCE website did not work during data collection. Resources include Carbon Trust standard; higher education carbon management programme (Carbon Trust, 2013); the carbon reduction commitment scheme (Department of Energy and Climate Change, 2013); and Sustainable ICT in further and higher education (Jisc, 2013). The "University of Salford is one of 33 Universities taking part in Phase 6 of the Higher Education Carbon Management programme" (S1/01/09/02). Fifty number Universities in the United Kingdom are on the EcoCampus Register (EcoCampus, 2013). The universities achieve stages, namely unclassified, bronze, silver, gold or platinum. Each institution allocates to a stage. Stages complete include unclassified; bronze 12nr; silver 20nr; gold 6nr; and platinum 20nr. The bronze stage relates to planning; silver implementation; gold operation and planning; platinum checking and correcting.

Chapter 3 & Chapter 9 identify inter-organisational guidance, standards and administration in relation to: estates strategies; knowledge management; practice and procedures; frameworks; shared contracts and frameworks; contractor adjudication; standardised legal documents; user interface and interpersonal contact; life cycle costing; and professional networks and initiatives. The 44 estates strategies provide a word tree for 'guidance' (25 sources; 73 occurrences), which is in Appendix I Content Analysis and includes 'BREEAM', 'HEFCE', 'Department of Health', 'HM Treasury', 'planning', 'Energy Consortium (Education) 2006' and 'NHS'. The term 'Cabinet Office' does not occur in any estate strategy. The word tree for 'standards' (34 sources; 158 occurrences) is also in Appendix I Content Analysis and includes 'BREEAM', 'HEFCE', 'British', 'Building Regulation', 'RICS condition' and 'local authority'.

The acronyms CSCS, IOSH, CITB, ECA, NICEIC or IRATA, CHAS do not occur in any of the 44 estate strategies. A number of organisations have both a health and safety policy and further policy/conditions for contractors. The acronyms are not present in health and safety policies (H1/07/001; MM/02/03/001; S2/01/01/003) or safety rules/conditions (H1/02/05/002; L1/001; MM/02/03/002; S2/01/01/004). Although, MM University issue tender documents

that refer to CSCS (MM/03/01/001, p. 1/38 ref.120A). The acronyms do not occur in the University of H1's 'Specification of Works and Materials' (H1/02/01/08/001). The University of H1 approves contractors using Construction line (H1/02/01/01/001). Construction line is an inter-organisational government certification service (Department of Business, Innovation & Skills, 2012). The University of Birmingham's (EU/001/) refers to a number of competence checking associations and institutions including CHAS; SSIP Forum Membership and accreditation; HSE Prosecutions Considerate Constructors Scheme, Considerate Constructors Scheme.

14.8 LEGAL FRAMEWORK AND TENDERING - FRAMEWORKS

Table 80 (p.299) includes notices that relate to projects (EU/01/; 05/; 06/; 08/; 09/; 10/; 11/), organisational frameworks (EU02/; 03/; 04/) and inter-organisational frameworks (EU/07). The Manchester City Council Framework 'North West Construction Hub' is for inter-organisational use. The notice refers to a number of Universities (EU/07) including the University of Bolton; University of Central Lancashire; University of Chester; University of Cumbria; Edge Hill University; Lancaster University; Liverpool Hope University; Liverpool John Moores University; University of Liverpool; Manchester Business School; Manchester Metropolitan University; The University of Manchester; Open University; and University of Salford.

> *"We have used that [NWCH] on the [Buiding A] whereas on the Arts building we have gone through the European procurement, because of the nature of what is in there. In our view, the experience of the contracts on the Manchester Hub does not match that so we have had to build it and put some different parameters in. Whereas the [Building A] one, a refurbishment might start so we have gone down that route, let us see how successful that is. This is the first time that we have used it" Associate Director of Estates for the University of S1 (S1/04/01/ADE2 ref. 370).*

The University of S1 operates a framework for contractors (S1/04/01/ADE2, ref. 82; S1/01/03/002), and makes use of the inter-organisational North West Construction Hub to procure construction works (CH/01/001). The ADE2 identifies that frameworks facilitate the supply chain to develop an understanding of the Universities requirements (S1/04/01/ADE2, ref. 86). The ADE2 demonstrates relatedness with frameworks by indicating, "We recognise that you are important to us and that we are important to you" (S1/04/01/ADE2, ref.86). The

North West Construction Hub runs for a duration of 4 years (EU/07/), after which there is a requirement to initiate a new framework. The framework has six contracting participants (EU/07/). The framework spans across a broad spectrum of participants with very different requirements and due to the scale of the framework only suits large contracting organisations. Therefore, the framework has the potential to inhibit relatedness and identification between the employer and supply chain organisations. Although, (similar to the University of S1), MM University is named within the North West Construction Hub's notice (EU/07/). MM University does not operate or use a framework. Instead, where legislation permits, the University provides the professional team with the autonomy to select contractors from experience.

> *"Unfortunately, the nature of construction when the going gets tough collaborative disappears out of the window. We entrench into contractual relationships. I have had them signed up so we are going to work collaboratively. It is non-contractual, the best practice collaborative. We cannot take it to court but we will stick it on the wall and put our names on it. I have done that and it works until things go wrong, and it disappears off the wall. The main problem, I do not know if you have come across this before on collaborative framework Contracts are the element of trust? I do not know if you have got that on here because trust is the only way you can work collaboratively" Associate Director of Estates for the University of S1 (S1/04/01/ADE2 ref.94).*

The Association of Directors of Estates have a representative within the Joint Contracts Tribunal (Association of University Directors of Estates, 2013a; Joint Contracts Tribunal, 2013). The University of H1's standard preliminaries (H1/01/01/401, p. 3) refer to JCT Minor Works Building Contract 2005 with latest amendments. The current edition of the JCT Contract is the 2011 edition, which incorporates later legislation (UK Parliament, 2009) than earlier versions. The University of S1 employs the "Form GC/Works/5: General Conditions for the Appointment of Consultants (1998) as amended by the University of S1, together with the appropriate annex specifying the required duties" (S1/01/03/002, p. 4). Although the JCT's contracts in unamend form provide for the payment period of 14 days, in the case of University H1 "payment is to be 30 days from date of accepted invoice" (H1/01/01/401, p. 3). Indicating the contracts deal with fair payment. Section B Literature & Section D Primary Data explore the presence of the maintenance service agreements, punishments, change control, and incentives in JCT contracts.

"Now, incentivisation is something that is out there in the industry and 90% of people were happy. However, in the public environment, which is what we are it is very difficult to go down the incentivisation route. For example, if we go down this route it will save £100,000 off the project. We will split it 50/50 you get £50,000 back but as the client we get £50,000. This is very difficult in the public sector because the way we are driven is that we would like the £100,000, because it is public money. Therefore, this is not collaborative?" Associate Director of Estates for the University of S1 (S1/04/01/ADE2, ref. 102).

The University of S1's tendering policy (S1/01/03/002, p. 1) relates to: construction works to provide additional accommodation; construction works to modify the existing estate; procurement of the services of consultants; and procurement of goods. The policy incorporates a tendering procedure that adopts the Code for Single Stage Selective Tendering and sets out no alteration to tender prices (National Joint Consultative Committee for Building Collaboration; The Scottish Joint Consultiative; The Joint Consultive Committee for Building Northern Ireland, 1996). The University of S1 has a works tender list. The tendering policy sets out that The North West Consortium of N.H.S. Trusts (2013) provides and maintains the list, which is an inter-organisational approach to working. The framework section of this chapter identifies that the University of S1 also procures a list of contractors through the North West Construction Hub, which demonstrates an element of procurement autonomy. The policy states tender lists are to include three to six contractors (S1/01/03/002, p. 8). The limit of six contractors considers the cost of tendering, demonstrating relatedness by the University. The policy provides a tender period of between ten and twenty working days (S1/01/03/002); and contractor selection is on a lowest tender basis, subject to the contractor achieving health and safety criteria.

The University of L. select contractors for a framework on the basis of offering the most economically advantageous tender with a weighting of 75% on quality and 25% cost (EU/03/001; /04/001). In contrast, also selects a contractor for a project using a weighting 40% quality and 60% cost. The University of Manchester, when procuring design and construction works, apply a weighting of 70% quality and 30% price. The University of Warwick when procuring construction works 30% delivery (interview) and 70% price. The University of Wolverhampton, when procuring design and construction works, apply the weighting of price quality 40% and price 60%. The University of Wolverhampton splits the

quality weighting between: contractor's proposals (16%); compliance with employer's requirements (8%); identification of and ability to manage major sub-contractors 8%; team experience and structure (4%); and post tender interview (4%).

The University of S1 have a tender list for both main contractors and mechanical and electrical sub-contractors (S1/02/01/018). "In our contracts, we put in a selection of names; for example, ITS have a framework for data installers, we encourage the main contractor to use any of the firms, which we have supplied on the data installation; likewise with the mechanical and the electrical" (S1/04/01/ADE2, ref.194). Slimily, the University of S2 only employs local electrical contractors, which are vetted through a Health and Safety Register (S2/01/01/001, p. 5). "Where the Electrical Contractor is to act as a domestic sub-contractor a similar schedule of preferred companies shall be supplied by the University Liaison Engineer to the main contractor" (S2/01/01/001, p. 5).

14.9 STRATEGY

Human resource documents include for example equality and diversity policies (B1/01/03/001; H1/01/01/501; 502; /03/001; L1/01/03/001; MM/01/03/; S1/01/03/001; S2/01/03/001). The University of S2 has a 'Control of Contractors' general policy (S2/01/01/102). The policy sets out that "Contractors must follow the University Harassment policy which prohibits harassment directed against people because of their ethnic origin, age, sexual orientation, physical or mental disability, or some other personal characteristic". Similarly, the University of H1 refers to the Race Relations Amendment Act (UK Parliament, 2000a) section in tender documents. The section states, "The Contractor will comply with legislation for the prevention of discrimination on the grounds of disability, race, sex, sexual orientation, age, religion and belief and the promotion of race equality" (H1/01/01/401, p. 11). This demonstrates relatedness and a capacity to achieve the external risk challenge of culture.

The Higher Education Statistic Agency provides data on behalf of the: Higher Education Funding Council; Higher Education Funding Council for Wales; Scottish Funding Council; and the Department for Employment and Learning. The Estates Management Statistics definition for functional suitability includes environment, layout/plan, location, flexibility, service requirements, user perception and general external environment (Higher Education Statistics Agency, 2011). User perception relate to "The decorative, aesthetic and cosmetic qualities of the room/area from the perspective of users" (Higher Education Statistics Agency,

2011). One use of the Functional Suitability measure is for the Capital Investment Framework (Higher Education Statistics Agency, 2013b). The amount of funding institutions receive depends on demonstrating capacity for improvement of functional sustainability (HEFCE, 2010).

The Association of University Directors of Estates (AUDE, 2013b), provide an inter-organisational guidance document for estates strategy preparation. Earlier guidance includes the Higher Education Funding Council for England's (HEFCE, 2004) 'Estate Strategies: A Guide to Good Practice'. Reference to HEFCE's (2004) guidance is made inside (Keele University, 2013) (UE/034), and outside of England (UI/001). The guidance (AUDE, 2013b) provides a flow diagram. The diagram indicates a number of other strategies that enable estates strategies, including: university strategic plan; institutional plans and strategies; existing estate strategy/plans; and financial strategy. The diagram also indicates how the estates strategies fit in organisations. Facility Directors consider a number of documents during preparation. Documents relate to future challenges associating to the institutional deliverable, including: academic plan/learning strategy; and research strategy. Documents relate to external challenge's including 'local authority plans'; and 'sustainability and corporate social responsibility'. In respect of motivation, reference to documents also demonstrates relatedness including ''sustainability and corporate social responsibility' and "equality and diversity". The use of the guidance is an inter-organisational way of working.

14.10 SHARED SERVICES

AUDE (2013b) guidance has a heading relating to shared services. "The government has announced that shared services will receive an exemption from VAT, removing what the Diamond Review identified as a significant barrier to collaboration between universities" (AUDE, 2013b, p.15). The terms 'shared contracts', 'share contracts', share contract' 'or 'shared contracts', do no occur in any of the forty-four estate strategies. The University of London consists of "18 self-governing Colleges and 10 other smaller specialist research institutes" (University of London, 2013). Member colleges have access to a wide range of shared services (Universities UK, 2011a) including University London Careers Group; Senate House Library; and student accommodation and housing services.

English National Procurement includes representatives from four regional purchasing consortia, namely London Universities Purchasing Consortium (2013), North Eastern

University Purchasing Consortium (2013), North Western Universities Purchasing Consortium (2013) and Southern Universities Purchasing Consortium (2013). There are also consortia in Wales (Higher Education Purchasing Consortium Wales, 2007) and Scotland (Advanced Procurement for Universities and Colleges (APUC) in Scotland, 2013). Table 83 includes members in the North Western Universities Purchasing Consortium (2013). The North Western Universities Purchasing Consortium (2013) includes a category for Estates and Facilities and includes items such as lift maintenance.

Table 83: North Western Universities Purchasing Consortium

Bangor University	Royal Northern College of Music
Edge Hill University	St Marys University College Belfast
Flintshire County Council	Staffordshire University
Glyndwr University	Universities Superannuation Scheme Ltd
Harper Adams University	University of Bolton
Keele University	University of Central Lancashire
Lancaster University	University of Chester
Liverpool Hope University	University of Cumbria
Liverpool John Moores University	University of Liverpool
Liverpool School of Tropical Medicine	University of Manchester
Manchester Metropolitan University	University of Salford
Newcastle-under-Lyme College	University of Ulster
Northwest Universities European Unit Ltd	University of Worcester
Queens University Belfast	

14.11 CHAPTER SUMMARY

This Chapter confirms the transferability of collaborative features from earlier Chapters to other higher education institutions in England. Table 84 summaries this Chapter. Further research is available to make wider recommendations for improvement of the sector.

Table 84: Table Demonstrating the Transferability of Collaborative Features

Category	Collaborative Features	Transferability
Interpersonal Contract	acting in good faith; in an open and trusting manner; in a cooperative manner; continuity of relationships; integration of other stakeholders; lessons learned meetings; shared office spaces; soft skills; teambuilding processes; and training.	collaboration; contractual communications framework/procedure; interpersonal contact; partnering; senior management support; trust; and user interface.
Value Management and Engineering	change control; risk management; value engineering and management; and whole life cycle costing.	carbon management; cost savings; change control; long term maintenance; value improvement; sustainable development; and whole life.
Performance Based Contracting; Performance Management	incentivisation; performance; performance based contract; performance management; performance indicators procurement route; and target contracts.	approval mechanisms; indicators; key performance indicators; performance; post contract review form; and targets.
Practice, Procedures, Information Technology	BIM; organisational level documents; inter-operability of systems; electronic meeting systems, and web 2.0-based collaboration technologies.	inter-organisational documents; knowledge management; legislative compliance; organisational intranet; permit to work; and standard documents/specifications.
Design and Operation Integration	design-construction integration; design and build; private sector engagement into design, construction and maintenance; frameworks; integrated project insurance; private finance initiative; prime contracting; project partnering contract; management agent contracting; organisational standard procurement; soft landings; and two stage open book.	design and build; private finance initiative; procurement autonomy; and BIM.

Category	Collaborative Features	Transferability
Inter-client organisational Knowledge and Initiatives	benchmarking; Considerate Constructors Scheme; CSCS; forward programme; research and development; grants; health and safety co-operation; and health and safety risk reduction professional networks.	carbon management; competence checking associations (including CSCS); HEFCE; professional networks; and sustainable development.
Legal Framework and Tendering	adjudication; change control; charters; contract simplification; contract completeness; contractor selection; enhanced health and safety conditions; CSCS; collaborative working clauses, collaborative/integrated supply chain; communications protocol; design, build, operate contract; dispute ladder; enhanced sharing information; environment and sustainability; facilitation; incentivisation; fair payment; risk assessment and allocation; financial incentivisation; legislative compliance; overarching collaborative agreement; non-competitive tendering; performance indicators; multi part contracts; pre-construction services agreement; simplification of contracts; standard pre-qualification; standardisation contracts and frameworks; sub-contractor relationships; mediation; and value engineering.	inter-organisational/organisational contractor selection matrix; frameworks; fair payment; contractor selection autonomy; organisational standard tendering policy; sub-contract/supply chain tender lists; procurement autonomy; standard forms of contract; and trust.
Strategy	condition of the estate; space efficiency; carbon reduction; environmental performance; affordability; and institutional sustainability.	equality and diversity; functional suitability/sustainability; institutional deliverables;
Shared Services	iBIM; lead buying; piggy backing; shared services; third party advisory; third party outsourcing; shared frameworks; and third party purchasing.	VAT exemption; purchasing consortium; and shared services.

CHAPTER 15 RISK MATURITY MODEL TRANSFERABILITY

15.1 CHAPTER INTRODUCTION

The implementation theme obtains transferability and relatedness to the sector of focus through reference to governmental strategies and the likes. Similarly, the motivation theme obtains transferability and relatedness due to human traits and the nature of humans as organisms. The risk theme basis forms from literature from sectors and locations different from that of the DBenv study. The aim of this Chapter is to relate the risk maturity model to the overall population of English higher educational institutions. The work obtains organisational estates strategies from English Higher Education Estates Strategies (see Chapter 13); analysis the estate strategies using content analysis to offer transferability to the challenges to the overall population.

15.2 MATURITY LEVEL I INTERNAL CHALLENGES

Table 85: Internal Challenge Words

Word	Length	Count	Percentage
budget	6	89	0.02
capital	7	951	0.26
cost	4	625	0.17
costs	5	712	0.20
economic	8	139	0.04
finance	7	125	0.03
financial	9	293	0.08
programme	9	775	0.21
programmes	10	227	0.06
progress	8	144	0.04
timetabling	11	75	0.02
quality	7	742	0.21
value	5	446	0.12
safe	4	89	0.02
safety	6	170	0.05
health	6	474	0.13
Total		6,076	1.68

Estates Strategies by definition relate to future challenges. The 44 Estates Strategies however refer to words that associate to internal challenges (Table 85). Words that associate to ‘programme’ include ‘programme’, ‘programmes’, ‘progress’ and ‘timetabling’. Words associating to cost include ‘budget’, ‘capital’, ‘cost’, ‘costs’, ‘finance’ and ‘financial’. Words

associating with quality include ‘quality’ and ‘value’. The remaining words in the table relate to safety include safe, safety and health. The word ‘health’ in instances relates to the deliverable of organisational activities in contrast to that of the building, for example a number of universities provide services within the health sector. Bournemouth University is an institution that refers to ‘health and social care’ in a different context than that of this study. 24 of the 44 estate strategies make reference to the term ‘health and safety’ on 96 occasions.

Table 86: Effectiveness Words

Word	Length	Count	Percentage
effective	9	197	0.05
effectively	11	75	0.02
efficiency	10	171	0.05
efficient	9	143	0.04
implement	9	115	0.03
implementation	14	259	0.07
purpose	7	396	0.11
purposes	8	99	0.03
relevant	8	101	0.03
success	7	116	0.03
successful	10	90	0.02
suitable	8	89	0.02
Total		1,851	0.51

Effectiveness relates to perceptions of success and failure. Table 86 includes words that associate with effectiveness including ‘effective’, ‘effectively’, ‘efficiency’, ‘efficient’, ‘implement’, ‘implementation’, ‘purpose’, ‘purposes’, ‘relevant’, ‘success’, ‘successful’ and ‘suitable’. The word ‘effective’ occurs 197 times in 39 of the 44 estates strategies. A number of words occur in combination with effective including ‘adaptable and integrated’, ‘delivery of the estates strategy’, ‘maintenance’, ‘programme’ and ‘training and support network’. The word tree for the word ‘efficiency’ is in Appendix I Content Analysis.

15.3 MATURITY LEVEL II EXTERNAL CHALLENGES

Universities operate in a global or international market place. Table 87 identifies words in 44 estates strategies relating to globalisation, which includes ‘global’, ‘national’, ‘public’, ‘region’, ‘regional’ and ‘world’. There is limited reference to international external challenges including ‘treaties’ (0nr), ‘European Union’ (2nr) and ‘United Nations’ (0nr). The

word tree for the word global is in Appendix I Content Analysis. The word 'global' combines with other words including 'challenges', 'climate change', 'community', 'effectiveness', 'environment', 'league tables', 'market', 'reputation' and 'society'. The University College Falmouth (UE/022, p. 69) identifies that "the management of all buildings is to comply with the EU Directive on the Energy Performance of Buildings including regular monitoring and analysis of the energy performance of all buildings".

Table 87: Globalisation Words

Word	Length	Count	Percentage
global	6	136	0.04
national	8	208	0.06
public	6	393	0.11
region	6	101	0.03
regional	8	97	0.03
world	5	315	0.09
Total		1,250	0.35

Table 88: Political Words

Word	Length	Count	Percentage
accessible	10	78	0.02
authority	9	72	0.02
council	7	337	0.09
economic	8	139	0.04
fund	4	101	0.03
funded	6	98	0.03
funding	7	550	0.15
funds	5	94	0.03
legislation	11	82	0.02
legislative	11	67	0.02
permission	10	81	0.02
planning	8	778	0.21
policies	8	143	0.04
policy	6	321	0.09
urban	5	87	0.02
Total		3,028	0.84

Earlier chapters identify the external challenge of politics. Table 88 identifies words from the strategies that relate to the external challenge of politics. Accessible relates to the ability of building users to access the asset, including people with a disability. Legislation protects the rights of disabled people to access assets (UK Parliament, 1995). In addition to accessible,

words (1,559nr) that associate to legislation include legislation, legislative, planning, permission, policies, policy and urban; the words also associate with the external challenge of culture. Other words that associate to politics include authority and council.

The University of M.'s project receives funding from such organisations as Engineering and Physical Sciences Research Council (2013) and European Regional Development Fund (European Commission, 2013) (EC/06/). In the Estates Strategies, there is significant use of words (843nr) that associate to funding including 'fund', 'funded', 'funding' and 'funds'. Section A Introduction identifies that funding of higher education organisations derives from both private and public sector organisations. Funding that derives from the public sector, for example as a capital expenditure grant, relates to the external challenge of politics.

Where funding is over the life cycle of the asset and derives from the private or public sector, a relationship with the future challenge of resource emerges. Funding is a resource. Table 89 includes words associating with the external risk challenge of culture including 'brief', 'culture', 'cultural', 'pedestrian', 'peer', 'peers' and 'stakeholders'. The word 'culture' occurs with the words 'communication', 'research excellence', 'client centred service', 'health and safety', 'cities' and 'academic'. Therefore indicating there are different cultures within higher education institutions. Culture also emerges in the form of social definition; such is the case of ethnicity and religion. The word 'prayer' occurs 9nr times in 6 of the sources. Culture also combines with other words and terms that associate with future challenges including 'change', 'overcome the', shifting the' and 'developing'. The Word tree for culture is in Appendix I Content Analysis.

Table 89: Culture Words

Word	Length	Count	Percentage
brief	5	82	0.02
cultural	8	95	0.03
culture	7	77	0.02
pedestrian	10	89	0.02
peer	4	92	0.03
peers	5	106	0.03
stakeholders	12	70	0.02
Total		611	0.17

Table 90 identifies words in the 44 Estates Strategies that associate with Technology, which includes 'computer', 'technologies' and 'technology' (34 sources; 175 occurrences). In

addition, Table 93 (p.327) identifies 'BREEAM', which technology enables. Words and terms combine with 'technology' indicate an external challenge including 'supported by', 'interactions between', 'research', 'science', 'innovation', 'collaborative', 'communications', 'modern', 'best use' and 'students'. Words and terms that combine with 'technology' which identify with future challenges include 'at the forefront of innovation technology' and 'accelerate'. The word tree for technology is in Appendix I Content Analysis.

Table 90: Technology Words

Word	Length	Count	Percentage
computer	8	75	0.02
technologies	12	79	0.02
technology	10	175	0.05
Total		329	0.09

15.4 MATURITY LEVEL III FUTURE RISK CHALLENGES

Table 91: Asset Utilisation Words

Word	Length	Count	Percentage
fitness	7	134	0.04
function	8	75	0.02
functional	10	253	0.07
functions	9	134	0.04
maintain	8	170	0.05
maintained	10	83	0.02
maintaining	11	67	0.02
maintenance	11	771	0.21
operation	9	89	0.02
operations	10	86	0.02
utilisation	11	446	0.12
Total		2,308	0.64

Words occur in the 44 Estates Strategies that relate to future challenges including 'growth' (484 occurrences) and 'vision' (38 sources; 345 occurrences). There is limited use of words, which relate to emergency, which includes 'fire' that occurs in 69 instances. Emergency relates to the future challenge of dealing with external occurrences during the operation of the asset. Table 91 identifies words from the strategies that relate to the future challenge of asset utilisation. There is significant use of words (1091nr), which associate to 'maintenance' including 'maintenance', 'maintaining', 'maintained' and 'maintain'. Other words relate to

the utilisation of the asset include ‘function’, ‘operations’, ‘operation’, ‘fitness’, ‘functions’, ‘functional’ and ‘utilisation’.

Table 92: Operational Effectiveness Words

Word	Length	Count	Percentage
academic	8	1168	0.32
accommodate	11	126	0.03
accommodation	13	1020	0.28
alumni	6	71	0.02
course	6	70	0.02
courses	7	128	0.04
lecture	7	181	0.05
operating	9	81	0.02
operational	11	190	0.05
park	4	825	0.23
parking	7	204	0.06
postgraduate	12	207	0.06
science	7	418	0.12
sciences	8	376	0.10
student	7	1844	0.51
students	8	1402	0.39
students’	9	105	0.03
studies	7	139	0.04
study	5	195	0.05
teaching	8	1228	0.34
undergraduate	13	129	0.04
Total		10,107	2.79

Higher Education Institutions operate an asset for a reason for example to provide a service. Words occur in the 44 Estates Strategies that relate to future challenges including ‘growth’ (484 occurrences) and ‘vision’ (38 sources; 345 occurrences). There is limited use of words, which relate to emergency, which includes ‘fire’ that occurs in 69 instances. Emergency relates to the future challenge of dealing with external occurrences during the operation of the asset. Table 91 identifies words from the strategies that relate to the future challenge of asset utilisation. There is significant use of words (1091nr), which associate to ‘maintenance’ including ‘maintenance’, ‘maintaining’, ‘maintained’ and ‘maintain’. Other words relate to the utilisation of the asset include ‘function’, ‘operations’, ‘operation’, ‘fitness’, ‘functions’, ‘functional’ and ‘utilisation’.

Table 92 indicates 10,107 words that associate to the operation of the asset and operational efficiency; both of which relate to the external challenge of culture. In addition, operation of the asset relates to the future challenge of the estate being suitable for developing and emerging cultures over time. Sustainability identifies with the external challenges of 'natural environment' and 'politics'. In addition, sustainability includes 'carbon reduction' and 'energy conservation'. 'Energy conservation' relates to the external challenges of operating the estate. The sources include words that associate with the environment including bream, carbon, emissions, energy, environment, environmental, green, nature, sustainability, sustainable, transport, travel, waste, water and, climate (Table 93). The word 'carbon' occurs 658 times in 34 sources. The significance of environmental challenges to higher education institutions are evident by the number of organisations that have environmental and biodiversity policies.

Table 93: Natural Environment Words

Word	Length	Count	Percentage
breeam	6	72	0.02
carbon	6	658	0.18
emissions	9	248	0.07
energy	6	775	0.21
environment	11	573	0.16
environmental	13	405	0.11
green	5	250	0.07
nature	6	83	0.02
sustainability	14	442	0.12
sustainable	11	351	0.10
transport	9	220	0.06
travel	6	222	0.06
waste	5	233	0.06
water	5	258	0.07
climate	7	91	0.03
Total		4,881	1.35

The Higher Education Statistics Agency (2013) indicates that out of the 130 Higher Education Institutions in England, 120 make available a copy of their environmental and 83 Biodiversity policy on the internet. The use of the internet to deliver environmental agendas identifies with the external risk challenge of making use of available technology. In addition, Facility or estates procedure documents relate to carbon management (B1/01/01/001; B1/01/04/001; S1/01/01/201; L1/01/04/002; MM/01/04/003; 004), sustainable development (B1/01/01/003;

004; S1/01/01/201; H1/01/04/001; L1/01/04/001 MM/01/04/001; S2/01/04/003; 004); environment (B1/01/01/005; 006; S1/01/01/003; L1/01/04/003; 005; MM/01/04/002); waste management (MM/01/02/006; H1/01/04/003; L1/01/04/006); and biodiversity (B1/01/04/003; H1/01/04/002; S2/01/04/001; 002).

The Association of Directors of Estates recognises provides AUDESAT as an inter-organisational approach to develop good practice in estates management, identifying with the future challenge of human resource. In addition, words associating to 'culture' (see Table 89, p.324) also relate to 'human resources'. Table 94 includes words associating to the future challenge of human resources including 'ability', 'able', 'collaboration', 'encourage', 'opportunities', 'opportunity', 'partner', 'partners', 'partnership', 'partnerships', 'professional', 'staff', 'team', 'training' and 'trust'. The word 'trust' occurs 352 times in 29 sources. The word trust occurs in combination with 'NHS', 'housing', 'carbon', 'Talbot Village', 'Civic', 'Foundation', 'St Luke's Parochial', 'Healthcare', 'Hospital', 'teaching', 'Guinness Housing', 'Energy Saving', 'Westfield', 'London', 'South Manchester', 'Research Endowment', 'Medical College' and 'Wildlife'. Therefore, there are limits to the words identification with 'human resource'. The word tree for 'trust' is in Appendix I Content Analysis.

Table 94: Human Resource Words

Word	Length	Count	Percentage
ability	7	111	0.03
able	4	76	0.02
collaboration	13	78	0.02
encourage	9	93	0.03
opportunities	13	487	0.13
opportunity	11	178	0.05
partner	7	71	0.02
partners	8	107	0.03
partnership	11	182	0.05
partnerships	12	122	0.03
professional	12	205	0.06
staff	5	1194	0.33
team	4	132	0.04
training	8	106	0.03
trust	5	352	0.10
Total		3,494	0.97

15.5 CHAPTER SUMMARY

Estate strategies by definition relate to future challenges. Table 95 is a summary of the tables in this Chapter, which relate data from the content analysis to risk challenges. There are words that relate to each maturity level of the risk theme. In relation to internal challenges, there are words that relate to programme, cost, quality and safety. In addition, there are words that associate to perceptions of effectiveness. In relation to external challenges, there are words that relate to external risk challenges. Politics includes reference to funding, existing legislation, authorities and planning. Further research is available with the strategies to assess and develop external considerations to future challenges. For example, compliance with existing legislation is an external challenge. Involvement in the drafting of legislation is a way to manage a future challenge. In the Table words that associate with future challenges occur the most. Natural environment occurs as a future challenge in that a proportion of the words relate to the impact the estate has on the environment. In summary, the content analysis confirms the transferability of the risk maturity model.

Table 95: Risk Challenge Summary

Risk Challenges Word Groups	Count	Percentage
Maturity Level I Internal		
Programme, Cost, Quality and Safety	6,076	1.68
Effectiveness	1,851	0.51
Maturity Level II External		
Globalisation	1,250	0.35
Politics	3,028	0.84
Culture	611	0.17
Technology	329	0.09
Maturity Level III Future		
Asset Utilisation	2,308	0.64
Operational Effectiveness	10,107	2.79
Natural Environment	4,881	1.35
Human Resource	3,494	0.97
Total	33,935	9.39

CHAPTER 16 SECTION SUMMARY

16.1 CHAPTER INTRODUCTION

The aim of Section E Transferability is to improve the transferability of work in earlier parts of the study to the overall population of higher education institutions in England. The aim of this Chapter is to provide a succinct summary of Section E Transferability. The work will demonstrate how the data in Chapter 14 demonstrates that the collaborative features are not unique to the primary case study.

16.2 COLLABORATIVE FEATURES

Table 96: Data Confirming Presence of Collaborative Features

Collaborative Feature Category	Estate Strategies	Auxiliary Case Studies	Tender Notices	Industry Sources
Interpersonal Contract	✓	✓		
Value Management and Engineering	✓	✓		
Performance Based Contracting; Performance Management	✓	✓		
Practice, Procedures, Information Technology		✓	✓	✓
Design and Operation Integration	✓	✓	✓	
Inter-client organisational Knowledge and Initiatives	✓	✓		✓
Legal Framework and Tendering		✓	✓	✓
Strategy		✓		✓
Shared Services				✓

Table 96 relates the data sources to the collaborative features from Section B Literature and Section D Primary Data to the data sources in this Section. The table refers to four data sources, namely estate strategies, auxiliary case studies, tender notices and industry sources. A tick is used where data sources demonstrate the presence of the collaborative feature category. The study confirms the transferability of the collaborative features between higher education institutions in England. The work analyses data using thematic analysis to create a narrative and identify keywords that relate to collaborative features. There is limited attempt to undertake summative content analysis to offer generalisations.

16.3 RISK MATURITY MODEL TRANSFERABILITY

The aim of the chapter is to relate the risk maturity model to the overall population of English Higher Educational Institutions. The Chapter primarily makes use of 44 estates strategies. There are 130 University Estates in England. The estates strategy data provides an organisational summary to 31% of the overall population; however, the data indicates summarising sample size by number of universities would be over simplifying the situation. Summative content analysis relates words in the estates strategies to the levels in the maturity model (see Table 95 p.329) and confirms the transferability of the maturity model.

16.4 CHAPTER SUMMARY

This Section pragmatically uses data to demonstrate the transferability of the collaborative features and the risk hierarchy.

SECTION F CONCLUSIONS

CHAPTER 17 SECTION INTRODUCTION

17.1 CHAPTER INTRODUCTION

The aim of this section is to achieve the aim of the DBenv study (Section A Introduction). This section will bring together the earlier chapters of the DBenv study to provide the overall deliverable suitable for use in practice; and summarise the study in relation to the aim of objectives set out in Section A Introduction.

17.2 FORMAT

Table 97: Section F Headings

Heading Level	Example	Purpose
I	3 CH….	This heading identifies a chapter within the DBenv thesis. This Section is different than earlier Sections in that Chapter 18 combines the three themes and there is not independent chapters for each theme (or maturity model).
II	3.1 CH…	The sub-heading identifies Parts within the Chapters differentiating such things as Chapter introductions, maturity models (Chapter 18), aim/objectives of DBenv study (Chapter 19) and summaries.
III	3.2.2 P…	The sub-sub-heading divides parts of the chapters and is used for part introductions, sub-parts and summaries. In Chapter 18 the sub- parts relate to levels in the maturity models.

Table 97 summarises the headings in Section F Conclusions. Figure 32 summarises the stages to arrive at the DBenv thesis conclusion and deliverable. Section F has two Chapters. The aim of Chapter 18 Discussions is to bring together the earlier chapters from the thesis to provide the overall framework. The aim of Chapter 19 Section Summary & Conclusion is to relate the work to the overall aims and objectives of the research at the same time as making recommendations for future research.

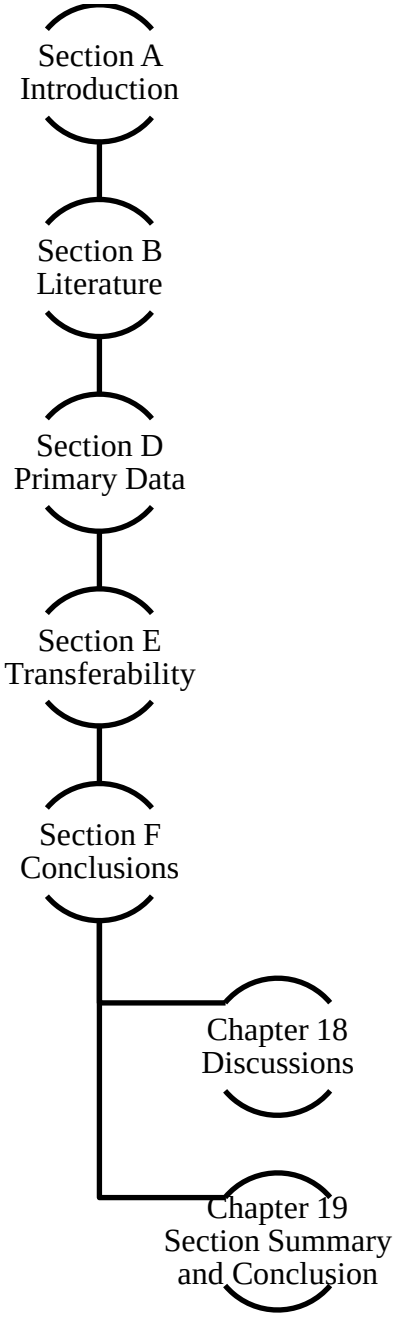

Figure 32: Stages of DBenv Study

17.3 CHAPTER SUMMARY

This chapter sets out how the DBenv will be concluded. This section is split into two Chapters. Chapter 18 Discussions provides an overall framework. Chapter 19 Section Summary & Conclusion confirms the DBenv's overall aims and objectives are achieved.

CHAPTER 18 DISCUSSIONS

18.1 CHAPTER INTRODUCTION

The research deliverable emerges through the Chapters of the DBenv thesis. The maturity models in Section B Literature develop in Section D Primary Data & Section E Transferability. The aim of this Chapter is to provide the research aim. The work will bring together other earlier chapters of the thesis to produce three maturity models; and will bring the maturity models together to offer the DBenv deliverable that is a framework.

18.2 IMPLEMENTATION MATURITY MODEL

18.2.1 PART INTRODUCTION

The aim of this Part is to summarise the implementation theme to provide a maturity model suitable to achieve the aim of the research. The work will bring together and summarise earlier implementation chapters; and provide a maturity model. The implementation theme sets out a process to work efficiently by reducing needless repetition.

18.2.2 MATURITY LEVEL I PROJECT LEVEL COLLABORATION

Design integration is set out in a number of UK Government Cabinet Office (2012a, p.21; 2012, p.3; 2011, p.3) and Treasury reports (HM Treasury & Infrastructure UK, 2011, p.10) and is a form of project level collaboration (Crowe & Fortune, 2012). Design integration includes pre and post contract integration of the contractor's knowledge into design (Crowe & Fortune, 2012; Cicmil & Marshall, 2005). Pre-contract may relate for example to a two stage tendering process. Post contract may relate to the use of design and build procurement. One justification to integrate the supply chain into design emerges from health and safety (HSE, 2007, p.16). There is a risk that Procurement methods that involve contractor design involve abortive work at tender; which is avoidable through such processes as two stage tendering (Cabinet Office, 2012; Cabinet Office, 2011). The Primary Case study organisation undertakes a two-stage tendering on the Primary Project (see Section D Primary Data).

Collaboration is less of a prescriptive process and more of a process led by sense making, perception forming and learning (Hartmann & Bresnen, 2011, p.41), which relates to soft skills. Soft skills relate to integrity/trust, verbal and non-verbal communication and leadership interpersonal relations (Garrett, 2005, p.15). Within the context of the Primary

Case Study the data indicates the presence of interpersonal contact at project level relating to building users and senior management support. Similarly, Section E Transferability confirms the recognition of relationships and trust by a number of higher education institutions.

18.2.3 Maturity Level II Organisational Level Collaboration

Decisions concerning collaboration can be made on a project-by-project basis, as is the case with Maturity Level I Project Level Collaboration. However, there is a requirement for operation integration including that in relation soft landings is set out in a number of the UK Government's Cabinet Office (2012a, pp.4,16; 2012, p.3; 2011, pp.13-14) and Treasury (HM Treasury & Infrastructure UK, 2011, p.16) reports. The primary case study procures work in a traditional manner. Similarly, in Section E Transferability there is limited reference to procurement routes that integrate the construction and operation phase. Therefore, the only way to achieve operation integration is through an organisational approach to procurement, providing the justification for this level of the maturity model. Further support comes from Section E Transferability that establishes that a large proportion of universities have estates strategies that set out the organisational approach to their estates.

The Primary Case Study undertakes an organisational approach to legislative compliance and developing the supply chain. At an organisational level, there are a number of documents available to employees and the supply chain; which refer to such things as legislation and include organisational manuals and specifications. Similarly, Section E Transferability establishes that a number of institutions make the documents available to the supply chain through electronic sources. There are limits to integration of supply chain knowledge in practice and procedures manuals, for example standard specifications; however an element of this may come through informal relationships and a preferred suppliers list, for example for lifts. In addition, the Primary Organisational Case Study makes available specialists to assist the supply chain to understand organisational procedures. The use of practice and procedures manual supports Maturity Level II Organisational Collaboration as part of the model.

This Chapter previously identifies Design Integration with Maturity Level I Project Level Collaboration. In the Primary Case study a procedures manual restricts design integration; for example, organisational contract preliminaries for design and build procurement are not available in the organisational documents. The organisational approach provides for implementation of standard preliminaries on all projects. Project specific preliminaries relate

the standard preliminaries to given projects. The organisational documents, however, provide for contractor's design portion of a small element of the works. In addition, practitioners have an amount of flexibility during implementation. In order to undertake design and build procurement the preliminaries need creating at project level, in contrast to the normal organisational approach; which was the case with a large capital project using design and build procurement undertaken by the Primary Case Study. This indicates an element of contrasting organisational approach, which the DBenv framework could assist in avoiding.

Further support for Maturity Level II Organisational Collaboration comes through the BIM agenda. The UK Government sets out its overall objective, for the implementation of BIM by 2016 (Cabinet Office, 2011; Cabinet Office, 2012). The Primary Case Study, similar to other organisations is a significant distance away from implementing BIM. The Primary Case Study, however, does implement inter-organisational software. An inter-organisational web based approach is undertaken to contract administration; however, it is fragmented from the rest of the organisations systems, further supporting for Maturity Level II Organisational Collaboration.

Collaboration occurs throughout the supply chain (Greenwood, 2001; Doran & Giamakis, 2011), which is a requirement of a number of UK Government Cabinet Office (2012a, p.13; 2012, p.4; 2011, p.3) and Treasury reports (HM Treasury, 2012, p.35; HM Treasury & Infrastructure UK, 2011, p.18; HM Treasury, 2011a, p.115). At organisational level, framework agreements are available to promote supply chain collaboration. There is an element of autonomy for university organisations, which procure works outside and inside of frameworks. Universities operate within confinements of legislation when setting up and maintaining frameworks. Frameworks implement at organisational and inter-organisational levels (Cabinet Office, 2012; Manchester City Council, 2013; NWCH, 2012); supporting Maturity Level II Organisational Collaboration and Maturity Level III Inter-Organisational Collaboration.

A requirement to focus on performance is set out in a number of industry (Egan, 1998), UK Government's Cabinet Office (2012a, p.21; 2012, p.4; Cabinet Office, 2011) and Treasury reports (HM Treasury & Infrastructure UK, 2011, p.3; HM Treasury, 2011a, p.116). The estate strategies employ words signifying perceptions of levels of performance. Section E Transferability identifies a fragmented approach to performance measurement with implementation by different organisations to different levels. The Primary Case Study is

starting to use performance indicators at organisational level; supporting Maturity Level II Organisational Collaboration and Maturity Level III Inter-Organisational Collaboration.

Incentivisation is a form of collaboration (Crowe & Fortune, 2012). The use of financial incentivisation is recognised in British Standards relating to target procurement, socio-economic objectives, employment and key performance indicators (BSI, 2010b, pp.11, 87, 92). Incentivisation comes through contractual provisions, for example, the standard contract documents include provision for liquidated damages. The Primary Case Study does not use financial incentives to promote delivery, for example linking to a guaranteed maximum price. Incentivisation instead links to the prospect of repeat work through frameworks; supporting Maturity Level II Organisational Collaboration.

Project performance improves through value management, value engineering and whole life cycle costing (Cabinet Office, 2012b, p.6). Value engineering and value management procedures are already in existing standard contracts. There is a requirement for value management to consider economic, environmental and social costs (Cabinet Office, 2012b; UK Parliament, 2006; UK Parliament, 2012). The process of value management requires consideration of assets over the lifecycle of an asset, providing support for Maturity Level II Organisational Level Collaboration. The Primary Case Study is found to consider life cycle costing informally at project level. The use of the maturity model by the estate may create a more formal approach placing greater emphasis on efficiencies.

There is a requirement for fair payment emerges from industry reports (Latham, 1994, p.37), UK Government (OGC, 2007; Cabinet Office, 2011, p.13), UK Legislation (UK Parliament, 1996; UK Parliament, 2009), charters (University of the West of England, 2013; Highways Agency, 2013) and Standards (Cabinet Office, 2012b; BSi, 2011c, p.44). There needs to be an organisational approach to fair payment, providing further support for Maturity Level II Organisational Level Collaboration.

18.2.4 Maturity Level III Inter- Organisational Level Collaboration

Inter-organisational collaboration occurs where organisations come together to share knowledge and develop individual supply chains. A requirement to develop the supply chain through the provision of a forward programming of information is set out in the UK Government's Cabinet Office (2010, pp.3,8; 2012a, p.8; 2012, p.4), Treasury (HM Treasury,

2012, p.19; HM Treasury & Infrastructure UK, 2011, p.15; HM Treasury, 2011a, p.115) and individual government agencies (Highways Agency, 2009a, p.16). The ability of data to incentivise long term development in research and development is identified in UK Government's Cabinet Office (2012a, p.21; 2012, p.4; 2011, p.3), Treasury (HM Treasury, 2012, p.35; HM Treasury & Infrastructure UK, 2011, p.19; HM Treasury, 2011a, p.115) and individual government agencies (Highways Agency, 2009a, p.34) reports. The requirement to share knowledge supports Maturity Level III Inter-Organisational Collaboration.

There is a relationship between Joint Contracts Tribunal and the Association of Directors of Estates. The Universities have the autonomy to enter into the agreements of their choosing. Decisions on contracts along with subsequent options clauses are made at organisational level. Such options include a requirement to implement Building Information Modelling. There is no attempt in this research to generalise the selection of contracts or the implementation of building information modelling in the higher education sector. The research identifies standard forms of contract, which is an inter-organisational way of working; supporting Maturity Level III Inter-Organisational Collaboration

Surveys (RICS & Davis Langdon, 2007; RICS & Davis Langdon, 2012; nbs, 2012) identify a number of (UK) industry standard contracts implement collaboration at project level including the NEC3, JCT, ACA and FIDIC suites. The suites implementation represents an inter-organisational way of working. Collaborative features in the contracts include: collaborative working (clauses); collaborative working (clauses) supply chain; enhanced sharing of information; communications protocol; risk assessment/allocation; enhanced health and safety; environment and sustainability; value engineering; financial incentivisation; change control/quotation; performance indicators; dispute ladder/negotiation between senior executives; and mediation. The Primary Case Study and other organisations make use of standard forms of contracts, which include collaborative ways of working. This makes evident that it is possible to achieve collaborative working at inter-organisational level.

Inter-organisational collaboration occurs through the market nature of the United Kingdom construction industry, with construction workers and practitioners working for multiple organisations, in contrast to directly employing staff. Therefore, long-term development occurs through the interchange of the supply chains between University organisations. Section E Transferability identifies the majority of higher education institution's estates departments and staff engage with informal and formal networks. A wide range professional

associations and forums have an active involvement in higher education estates and properties. Therefore, the requirement to share knowledge supports Maturity Level III Inter-Organisational Collaboration.

Higher Education Institutions including the Primary Case Study undertake a strategic (or organisational) approach to the management of their estate in order to achieve capital funding (HEFCE, 2012). Organisations funding the Primary Case Study place a requirement to share information and join initiatives inter-organisationally. In addition, universities make use of other documents from other organisations including guidance, standards and legal publications, which have cross-referencing in organisational documents. Inter-organisational information is available including guidance and benchmarking data. There are also inter-organisational mechanisms for the monitoring and promoting performance. Universities actively involve themselves with initiatives including that in relation sustainability, older buildings and estate management. Section E Transferability identifies reference in 44 estates strategies to initiatives such as BREEAM. There is no reference to a number of competence checking organisations in the estates strategies, however, reference is made in other organisational documents. The inter-organisational approach to management of estates supports Maturity Level III Inter-Organisational Collaboration.

18.2.5 Maturity Level IV Integrated Collaboration

Integrated collaboration occurs as lead buying, shared services, piggy backing, third party advisory, third party purchasing and third party outsourcing (Bakker et al., 2008). The idea of integrated procurement is that universities come together to procure a shared service under a shared contract. Support for Maturity Level IV Integrated Collaboration receives support from VAT incentivisation. There are a number of shared frameworks and purchasing consortia available to universities. The Primary Case Study shares a consultant framework, unlike the organisational framework for contractors. Consultants receive direct appointments from the Primary Case Study, which makes limited use of joint ventures. There is evidence of minimal sharing of services, for example in relation to waste management. Section E Section E Transferability indicates limited use of shared contracts, one exception is that undertaken by the University of London. The data does not suggest that the Primary Case Study uses funding agreements to promote the provision of services that meet organisational deliverables, for example a grant given to a supplier in return for offering a service. Funding agreements can be used in place of construction contracts to promote the provision of a deliverable

(Homes and Communities Agency, 2013). Therefore, it indicates the maturity model would be of use to improve practice.

18.2.6 PART SUMMARY

Chapter 3 Implementation analyses and synthesis literature to create a maturity model with four increments (see Table 98). The hierarchy achieves capacity for transferability between institutions through a number of government reports, strategies and the likes. During the construction of the maturity model a number of collaborative features complete with categories emerge that will be of use for the other two maturity models. A test of the maturity model using a Primary case study confirms that the model works in practice. Collaborative features that relate to low levels in the maturity model can develop to achieve higher levels.

Table 98: Implementation Maturity Model

Category	Collaborative Feature	Level I Project	Level II Organisational	Level III Inter-organisational	Level IV Integrated
Interpersonal Contract	acting: in good faith; in an open and trusting manner; in a cooperative manner; continuity of relationships; integration of other stakeholders; lessons learned meetings; shared office spaces; soft skills; teambuilding processes; and training.				
Value Management and Engineering	change control; risk management; value engineering and management; and whole life cycle costing.				
Performance Based Contracting; Performance Management	incentivisation; performance; performance based contract; performance management; performance indicators procurement route; and target contracts.				
Practice, Procedures, Information Technology	BIM; organisational level documents; inter-operability of systems; and electronic meeting systems, web 2.0-based collaboration technologies.				
Design and Operation Integration	design-construction integration; design and build; private sector engagement into design, construction and maintenance; frameworks; integrated project insurance; private finance initiative; prime contracting; project partnering contract; management agent contracting; organisational standard procurement; soft landings; and two stage open book.				
Inter-organisational Knowledge and Initiatives	benchmarking; Considerate Constructors Scheme; CSCS; forward programme; research and development; grants; health and safety co-operation; health and safety risk reduction; and professional networks.				

Category	Collaborative Feature	Level I Project	Level II Organisational	Level III Inter-organisational	Level IV Integrated
Legal Framework and Tendering	adjudication; change control; charters; contract simplification; contract completeness; contractor selection; enhanced health and safety conditions; CSCS; collaborative working clauses, collaborative/integrated supply chain; communications protocol; design, build, operate contract; dispute ladder; enhanced sharing information; environment and sustainability; facilitation; incentivisation; fair payment; risk assessment and allocation; financial incentivisation; legislative compliance; overarching collaborative agreement; non-competitive tendering; performance indicators; multi party contracts; pre-construction services agreement; simplification of contracts; standard pre-qualification; standard contracts and frameworks; sub-contractor relationships; mediation; and value engineering.				
Strategy	condition of the estate; space efficiency; carbon reduction; environmental performance; affordability; and institutional sustainability.				
Shared Services	iBIM; lead buying; piggy backing; shared services; third party advisory; third party outsourcing; shared frameworks; and third party purchasing.				

18.3 MOTIVATION MATURITY MODEL

18.3.1 PART INTRODUCTION

The previous theme (implementation) demonstrates the occurrence of collaborative features in a Primary Case Study and other Universities in England. The aim of this Part is to summarise the motivation theme to provide a maturity model suitable to achieve the aim of the research. The work will bring together and summarise earlier motivation chapters; and provide a maturity model. The motivation theme sets out a process to motivate practitioners to exceed performance requirements.

18.3.2 MATURITY LEVEL I EXTERNAL REGULATION

Chapter 4 Motivation establishes that external regulation reduces intrinsic motivation and has a negative effect on vitality, depression and physical symptoms. The Primary Case Study employs organisational documents such as practice and procedures manuals to implement external regulation within the organisation. The locus of regulation with frameworks is with employees, for example, there is a prescriptive procedure associating to tendering adjudication and the organisational framework, which restricts autonomy. In addition, an element of external regulation exists with the supply chain in respect of the framework (M1/02/PR/SUB1, ref.17). In that failing to comply with the University's organisational regulations bring with it a risk to Contractors' future workload (M1/06/02/005, p. 3). The use of external regulation supports Maturity Level I External Regulation

The Primary Case Study and other English Universities employ legal systems to implement external regulation that is evident through the employment of construction contracts (M1/03/05/006). The use of external regulation further supports Maturity Level I External Regulation. The contracts are prescriptive in relation to collaborative clauses and design. Contractual drafting includes a spectrum of other documents that limit identification and integration. However, there is organisational relatedness and recognition of industry competence evident in the use of standard forms of contract. This supports the case for collaborative features achieving mixed regularity styles. In summary, the prescriptive management style that associates to contractual behaviour restricts autonomy. In contrast, the bespoke nature of construction promotes autonomy.

18.3.3 MATURITY LEVEL II INTROJECTION

Chapter 4 Motivation establishes that negative introjection including that relating to punishment, feelings of incompetence and controlling feedback, reduces intrinsic motivation. The data indicates an element of negative introjection occurs with the Primary Case Study, with a lack of relatedness from senior management towards employees. In addition, a lack of relatedness is found with the supply chain. Section E Transferability identifies that senior management support is a consideration by a number of organisations, therefore supporting the case for Maturity Level II Introjection.

In the Primary Case Study prescriptive standards facilitates introjection (M1/02/PR/SUB1, ref. 35) relating to organisational standards (M1/03/-; 06/-). However, the data does not suggest that organisational standards are a prerequisite to introjection. To an extent, a culture of introjection is evident in the organisation; therefore, there is the potential for it to occur with other collaborative features. Onerous prescriptive standards do not comply with the requirements of autonomy. In addition, any feature that achieves a high level of introjection exhibits low levels of integration. Collaborative features that have the ability to provide relatedness and identification are limited from progressing to higher levels of maturity due to cultural introjection in the Primary Case Study, therefore supporting the case for Maturity Level II Introjection.

18.3.4 MATURITY LEVEL III IDENTIFICATION

Chapter 4 Motivation establishes that a regularity style of integration increases performance and persistence. The organisation undertakes performance measurement informally without links to external regulation, indicating cognitive autonomy. Section E Transferability establishes that a number of organisations undertake performance measurement to offer the contractor feedback on performance, promoting integration. However, there is limited evidence to suggest that feedback is two-directional, demonstrating limited relatedness. Performance measurement is undertaken to enable the supply chain to obtain a better understanding of the procuring organisation, therefore supporting the case for Maturity Level III Identification.

The practice and procedures manual is available to promote supply chain competence through identification of University requirements. However, relatedness and organisational autonomy

is restricted by the practice and procedures manual (knowledge management), in that it is prescriptive and applied by the University on to the supply chain. In contrast, there is evidence of informal knowledge sharing within and between Primary Case Study and the supply chain; with an element of procedural autonomy providing supply chain knowledge integration. The use of the practice and procedures manual therefore supports the case for Maturity Level III Identification.

18.3.5 Maturity Level IV Integration

Collaborative features associating to Maturity Level IV Integration also by definition associate to Maturity Level III Identification. Chapter 4 Motivation establishes that a regularity style of integration associates to relatedness competence and autonomy. In addition, the work states the regulatory style associates to increases in intrinsic motivation. Employees undertake the service of the supply chain. Therefore, when applying to organisations they apply to employees. The Primary Case Study facilitates and provides competence, autonomy and relatedness which associates to interpersonal contact and informal ways of working. Interpersonal contact is evident in user interface and professional networks. Similarly, Section E Transferability identifies that a considerable number of English university employees are involved in professional institutions, supporting the case for Maturity Level IV Integration.

There are larger geographical inter-organisational frameworks to assist Universities to comply with legislation, however, have a capacity to inhibit relatedness. The Primary Case Study implements a framework though a non-binding agreement. The use of a non-binding agreement restricts the potential for external regulation. There are limits to the agreements enforceability. Limited enforceability brings with it autonomy and limits external regulation. The reduction in external regulation reduces the potential for introjection. The use of non-binding agreements supports the case for Maturity Level IV Integration. Universities do however use external regulation to achieve relatedness; for example, they have standard documents, with recourses to promote equality. The framework facilitates the development of the supply chains competence and demonstrates relatedness. Long-term relationships allow greater understanding and development of the supply chain and university employee competence. In addition, long-term relationships demonstrate relatedness to the supply chains requirement for continuity of workload. The organisational relatedness supports the case for Maturity Level IV Integration.

Recently the Primary Case Study provides more autonomy to main contractors to select sub-contractors, which reduces capacity of the University to build long-term relationships with sub-contractors. The main contractor framework provides evidence of relatedness to fair payment, in that the University restricts tender lists. Main contractor incentivisation is in the form of repeat business in contrast to sums contingent on performance, therefore limiting external regulation. In contrast, due to continuity of workload there is evidence of performance related payment at sub-contract level. Therefore, there is a requirement to consider Maturity Level IV Integration through the supply chain.

Autonomy relates to the achievement of motivational integration, however also creates risk. There is evidence in the Primary Case Study of informal ways of working including that relating to change control, risk management and life cycle costing. The recognition of informal mechanisms demonstrate relatedness to the supply-chains' employees competence. Relatedness to supply chain knowledge is seen for example in the use of Design and Build procurement. In the Primary Case Study, there are feelings that where processes are undertaken formally there is to an extent a feeling of wasting resources. The university sets out formal routes for communication in the construction contract. However, there is not a strategy in place to implement building information modelling, demonstrating procedural autonomy. Therefore, there is a balance between autonomy, competence and relatedness when achieving Maturity Level IV Integration.

18.3.6 PART SUMMARY

This Part summarises the motivation theme in the research to provide a maturity model suitable for overall aim of the research (see Table 99). The Primary case Study implements external regulation with construction contracts. The contracts refer to practice and procedures manuals; risk allocation; maintenance service agreements; contractor adjudication, punishments; standardised legal documents; initiatives, competence checking (associations and institutions); inter-organisational standards and guidance. The external regulation limits organisational autonomy support. In contrast, the bespoke nature of construction brings an element of procedural autonomy support. The organisation employs informal change management providing an element of cognitive autonomy. There is evidence within the organisation of introjection. The Primary Case Study promotes identification with procurement autonomy, knowledge management and performance management. Integration

is evident in informal ways of working, frameworks, non-performance contingent incentivisation and professional networks.

Table 99: Motivation Maturity Model

Category	Collaborative Feature	External Regulation	Introjection	Identification	Integration
		contingent incentivisation	ego involvement, controlling feedback, self-awareness	interpersonal contact, beneficiary contact	relatedness, competence, autonomy
Interpersonal Contract	acting: in good faith; in an open and trusting manner; in a cooperative manner; continuity of relationships; integration of other stakeholders; lessons learned meetings; shared office spaces; soft skills; teambuilding processes; and training.				
Value Management and Engineering	change control; risk management; value engineering and management; and whole life cycle costing.				
Performance Based Contracting; Performance Management	incentivisation; performance; performance based contract; performance management; performance indicators procurement route; and target contracts.				
Practice, Procedures, Information Technology	BIM; organisational level documents; inter-operability of systems; electronic meeting systems, and web 2.0-based collaboration technologies.				

Category	Collaborative Feature	External Regulation	Introjection	Identification	Integration
Design and Operation Integration	design-construction integration; design and build; private sector engagement into design, construction and maintenance; frameworks; integrated project Insurance; private finance initiative; prime contracting; project partnering contract; management agent contracting; organisational standard procurement; soft landings; and two stage open book.				
Inter-organisational Knowledge and Initiatives	benchmarking; Considerate Constructors Scheme; CSCS; forward programme; research and development; grants; health and safety co-operation; health and safety risk reduction; and professional networks.				

Category	Collaborative Feature	External Regulation	Introjection	Identification	Integration
Legal Framework and Tendering	adjudication; change control; charters; contract simplification; contract completeness; contractor selection; enhanced health and safety conditions; CSCS; collaborative working clauses, collaborative/integrated supply chain; communications protocol; design, build, operate contract; dispute ladder; enhanced sharing information; environment and sustainability; facilitation; incentivisation; fair payment; risk assessment and allocation; financial incentivisation; legislative compliance; overarching collaborative agreement; non-competitive tendering; performance indicators; multi part contracts; pre-construction services agreement; simplification of contracts; standard pre-qualification; standardisation contracts and frameworks; sub-contractor relationships; mediation; and value engineering.				
Estates Strategy	condition of the estate; space efficiency; carbon reduction; environmental performance; affordability; and institutional sustainability.				
Shared Services	iBIM; lead buying; piggy backing; shared services; third party advisory; third party outsourcing; shared frameworks; and third party purchasing.				

18.4 RISK MATURITY MODEL

18.4.1 PART INTRODUCTION

The aim of this Part is to summarise the risk theme to provide a maturity model suitable of meeting the aim of the research. The work brings together the summative analysis from Chapter 11 and Chapter 15; and confirms the maturity model is appropriate for use by the overall population of English Universities.

18.4.2 MATURITY LEVEL I INTERNAL RISK CHALLENGES

Chapter 4 Motivation identifies risk sources, consequences and mitigation in relation to internally controllable risks. Table 100 summarises the content analysis from the DBenv thesis that explores internal risk challenges. There are a significant number of words (6,760) relating to the internal risk challenges of programme, quality, cost and safety. There are also a number of words that associate to effectiveness and understandings of performance (1,869). This supports the use of Maturity Level I Internal Risk Challenges.

Table 100: Internal Risk Challenge Content Analysis Reconciliation

Risk Factor	Primary Case Study		44 Estate Strategies	Total
	Participant	Interviewer		
Internal Challenges	519	165	6,076	6,760
Effectiveness	16	2	1,851	1,869
Total	535	167	7,927	8,629

The Primary Case Study makes use of an organisation practice and procedures manual. The manual is one directional and does not make use of available technology to encapsulate supply chain knowledge. Similarly, the organisation makes limited use of procurement routes that facilitate the supply chain to incorporate knowledge into the design. The requirement of the organisation to improve in relation to available technology supports the case for Maturity Level II External Risk Challenge.

18.4.3 MATURITY LEVEL II EXTERNAL RISK CHALLENGES

External risks challenges occur externally outside of a project team's control. At an internal maturity level, the concern is managing the risks on the project, for example making sure the materials turn up on time and are suitable for purpose. This level of the maturity model

focuses on external risk sources. The risk consequences are the same as the previous level of the maturity model. Table 101 summarises the content analysis from the DBenv thesis that explore external risk challenges.

Table 101: External Risk Challenge Content Analysis Reconciliation

Risk Factor	Primary Case Study		44 Estate Strategies	Total
	Participant	Interviewer		
Globalisation	Not measured	Not measured	1,250	1,250
Political	10	2	3,028	3,040
Culture	24	20	611	6,55
Technology	29	12	329	3,70
Natural Environment	22	2	Not measured	24
Total	85	36	5,218	5,339

At Maturity Level II, risks identify with politics, natural environment, available technology and organisational culture. Political uncertainties include changes in government, poor public decision making, strong political hospitality/opposition, terms of trade, legislation/regulation, inadequate public services, government contributions and governmental controls (Miller, 1992; Bing et al., 2005; Palaneeswaran et al., 2001). The acts of governments along with international factors create influential economic events. Influential economic events include interest rates, availability of finance, solvency and inflation (Bing et al., 2005; Miller, 1992; Kamarazaly et al., 2013). In relation to Maturity Level II (external challenges), the risk relates to the high cost of finance during the construction phase.

The Primary Case Study similar to other organisations (see Section E Transferability) operates a practice and procedures manual to assist in the management of external risks. The manuals refer to a broad spectrum of legislation, which a number of organisations find difficulties in ensuring information is up to date. There is significant repetition between different organisational documents and there is scope for further integration. The Primary Case Study's procedures document restricts the selection of procurement routes that combine the design and operation of an asset. Design integration of the supply chain demonstrates compliance with legislation in relation to the CDM Regulations.

The Universities make use of available technology by operating an electronic system, to deliver practice and procedures manuals. The manual's documents include standard

construction contracts as part of a process to ensure legislative compliance. Standard forms of contract respond to the external challenge of legislation; although Section E Transferability identifies a university policy document specifies an out of date contract. Standard contracts incorporate mechanisms, such as fair payment that demonstrate relatedness and future challenges that associate with contractor solvency. Legislative governance ensures that Universities have approval gateways in process and employees of the organisation work intra vires. Approval gateways by their nature restrict autonomy and implement at organisational level to meet the external challenges of funding. Approval gateways relate to initial capital expenditure, for example the contract sum for traditional contracts. They also relate to external political challenges including building control and planning approval. The role of the procedure manual in regulatory compliance supports the case for Maturity Level II External Risk Challenges.

The selection of contractors through an auditable process relates to external challenges including that which associates with Bribery and Fraud legislation. Competitive behaviour restricts inter-contractor communication. The Primary Case Study's selection of contractors on a rotational basis meets the future challenge of resource solvency, particularly in competitive periods of the market. The Primary Case Study selects contractors using a matrix, which refers to internal challenges such as commercial, quality, time and safety. In addition, reference is made to the external challenge of environment. The requirement for auditability reinforces the case for Maturity Level II External Risk Challenges.

Natural environment associates to the weather and site (Chan & Chan, 2004; Kamarazaly et al., 2013; Tah & Carr, 2001; Bing et al., 2005; Miller, 1992; Palaneeswaran et al., 2001; Mills, 2001). Zou et al. (2006, p.6) identifies environmental risks to similar risk factors to internal challenges. The natural environment has an external impact on the construction. Reciprocally, construction activity and the built assets have an impact on the environment. Technology is developing to improve built assets sustainability performance. There is the external challenge that buildings will incorporate latest technology. In addition, there are market and coordination flow systems available for use during procurement and construction (Xue et al., 2007). The requirement to make best use of technology supports the case for Maturity Level II External Risk Challenges.

In the Primary Case Study, autonomy facilitates user interface. User interface and interpersonal contact relates to the external challenge of culture and the future challenges of

human resource and functional suitability. Although interpersonal contact by nature is undertaken though autonomous, behaviour there is both organisational and inter-organisational guidance. User interface relates to the external challenge of legislation, for example in relation to equality and safety. Organisational culture is an external challenge during construction. As an internal challenge, managing culture on site relates to promoting positive behaviour between project members. At external level, consideration is made to the cultural requirements of both the employer and supply chain. Larson makes a connection between the methods of collaboration that identify with Maturity Level I (internal challenges) and customer needs for example conflict identification. There are both internal and external cultural difficulties in implementing collaborative ways of working. Dealing with the clients' representative at project level is a Level I Internal Risk Challenge. At level II, there is a consideration of wider aspects of the University as a customer, with stakeholders having needs and requirements that relationship management cannot control. Recognising stakeholders' needs outside of the construction process supports the case for Maturity Level II External Risk Challenges.

18.4.4 Maturity Level III Future Risk Challenges

Table 102: Future Risk Challenge Content Analysis Reconciliation

Risk Factor	Primary Case Study		44 Estate Strategies	Total
	Participant	Interviewer		
Asset Utilisation	19	15	2,308	2,342
Operational Effectiveness	30	12	10,107	10,149
Natural Environment	Not measured	Not measured	4,881	4,881
Human Resource Words	21	10	3,494	3,525
Resource	187	62	Not measured	249
Total	257	99	20,790	21,146

Future risks involve the future development of the asset. At maturity level I and II, consideration is for a particular project or series of projects focuses on the construction phase. At Maturity Level III the focus is on emerging or future challenges. Future risk challenges occur in relation to asset utilisation, resource efficiency, human resource and operational effectiveness (Kamarazaly et al., 2013; Palaneeswaran et al., 2001, p.166; Chan & Chan,

2004). Table 102 summarises the content analysis from the DBenv thesis that explore future risk challenges. The data demonstrates the validity of Maturity Level III Future Risk Challenges.

Asset utilisation relates to maintenance, operational efficiency, emergency management and utilisation return (Kamarazaly et al., 2013; Palaneeswaran et al., 2001, p.166; Chan & Chan, 2004; Bing et al., 2005, p.28). Universities set out in estate strategies intentions to procure the refurbishment and renewal of estates. The estates strategies include words and terms that associate to the future challenges of 'asset utilisation', 'operation of the asset', 'natural environment' and 'human resource'. Section E Transferability identifies limited use of forms of procurement that integrate operation of the asset; such is the case of the private finance initiative. The Primary Case Study does not undertake private finance projects; however, the organisation incorporates maintenance service agreements within contracts. The requirement for organisations to consider asset utilisation during construction procurement supports the case for Maturity Level III Future Risk Challenges

There is a legislative link between carbon reduction and international treaties, which identifies with the external challenge of politics and compliance with legislation. Carbon reduction relates to life cycle costs and the future challenge of asset utilisation. The correlation between carbon reduction and life cycle costs identifies the natural environment to future challenges. Universities undertake an inter-organisational approach to performance measurement of activities relating to carbon. Universities provide data inter-organisationally concerning functional suitability, for the purposes of funding. The Primary Case Study is in the process of implementing BREEAM though inter-organisational guidance. The case for long-term considerations that associate to sustainability supports the case for Maturity Level III Future Risk Challenges

Operational effectiveness relates to the effectiveness of the employer organisation to offer its services. Where asset utilisation relates to best use of an asset, operational effectiveness relates to how the construction and use of the asset delivers the employers overall long-term objectives. Long-term objectives relating to a university include attracting more students and funding along with high quality research and teaching. University identity includes internal and external elements. Internal elements include organisational and symbolic identity (Steiner et al., 2013, p.409). External elements include reputation and corporate risk (Steiner et al., 2013, p.409; Kamarazaly et al., 2013). The requirement for organisations to consider

long-term deliverable as Universities supports the case for Maturity Level III Future Risk Challenges

The development of human resource involves training personnel including those that work for client and sub-contractor organisations. The risk relates to personnel not having an acceptable skill level (Ng et al., 2002). Another risk that relates to the human resource is health and continuity of employment (2012). Training and development is available in both directions between the employer and supply chains (Briscoe et al., 2001; Ofori, 2000; Pathirage, 2010; Hippel, 1987); in other words learning through sharing knowledge between organisations. Failure to share knowledge is a risk. Positive feedback has positive effect on knowledge sharing in construction teams (Zhang & Ng, 2012, p.1340). Positive feedback is achievable through senior management support. A demonstration of Universities capacity for senior management support is evident in the use of equality policies. Therefore when dealing with human resource the importance of considering Maturity Level III Future Risk Challenges emerges.

One way to share knowledge concerning asset utilisation is through professional networks. The University is an organisational member of professional networks, which assist meeting the future challenges of asset utilisation, human resource and operational effectiveness. In addition to professional networks, the university prescribes to other organisations that offer initiatives, for example the BRE and the Higher Education Statistics Agency. The primary case study refers to organisations/initiatives in contract documents to promote competence of human resource including CSCS, IOSH and CITB. The organisations/initiatives promote the achievement of standards and professional development. Universities use of professional networks and initiatives supports the case for Maturity Level III Future Risk Challenges.

The availability of suitable resources over the life cycle of a procuring organisation is a risk. Resources relate to labour, machinery and materials (Kamarazaly et al., 2013; Tah & Carr, 2001; Bing et al., 2005; Mills, 2001). There are formal and relational mechanisms to manage supply chains (Faems et al., 2008; Szczepański & Światowiec-Szczepańska, 2012). Formal mechanisms to manage resources include competitive tendering, which enhances accountability, price competition and responsibility (Adedokun et al., 2013). Relational ways of working mitigate risk including that associate to litigation, overall results and controlling cost (Larson, 1997; Palaneeswaran et al., 2003; Xue et al., 2007). In addition, they avoid risks associating to lowest cost tendering including negative spiral relationships and

additional logistic costs, and transactional costs (Vrijhoef & Koskela, 2000; McDermott et al., 2005). Frameworks are a mechanism to develop relationships and have capacity to limit the number of contractors on tender lists. Shorter tender lists reduce competition therefore meet the future challenge of supply chain solvency. Although relationships form outside of frameworks, logic suggests that the long-term nature of frameworks provides for the supply chain and the Universities to gain an understanding of one another assisting with relatedness, competence and trust. An important element to relationships is trust (Darabi & Clark, 2012; Ng et al., 2002; Laan et al., 2011; McDermott et al., 2005). The requirement for relationships supports the case for Maturity Level III Future Risk Challenges.

18.4.5 PART SUMMARY

Table 103: Summative Analysis Summary

Risk Factor	Primary Case Study		44 Estate Strategies	Total
	Participant	Interviewer		
Internal Risk	535	167	7,927	8,629
External Risk	85	36	5,218	5,339
Future Risk Challenges	257	99	20,790	21,146
Total	877	302	33,935	35,114

This Part summarises the motivation theme in the research to provide a maturity model suitable for overall aim of the research (see Table 103). The levels are internal, external and future. Thematic and summative content analysis identifies that all three-maturity levels are relevant to the case study and the higher education estates and property sector (see Table 104). Words that associate with internal challenges occur most commonly in the participants' transcripts occurring 535 times. Words that associate to future challenges occur most commonly in the estate strategies.

Table 104: Risk Maturity Model

Category	Collaborative Feature	Risk Mitigation	Internal	External	Future
			Mitigates management risks (programme, cost, quality, safety, overall performance and effectiveness)	Mitigates risks outside control of the management team (politics, natural environment, available technology, organisational culture)	Mitigates future risks (asset utilisation, operational effectiveness, future natural environment, human resource, resource)
Interpersonal Contract	acting: in good faith; in an open and trusting manner; in a cooperative manner; continuity of relationships; integration of other stakeholders; lessons learned meetings; shared office spaces; soft skills; teambuilding processes; and training.	conflict identification; personnel development; and top management supported teamwork.			
Value Management and Engineering	change control; risk management; value engineering and management; and whole life cycle costing.	provisions for continuous improvement.			
Performance Based Contracting; Performance Management	incentivisation; performance; performance based contract; performance management; performance indicators procurement route; and target contracts.				

Category	Collaborative Feature	Risk Mitigation	Internal	External	Future
Practice, Procedures, Information Technology	BIM; organisational level documents; inter-operability of systems; and electronic meeting systems, web 2.0-based collaboration technologies.	knowledge management.			
Design and Operation Integration	design-construction integration; design and build; private sector engagement into design, construction and maintenance; frameworks; integrated project Insurance; private finance initiative; prime contracting; project partnering contract; management agent contracting; organisational standard procurement; soft landings; and two stage open book.	problem-solving process established; operation integration; supply chain design integration.			
Inter-client organisational Knowledge and Initiatives	benchmarking; Considerate Constructors Scheme; CSCS; forward programme; research and development; grants; health and safety co-operation; health and safety risk reduction; and professional networks.				

Category	Collaborative Feature	Risk Mitigation	Internal	External	Future
Legal Framework and Tendering	adjudication; change control; charters; contract simplification; contract completeness; contractor selection; enhanced health and safety conditions; CSCS; collaborative working clauses, collaborative/integrated supply chain; communications protocol; design, build, operate contract; dispute ladder; enhanced sharing information; environment and sustainability; facilitation; incentivisation; fair payment; risk assessment and allocation; financial incentivisation; legislative compliance; overarching collaborative agreement; non-competitive tendering; performance indicators; multi part contracts; pre-construction services agreement; simplification of contracts; standard pre-qualification; standardisation contracts and frameworks; sub-contractor relationships; mediation; and value engineering.	previous work experience; relational contracting; and fair profit assumption.			
Strategy	condition of the estate; space efficiency; carbon reduction; environmental performance; affordability; and institutional sustainability.	corporate social responsibility.			
Shared Services	iBIM; lead buying; piggy backing; shared services; third party advisory; third party outsourcing; shared frameworks; third party purchasing				

18.5 CHAPTER SUMMARY

The DBenv study provides three maturity models suitable for use in practice, namely Implementation (Table 98, p.342), Motivation (Table 99, p.349) and Risk (Table 104, p.359). The three models come together to provide a Framework (see Figure 33). The maturity model forms in literature. The model is then tested in practice using a thematic approach, which is appropriate to the real world that is being examined. To test the external validity of the primary case study findings, further data collection is undertaken in Section E Transferability.

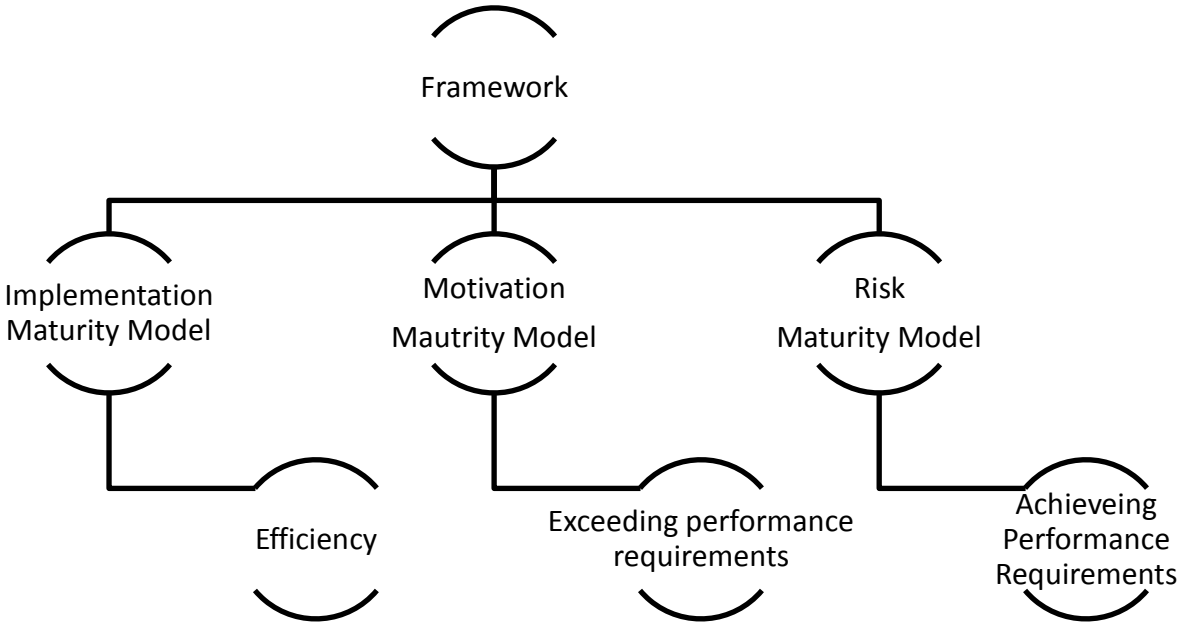

Figure 33: Framework to Evaluate Collaborative Strategies

CHAPTER 19 SECTION SUMMARY & CONCLUSION

19.1 CHAPTER INTRODUCTION

Section A Introduction sets out the importance of the Higher Education sector to England, UK as well as internationally. International data indicates there is not a correlation between public sector funding and returns. However, expenditure on education, including estates has economic impact. Revisions to Higher Education sector funding increases competition and focuses institutions on deliverables. The sustainability agenda places a requirement for Universities to develop estates in line with the retrofit agenda. Therefore certain institutions, find themselves in both a time of austerity and with emphasis on improvement relating to environmental and organisational sustainability. This places emphasis on universities to receive best practice from supply chains and the justification for the DBenv research.

There is significant existing research concerning collaborative features capacity to improve performance. The DBenv research sets out a framework with three themes to assist practitioners make decisions on ways of working (see Figure , p. 362). The framework is of particular use to Associate-Directors of Estates while making strategic decisions concerning the implementation of collaborative features. The first implementation theme outlines an approach to promote inter-organisational collaboration in line with the UK Governments agenda. The second theme outlines an approach to promote practitioners to perform beyond set criteria. The third theme risk outlines an approach to promote practitioners to achieve performance requirements. This aim of this Chapter is to conclude the DBenv study in line with the aim and objectives from Section A Introduction. The work will also make recommendations for future research.

19.2 OBJECTIVE I CONSTRUCT A FRAMEWORK

The first objective is to construct a suitable framework. The concept of providing a maturity model is from a Paper published and presented in 2012 to the ARCOM conference. The model contains three axes that require calibrations. The research does not propose that the three axes are exhaustive and further research will expand the concept to include further axis/axes. The work suggests that collaborative features are to be plot on the axis (see Chapter 2 Literature Section Introduction). Section B Literature calibrates the axes. While calibrating the axis the work identifies that, a particular collaborative feature, similar to the

motivational locus of self-determination theory, may allocate to more than one level of a maturity model.

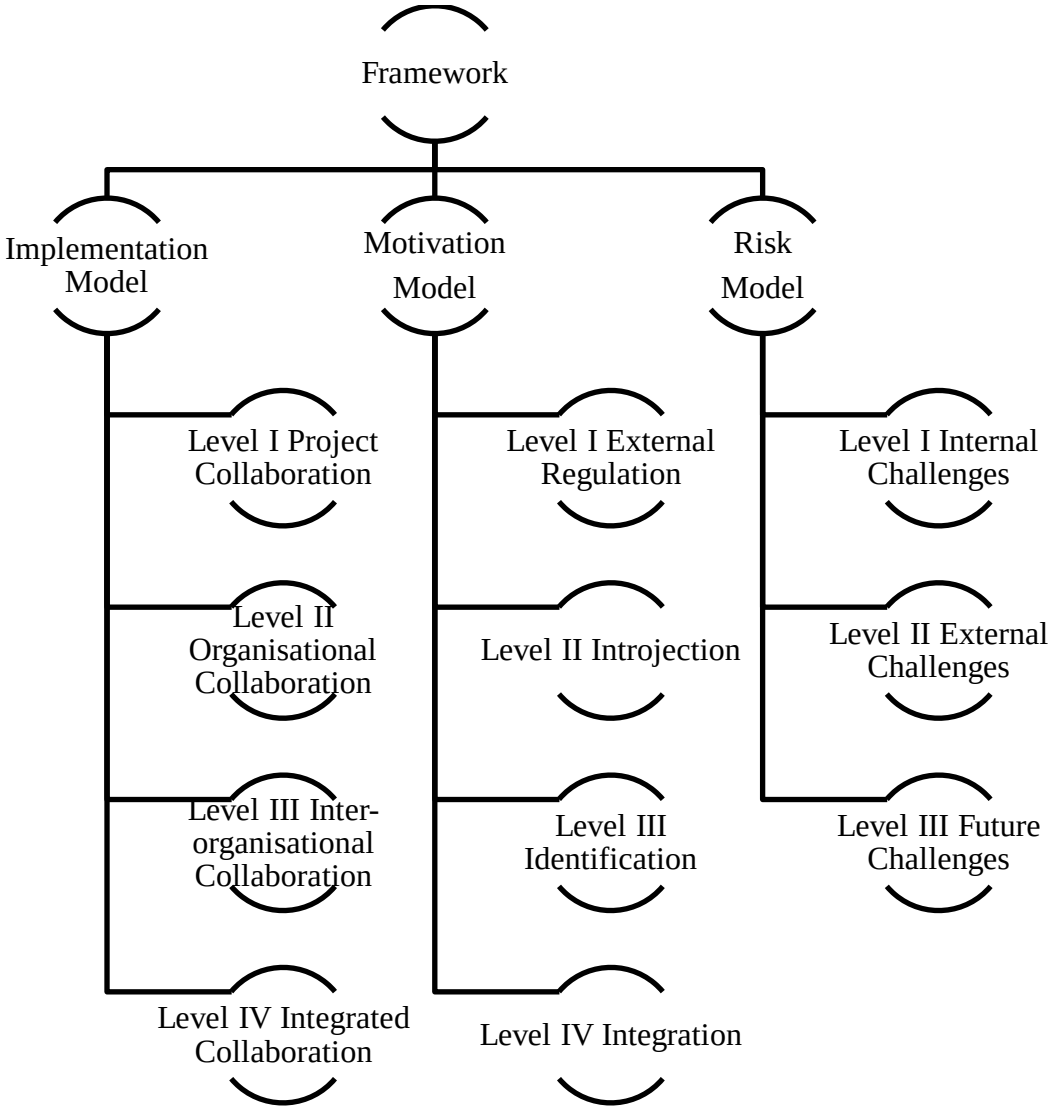

Figure 34: Maturity Model

The work outlines a framework for practitioners to analyse collaborative features in the form of maturity increments (see Figure 34: Maturity Model). The framework is useful both for assessing the current state of practice and the future selection of collaborative features. The overall approach is flexible to fit practitioners' individual requirements instead of prescriptive. In this way, the work identifies with organisational fragmentation of the sector. There are three or four increments to each theme with one being low and four high. Future research is available to establish the fourth increment for the risk theme. Where a particular

collaborative feature scores low there is potential to make improvements facilitating a higher score.

Chapter 3 Implementation provides four maturity levels considering collaborative features namely Project, Organisational, Inter-organisational and integrated. Inter-organisational level involves sharing information to assist with ways organisational working. Integrated level involves organisations working together to provide a service. Such is the case where a special purpose vehicle provides services to two or more institutions. In addition to the hierarchical increments, the chapter also identifies a series of collaborative features (or characteristics). The Dbenv work does not attempt to create an exhaustive list of collaborative features. The work is post-modern in the understanding that different organisations will have different requirements. The identification of collaborative features assists with later phases of the research when populating the framework for the purposes of developing and testing.

Chapter 4 Motivation considers what makes practitioners as people perform beyond set performance requirements. The work explores number of theories concerning motivation and settles on work in self-determination theory. There are significant contributions to work in the theory that include conceptual work, literature reviews and experiments. The rigour of data analysis sets the research apart from many other theories. In addition, the theory finds support in the form of common sense. The work has international recognition particularly in the United States, where significant contributions are made by researchers at the University of Rochester. Research finds cultural differences in motivation, however there is a convincing argument to generalise a relatively flexible theory. International contributions offer the theme an element of transferability through generalisation. Self-determination theory has significant contributions in education, health care, organisations, sports, exercise, environment, health and well-being.

The motivation maturity levels relate to four regulatory styles namely external regulation, introjection, identification and integration. External regulation relates to having rules in place with consequences for non-compliance. In relation to construction such rules include a construction contract and consequences for non-compliance including litigation. Benefits of compliance include financial rewards. Introjection relates to emotional manipulation, which includes positive and negative personal feelings. Introjection relates to both egos and being controlling. Both external regulation and introjection are extrinsic motivational styles, of which significant work in the field associates to reductions in health and vitality.

Identification relates to valuing an activity through self-endorsed goals. For example, in construction includes facilitating communication between building users and contractors. Allowing contractors to understand a project is important. At this level, understanding travels in one direction. For example, the contractor would gain an understanding of users' requirements and expectations; however, there would be limited reciprocation. Similar to identification motivational style, integration promotes intrinsic motivation. Intrinsic motivation relates to the psychological needs of autonomy, competence and relatedness. The level is relatable to other theories that offer hierarchical synthesis of goals of congruence.

Chapter 5 Risk relates increments to risk sources, consequences and mitigation. There are three increments namely internal, external and future. In the other two themes, the final increment relates to integration. The concept of levels of risk challenges emerges from work in Australia in the Higher Education Estates and Property Sector. Chapter 5 Risk develops the Australian work using international peer reviewed literature. A selection of risk challenges support the Australian work and the next objective of the research. There is a requirement as part of this research to assess the appropriateness of the risk challenge increments to the higher education sector in England.

Risk maturity level one relates to challenges managed at project level including those that relate to programme, cost, quality, safety, effectiveness and overall performance. The level of maturity is available where there are simple forms of contract available. Management of the risk challenges is within the control of the team. Maturity Level II, external challenges relates to politics, natural environment, available technology and organisational culture. External challenges relate to those items outside the control of the project team. Traditional construction contracts typically deal with external risk. There is a link between the external and internal challenges. For example, risk that associates to a political challenge may have a programme impact. However, an internal is not necessarily brought about by external challenge. For example, operatives' ability to work effectively on site has the potential to be in the control of the project team. The ability of external to impact internal challenges creates the order in the maturity model.

Future risk challenges include those, which associate with asset utilisation, future environment, resource, human resource and operational effectiveness. . Asset utilisation involves the deliverable of the building over the life cycle of the project; from practical completion of construction works to decommissioning of the asset. The retrofit agenda

indicates a challenge during the operation of an asset, which associates to sustainability. Decommissioning may include demolition and replacement. At level II Natural environment as an external challenge, relates to site conditions and weather that imposes itself during the construction of the asset. The environment as a Level III future challenge relates to the impact of the estates on the environment.

Availability of resources is a future risk challenge. Human resource concerns the availability practitioners with suitable experience and qualification during the procurement of works. At External Risk Challenge Level II the concern would be one of immediate availability, for a given project or series of projects. Higher Education Institutions are longstanding institutions; the risk of human resource in the future extends to 'will there be suitable practitioners to undertake works and projects not yet under procurement'. At future level III, the concern is availability of staff for future maintenance. Operational effectiveness relates to employer organisations deliverable, for example in relation to organisational sustainability, attracting students and researchers. After all, funding links to the output of the university and an estate is only affordable in the constraints of organisational budgets. As an external challenge, the concern is that the estate will meet the current requirements of the organisation. A future challenge promotes sustainability over the life cycle of a higher education institution.

19.3 OBJECTIVE II DEVELOP FRAMEWORK USING A PARTICULAR ORGANISATION

The second objective is to develop a framework using a particular organisation. Section D Primary Data develops the three maturity models from Literature using a single case study. The Section receives validity through the insider research having an in-depth understanding of the organisation through practice work. The transferability of the knowledge receives peer review from practitioner students on a successful LLM/MSc module, during two modules namely 'Contemporary Procurement'; and 'Construction Contract Operation and Administration'. In addition, the implementation theme's deliverable forms part of conference proceedings providing further peer review (Crowe, 2013).

Chapter 9 Implementation has sub- headings that relate to the maturity levels from Chapter 3, namely Level I Project, Level II Organisational, Level III Inter-organisational and Level IV integrated (see Chapter 8 Primary Data Section Introduction). Data from the case study organisation allocates collaborative features that originally emerge from the literature section to sub-headings. In instances, different characteristics of collaborative features allocate to

more than one maturity level. The work provides categories to the collaborative features to improve the transferability of the work, after all professional practice requires flexibility.

Level 1 Project collaboration relates to informal ways of working and interpersonal contact. By nature, there is fragmentation and limited generalizability. Organisational level collaboration is set out in documents available from secure and openly available electronic sources. The organisation shares documents and ways of working to reduce a duplication of efforts. Procurement risk allocation is undertaken at an organisational level. The organisational approach receives support through inter-organisational ways of working. For example, the organisation produces a multitude of documents containing generic information. Reference is made in the documents to legislation and inter-organisational suppliers, associations and the like, which is demanding to keep up-to-date. There is limited attempt to share project information outside the organisation and the direct supply chain. The primary case study organisation makes limited attempt to share contracts and frameworks. Shared services emerge from the UK Government's Construction Strategy; which is for example evident in value added tax exemption.

Chapter 10 Motivation incorporates the sub-headings from Chapter 4, namely External Regulation, Introjection, Identification and Integration. Each sub-heading represents a level within the maturity model (see Chapter 8 Primary Data Section Introduction). Collaborative features allocate to one or more regularity styles in the discussion. Emphasis is on achieving high maturity levels of identification and integration and making improvements where low levels of external regulation and introjection exist. The Primary Case Study undertakes significant external regulation using extensive organisational documents. Reference is made to organisational and inter-organisation documents in construction contracts, indicating a requirement for compliance, which is in contrast to provision of the documents as informational. The supply chain has limited opportunity to make amendments to the documents, which further suggests a requirement for compliance

The study identifies an element of autonomy in the implementation of explicit procedures. During the study, there is limited evidence to suggest that performance measurement is undertaken in such a manner to associate with extrinsic motivational styles. The organisation undertakes performance measurement in an informational manner. Therefore assists the supply chain to identify with the employer organisation. The case study develops relationships and competence of the supply chain through long-term relationships that receive

reinforcement through interpersonal contact. The feedback is one directional, demonstrating a lack of relatedness, therefore, improvements are available to achieve integration maturity level. Lack of relatedness is also shown during tender adjudication.

Chapter 11 Risk includes sub-headings from Chapter 5 relating to internal, external and future challenges. Data from the case study identifies the collaborative features to levels in the maturity model. The chapter includes a stronger use of summative content analysis than earlier chapters to associate the maturity levels of the risk challenges to the case study and the sector. The reason for this is to align the data analysis with Chapter 15 Risk Maturity Model Transferability. The work is insider research as such the participant's knowledge forms part of the data. In addition, it allows the work to consider the potential of interviewees being led in the interviews, which have a semi structure. Overall frequency of the words is dependent on their relationship to levels within the maturity model (see Table 73, p.286); with words that relate to internal risk challenges occurring most frequently. Words that associate with external risk challenges occur less frequently (see Table 73, p.286).

The interview transcripts refer to words associating to future challenges. Similar to the previous maturity levels participants with an organisational viewpoint make more use of the words than those with a project perspective. The organisation has a clear approach to future risk challenges including those that relate to the competence of human resource. The organisational documents relate to diversity, sustainability and estates strategy; and are available to the supply chain through electronic sources. The estate strategy refers to external challenges including those, which associate to politics, natural environment and organisational culture. Available technology is one area for improvement, including that which relates to construction activity and complete assets. The estates strategy refers to the future risk challenges of asset utilisation and operational efficiency. Informal ways of working results in limited reference to resources and human resources.

At the end of each of the chapter is a Table that summarises the organisation in relation to its use of collaborative features (see Table 105). The Framework includes all three tables (see Figure 33, p. 362). There is no attempt to list all the collaborative features undertaken by the organisation. Instead, the framework is for use as part of iterative action learning to improve an organisational approach to the use of collaborative features.

Table 105: Primary Case Study Framework to develop Collaborative Features

Maturity Model	Table	Page
Table 50	Implementation Primary Case Study	220
Table 55	Motivation Primary Case Study	252
Table 74	Risk Primary Case Study	287

19.4 OBJECTIVE III TEST TRANSFERABILITY

Table 106: DBenv's Deliverable Transferability to English Higher Education Sector

Description	Validation	
	Confirms in Practice	Confirms Transferability
Implementation Maturity Model	Chapter 9	Chapter 3
Motivation Maturity Model	Chapter 10	Chapter 4
Risk Maturity Model	Chapter 11	Chapter 15
Collaborative Features	Section D	Chapter 14

The second objective is to assess the framework in the wider context of English Higher Education Institutions. Table 106 indicates the Chapters of the DBenv thesis that confirms the transferability of maturity models and the collaborative features. Section B Literature provides the transferability of the implementation and motivational themes. However, section B does not provide the transferability of the risk maturity model. The risk theme receives the benefits from international contributions from different locations and sectors of that of the study. Chapter 15 tests the risk theme over a wide sample of higher education institutions in England including data from 44 estates strategies. Chapter 14 establishes the transferability of the collaborative feature categories to other higher education institutions than the Primary Case Study. The work uses a pragmatic selection of data sources that includes thematic and summative content analysis of estate strategies; case studies; tender notices; and industry sources.

19.5 AIM HIGHER EDUCATION FRAMEWORK FOR ENGLISH ESTATES

The aim of the research is to 'Develop a framework to evaluate collaborative practice in Higher Education Property and Estates Departments in England'. This chapter concludes the objectives undertaken to achieve the aim. Figure 33 (p.362) & Figure 34 (p.364) summarise the overall framework deliverable. The Framework has three maturity models (see Table 105,

p.370) that although at points have an inter-relationship, also have a distinct purpose. The overall purpose of the increments is to provide practitioners with the framework to evaluate collaborative features. There is flexibility in the system to promote autonomy to cope with the postmodern nature of practice. The research also identifies a number of collaborative features for the purposes of testing. The research's overall deliverable has significant peer review at conferences, industrial knowledge exchanges and during delivery of a part time practitioner MSc/LLM module over a number of years, confirming the usefulness of the work. The implementation theme broadly relates to the UK Government's agenda of encouraging employer organisations to work closer together to improve effectiveness. The risk theme focuses practitioners to achieve performance requirements. The motivation theme fosters practitioners to work beyond performance requirements, particularly in relation to contextual performance.

19.6 FUTURE RESEARCH AGENDA

19.6.1 FRAMEWORK

The research investigates a number of case studies to a greater and lesser extent. Further action research should be undertaken using the DBenv's framework in higher education institutions. In addition, future research should be undertaken to develop the maturity models to include further increments. The research develops the framework with the retrofit agenda in mind further research should be undertaken to test and develop the framework for use on large-scale capital projects. In addition to the higher education sector in England, the framework is suitable for adaptation for use in other sectors and locations with further research.

19.6.2 IMPLEMENTATION

The Implementation theme explores peer-reviewed and industry literature alongside UK Government strategies. The Implementation maturity model is of particular use to the UK government, to roll out its construction strategy across public sector. Future action research should be undertaken to implement the DBenv's framework in other sectors. The Implementation theme focuses on the UK government and its associated agencies' strategies. Further research should be undertaken to reconcile the UK Government's efficiency drive against that of other governments.

Similar to the primary case study other organisations operate and attempt to maintain bespoke documents. There is fragmentation in inter-organisational knowledge that emerges from a multitude of organisations. Further research is available to determine potential consolidation of inter-organisational documents, replacing bespoke documents along with their fragmented counterparts. Considerable savings are available through further inter-organisational and integrated ways of working.

There is potential for the documents to be available inter-organisationally, with much smaller documents relating to organisational specifics. Universities use inter-organisational documents relating to construction contracts and initiatives. Therefore, there is agenda for inter-organisational working. Future research should be undertaken to understand how the Universities could implement and make savings from an inter-organisational approach. In addition, further research is available to determine the role of parliament, government departments, government agencies and funding bodies in assisting and promoting inter-organisational (and integrated) ways of working.

During the DBenv investigation, the research identifies that the UK Government is keen for organisations to bring together and integrate design, construction and operation. The DBenv identifies in a number of instances that there are inhibitors in the English Higher Education Sector to achieve such integration. Further research should be undertaken to establish the inhibitors and enablers to offer further integration. Similarly, the UK Government promotes procurement integration between Universities, which is also appropriate for further research.

19.6.3 MOTIVATION

The basis of the motivation maturity model's generalizability emerges through robust work in psychology. The maturity model would however receive a warmer welcome from industry if more experiments were undertaken to validate the motivation maturity model using construction professionals. The testing of the motivational maturity model would work well in particular using action learning and empirical studies. Further work is also appropriate in the social sciences relating to the effects of external regulation, negative introjection and relatedness on construction professionals' performance and health.

Universities have procedures manuals. Further research should be undertaken to establish the extent of the compliance culture within the organisation, in particular the relationship between

prescriptive compliance and real world practice within the organisation. Another research opportunity is to assess the extent of introjection within organisations.

19.6.4 RISK

The Primary Case Study has a clear approach to external risk challenges that includes construction contracts. The prescriptive nature of specifications and restrictive nature of tender lists reduce organisational capacity to receive the benefit of available supply chain technology; for example, restricting contractors from tender lists that have innovative installation experience. Further research should be undertaken to assess the flexibility of European Legislation concerning frameworks during the appointment of contractors, including small to medium sized enterprises for one off projects.

Table 107: Summative Content Analysis Interviews

Content Analysis Summary	Viewpoint		Total
	Organisational	Project	
Internal	353	182	535
External	70	15	85
Future	186	71	257
Total	609	268	877

Table 107 provides a summary of the content analysis from Chapter 11 Risk. Participants with an organisational viewpoint use words that associate to each level of the maturity model more than those with a project perspective. Future research should be undertaken to: assess levels of understanding of risk in organisations; assess the relationship between positions in organisations and understandings of risk; and improving practitioners understating of risk to achieve higher levels of maturity.

In instances information in the Higher Education Sector, flows in one direction from the employer to the supply chain. Future research should be undertaken to develop the inter-organisational integration of knowledge management practice in the sector with supply chains; including how technology can be used to improve an organisations approach to risk. In addition, future research should be undertaken to explore the use of web 2.0 technologies to improve communication between employer and supply chain organisations.

The DBenv study identifies earlier work that associates different collaborative ways of working to risk mitigation. Further empirical studies should be undertaken to reinforce the link between collaborative working and risk mitigation. The risk maturity model that develops from literature is validated through reference to estates strategies. Further research should be undertaken to develop the estates strategies themselves to consider wider and future risk challenges.

During the search for electronically available estate strategies, the DBenv study identifies for a number of reasons they were not available. Further research should be undertaken to: establish the implication of not having estates strategies in place; and to develop technologies to improve supply chains' knowledge of overall objectives. In addition future research should be undertaken to establish the relationship between future challenges and higher education estates, for example the relationship between investment in assets and operational effectiveness

19.6.5 Collaborative Features

The research is in context of Lyotard understanding of the post-modernism, which "abandons absolute standards, universal categories and grand theories in favour of local, contextualised and pragmatic conceptual strategies" (Seidman, 2008, p.164). Organisations implement collaborative features differently. There is limited attempt in the research to identify the total population of collaborative features in the case study organisation. Future research is available to be undertaken to summarise collaborative features in the overall population of higher education institutions in England.

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ABBREVIATIONS

AUDE Association of University Directors of Estates

BREEAM BRE Environmental Assessment Method

BIM Building Information Modelling

CDM Construction Design and Management

CE Constructing Excellence

DBO Design Build Operate

ECC Engineering and Construction Contract

GDP Gross Domestic Product

HE Higher Education

HEFCE Higher Education Funding Council for England

HESA Higher Education Statistics Agency

IT Information Technology

JCT Joint Contracts Tribunal

KPI Key Performance Indicator

NWCH North West Construction Hub

OGC Office of Government Commerce

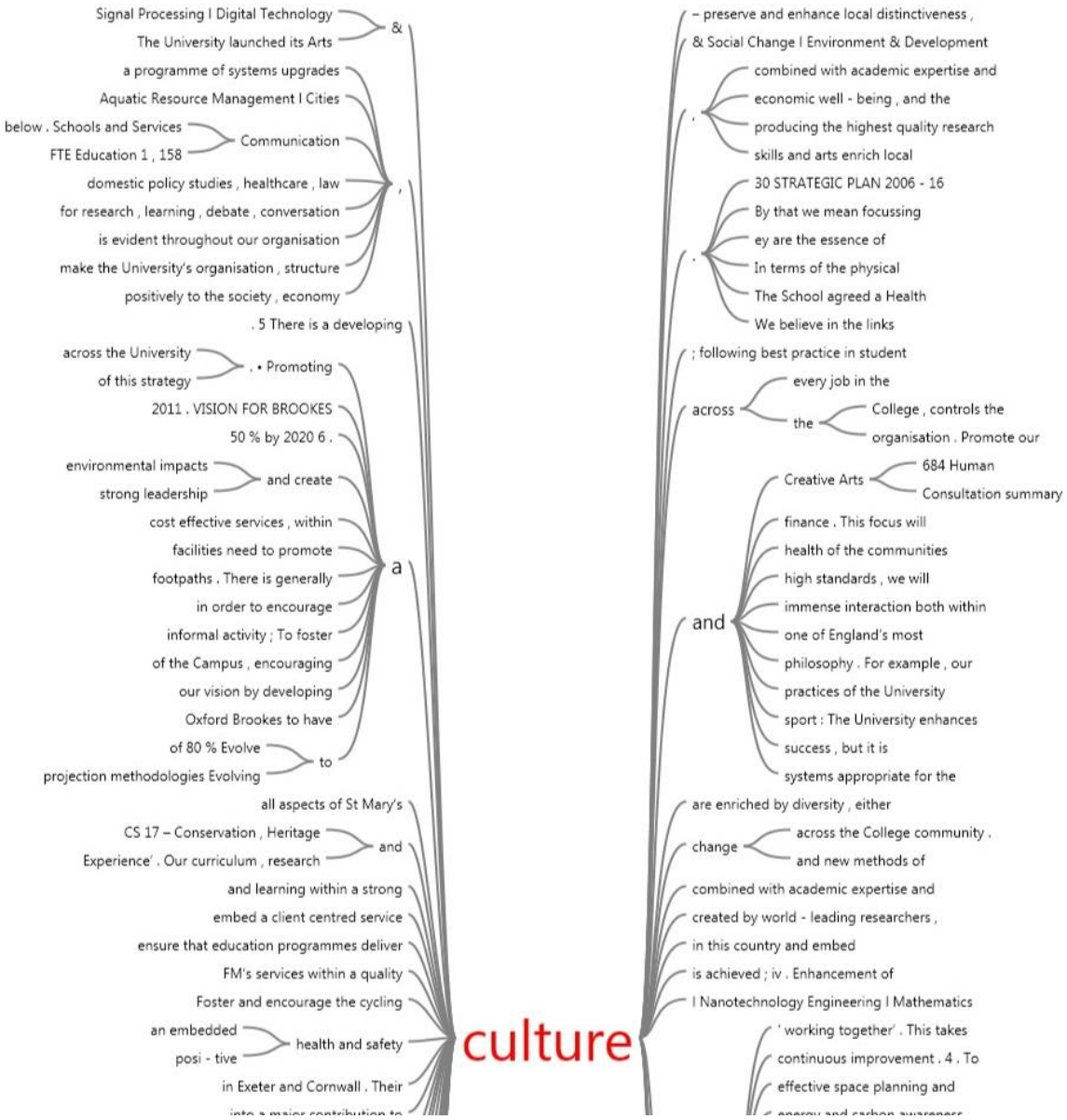
PFI Private Finance Initiative

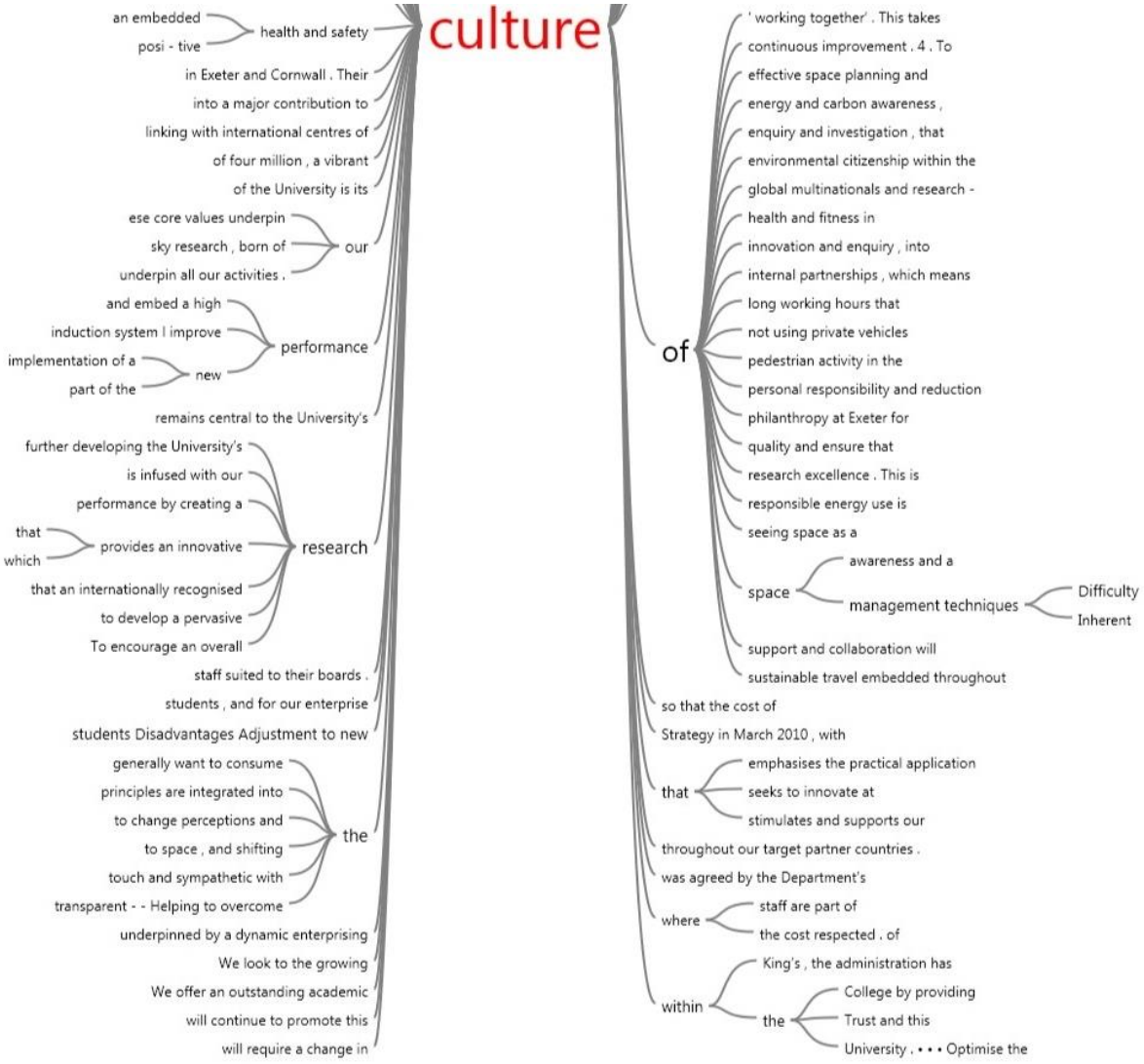
PPP Public–Private Partnership

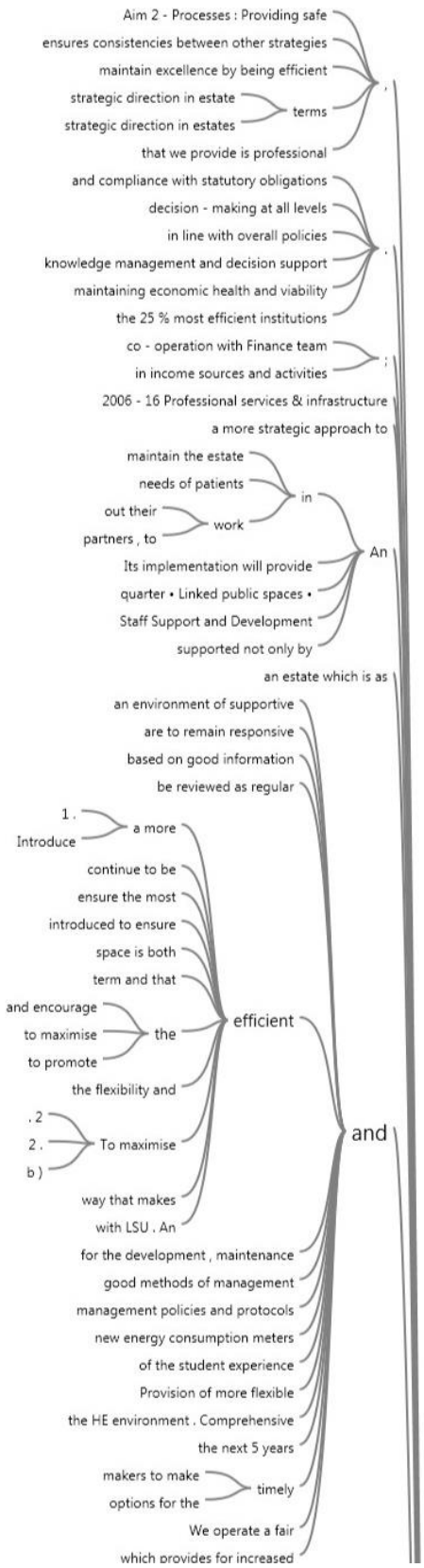
US United States of America

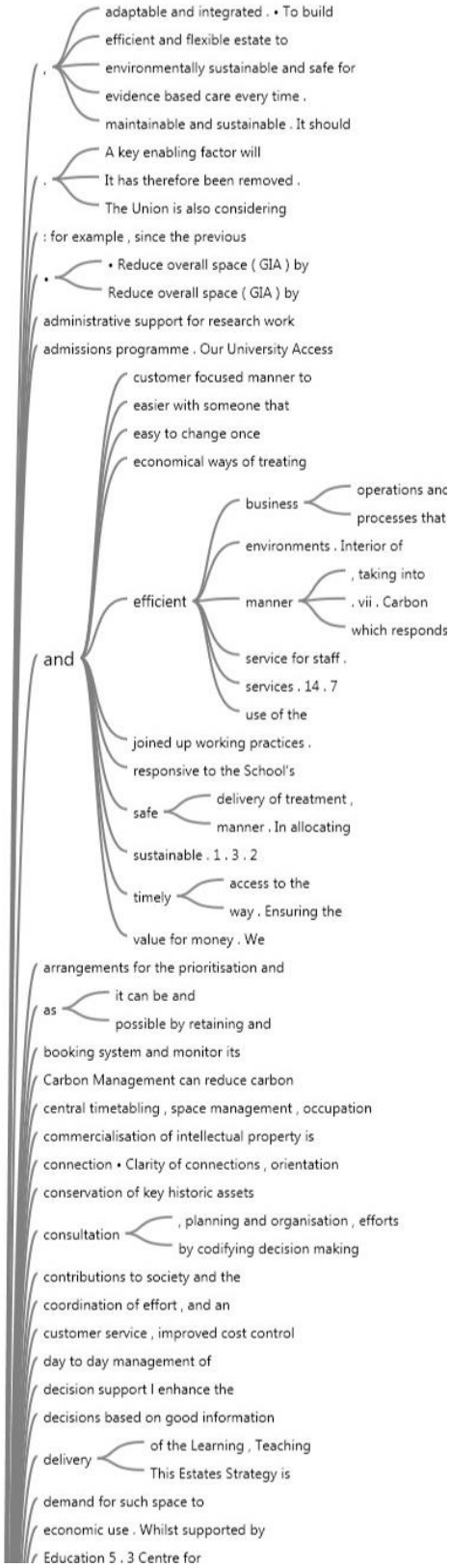
APPENDIX I CONTENT ANALYSIS

Content analysis in alphabetical order and split across pages.

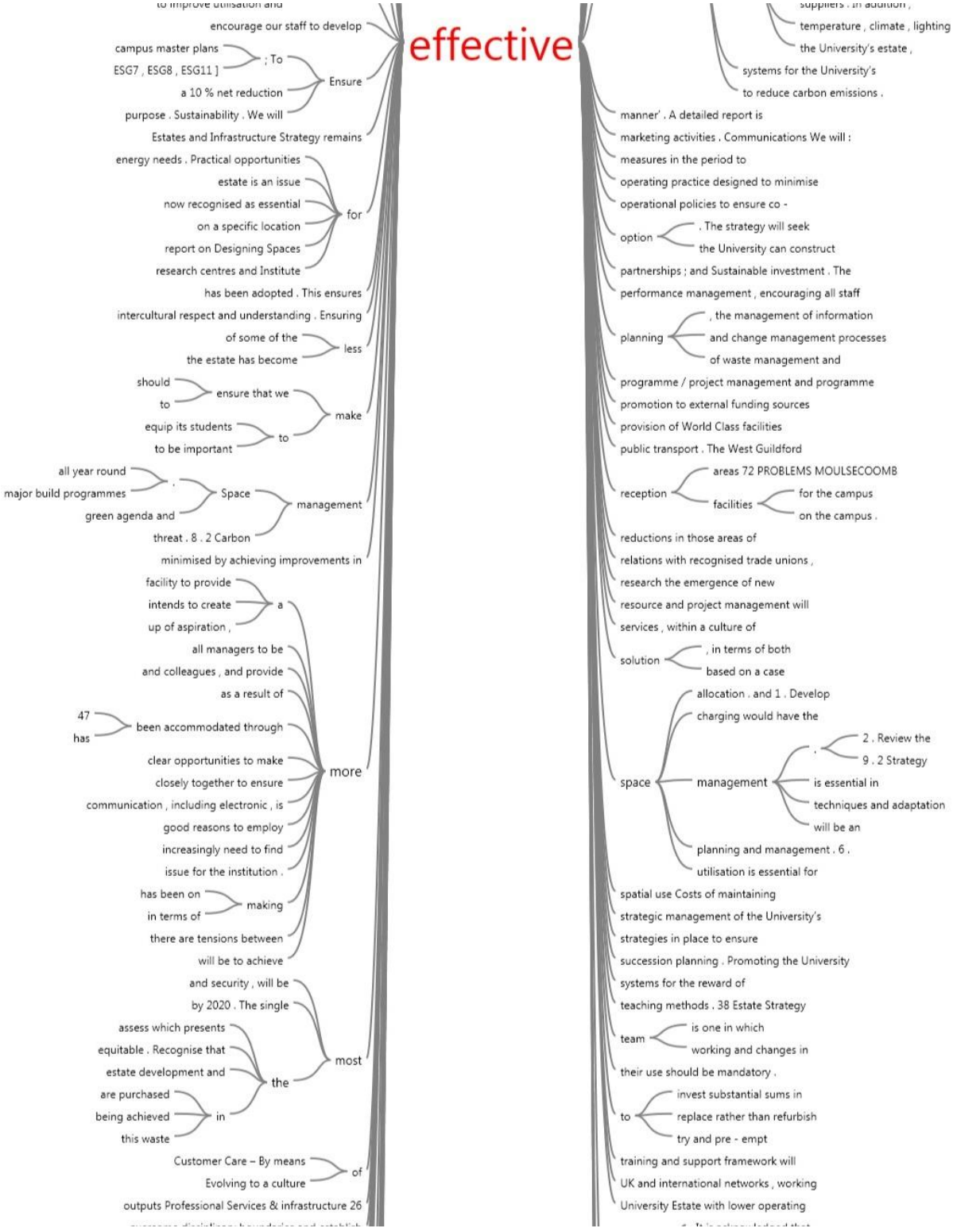

culture
Signal Processing I Digital Technology
The University launched its Arts
&
a programme of systems upgrades
Aquatic Resource Management I Cities
below . Schools and Services
FTE Education 1 , 158
Communication
domestic policy studies , healthcare , law
for research , learning , debate , conversation
is evident throughout our organisation
make the University's organisation , structure
positively to the society , economy
,
. 5 There is a developing
across the University
of this strategy
. • Promoting
2011 . VISION FOR BROOKES
50 % by 2020 6 .
environmental impacts
strong leadership
and create
cost effective services , within
facilities need to promote
footpaths . There is generally
in order to encourage
informal activity ; To foster
of the Campus , encouraging
our vision by developing
Oxford Brookes to have
of 80 % Evolve
projection methodologies Evolving
to
a
all aspects of St Mary's
CS 17 – Conservation , Heritage
Experience' . Our curriculum , research
and
and learning within a strong
embed a client centred service
ensure that education programmes deliver
FM's services within a quality
Foster and encourage the cycling
an embedded
posi - tive
health and safety
in Exeter and Cornwall . Their
– preserve and enhance local distinctiveness ,
& Social Change I Environment & Development
combined with academic expertise and
economic well - being , and the
producing the highest quality research
skills and arts enrich local
,
30 STRATEGIC PLAN 2006 - 16
By that we mean focussing
ey are the essence of
In terms of the physical
The School agreed a Health
We believe in the links
.
; following best practice in student
every job in the
across
College , controls the
the
organisation . Promote our
Creative Arts
684 Human
Consultation summary
finance . This focus will
health of the communities
high standards , we will
immense interaction both within
one of England's most
philosophy . For example , our
practices of the University
sport : The University enhances
success , but it is
systems appropriate for the
and
are enriched by diversity , either
across the College community .
change
and new methods of
combined with academic expertise and
created by world - leading researchers ,
in this country and embed
is achieved ; iv . Enhancement of
I Nanotechnology Engineering I Mathematics
' working together' . This takes
continuous improvement . 4 . To
effective space planning and

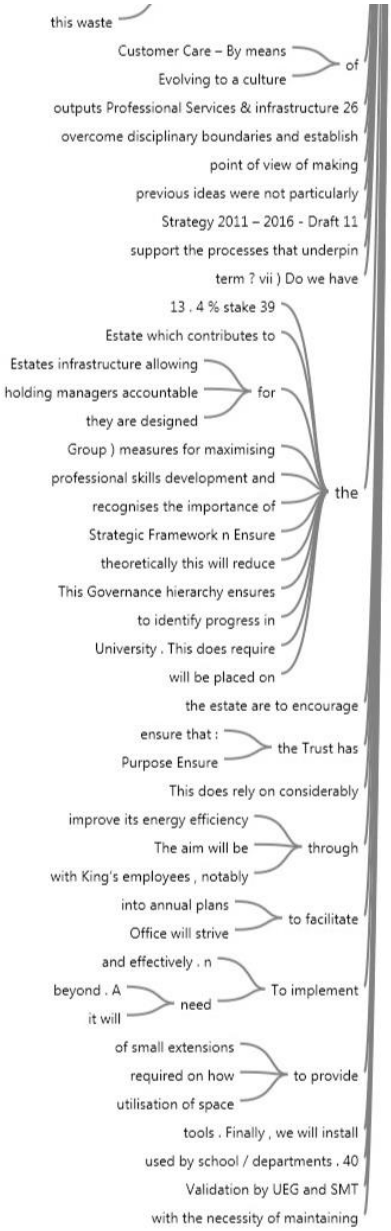

culture
an embedded
posi - tive
health and safety
in Exeter and Cornwall . Their
into a major contribution to
linking with international centres of
of four million , a vibrant
of the University is its
ese core values underpin
sky research , born of
underpin all our activities .
our
and embed a high
induction system I improve
implementation of a
part of the
new
performance
remains central to the University's
further developing the University's
is infused with our
performance by creating a
that
which
provides an innovative
that an internationally recognised
to develop a pervasive
To encourage an overall
research
staff suited to their boards .
students , and for our enterprise
students Disadvantages Adjustment to new
generally want to consume
principles are integrated into
to change perceptions and
to space , and shifting
touch and sympathetic with
transparent - - Helping to overcome
the
underpinned by a dynamic enterprising
We look to the growing
We offer an outstanding academic
will continue to promote this
will require a change in
' working together' . This takes
continuous improvement . 4 . To
effective space planning and
energy and carbon awareness ,
enquiry and investigation , that
environmental citizenship within the
global multinationals and research -
health and fitness in
innovation and enquiry , into
internal partnerships , which means
long working hours that
not using private vehicles
pedestrian activity in the
personal responsibility and reduction
philanthropy at Exeter for
quality and ensure that
research excellence . This is
responsible energy use is
seeing space as a
awareness and a
space
management techniques
Difficulty
Inherent
of
support and collaboration will
sustainable travel embedded throughout
so that the cost of
Strategy in March 2010 , with
emphasises the practical application
that
seeks to innovate at
stimulates and supports our
throughout our target partner countries .
was agreed by the Department's
staff are part of
where
the cost respected . of
King's , the administration has
College by providing
within
the
Trust and this
University . • • • Optimise the

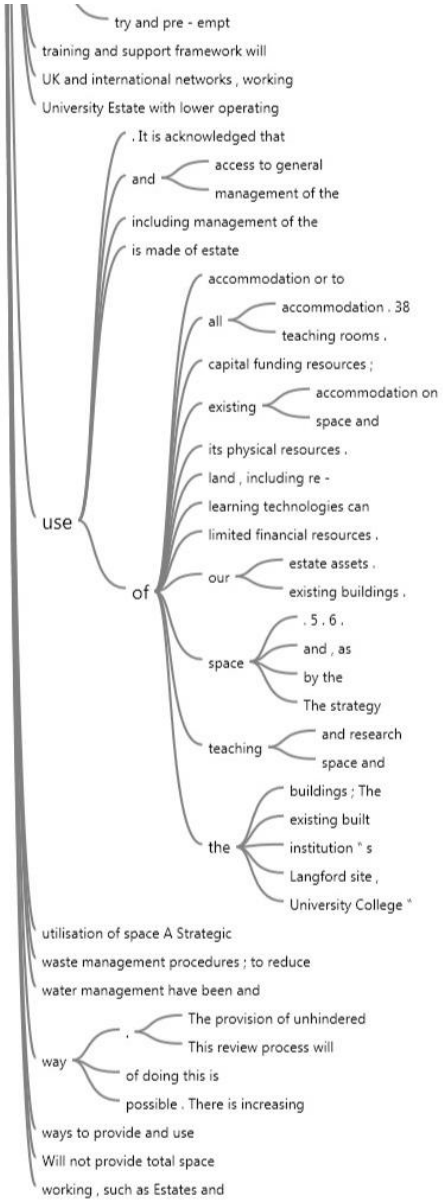

Aim 2 - Processes : Providing safe
ensures consistencies between other strategies
maintain excellence by being efficient
strategic direction in estate
strategic direction in estates
terms
that we provide is professional
,
and compliance with statutory obligations
decision - making at all levels
in line with overall policies
knowledge management and decision support
maintaining economic health and viability
the 25 % most efficient institutions
,
co - operation with Finance team
in income sources and activities
;
2006 - 16 Professional services & infrastructure
a more strategic approach to
maintain the estate
needs of patients
in
out their
work
partners , to
Its implementation will provide
quarter • Linked public spaces •
Staff Support and Development
supported not only by
An
an estate which is as
an environment of supportive
are to remain responsive
based on good information
be reviewed as regular
1 .
Introduce
a more
continue to be
ensure the most
introduced to ensure
space is both
term and that
and encourage
to maximise
to promote
the
efficient
the flexibility and
. 2
2 .
b)
To maximise
way that makes
with LSU . An
for the development , maintenance
good methods of management
management policies and protocols
new energy consumption meters
of the student experience
Provision of more flexible
the HE environment . Comprehensive
the next 5 years
makers to make
options for the
timely
We operate a fair
which provides for increased
and

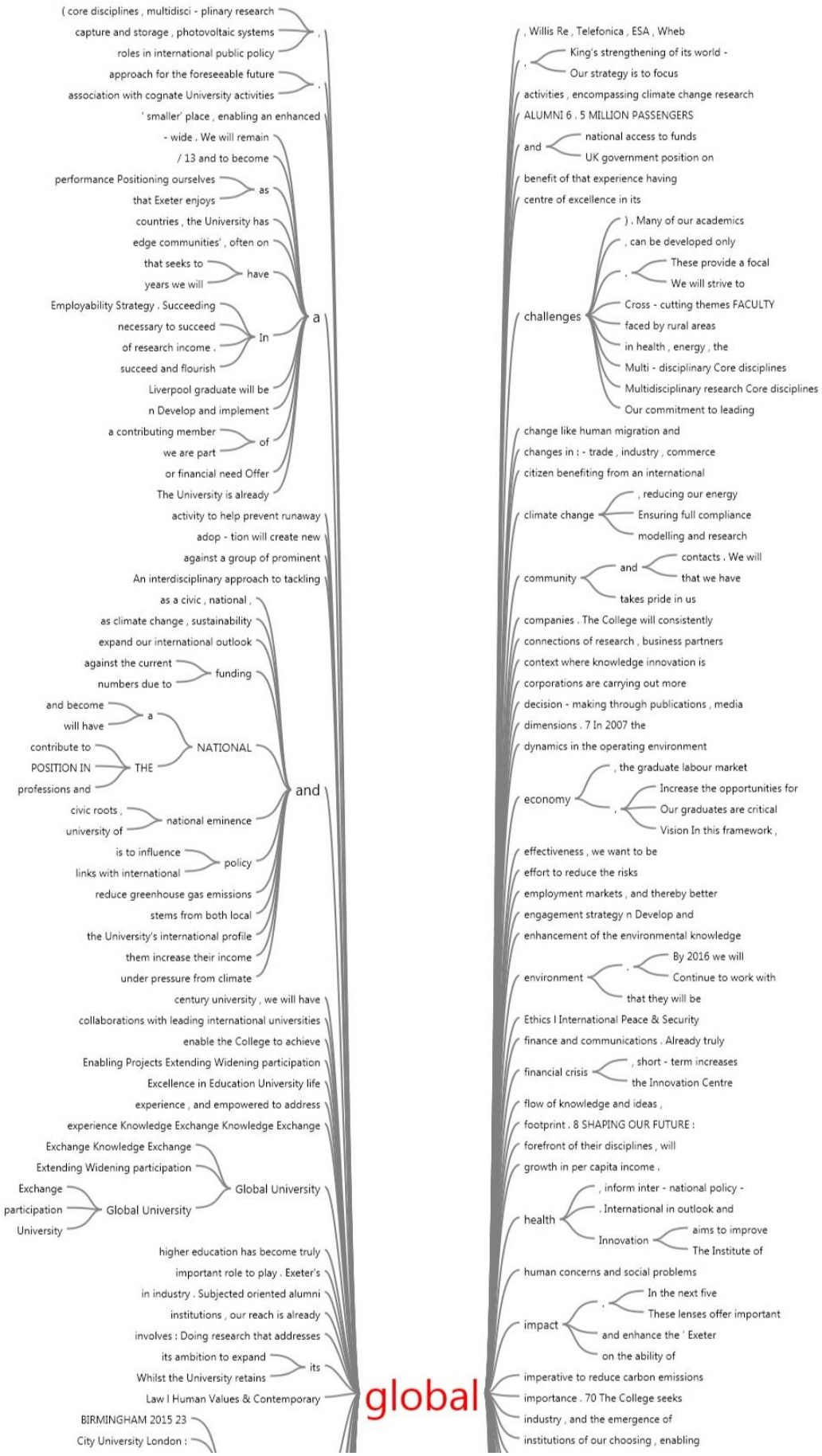

,
adaptable and integrated . • To build
efficient and flexible estate to
environmentally sustainable and safe for
evidence based care every time .
maintainable and sustainable . It should
,
A key enabling factor will
It has therefore been removed .
The Union is also considering
: for example , since the previous
•
• Reduce overall space (GIA) by
Reduce overall space (GIA) by
administrative support for research work
admissions programme . Our University Access
customer focused manner to
easier with someone that
easy to change once
economical ways of treating
business
operations and
processes that
environments . Interior of
efficient
manner
, taking into
, vii . Carbon
which responds
service for staff .
services . 14 . 7
use of the
and
joined up working practices .
responsive to the School's
safe
delivery of treatment ,
manner . In allocating
sustainable . 1 . 3 . 2
timely
access to the
way . Ensuring the
value for money . We
arrangements for the prioritisation and
as
it can be and
possible by retaining and
booking system and monitor its
Carbon Management can reduce carbon
central timetabling , space management , occupation
commercialisation of intellectual property is
connection • Clarity of connections , orientation
conservation of key historic assets
consultation
, planning and organisation , efforts
by codifying decision making
contributions to society and the
coordination of effort , and an
customer service , improved cost control
day to day management of
decision support I enhance the
decisions based on good information
delivery
of the Learning , Teaching
This Estates Strategy is
demand for such space to
economic use . Whilst supported by
Education 5 . 3 Centre for

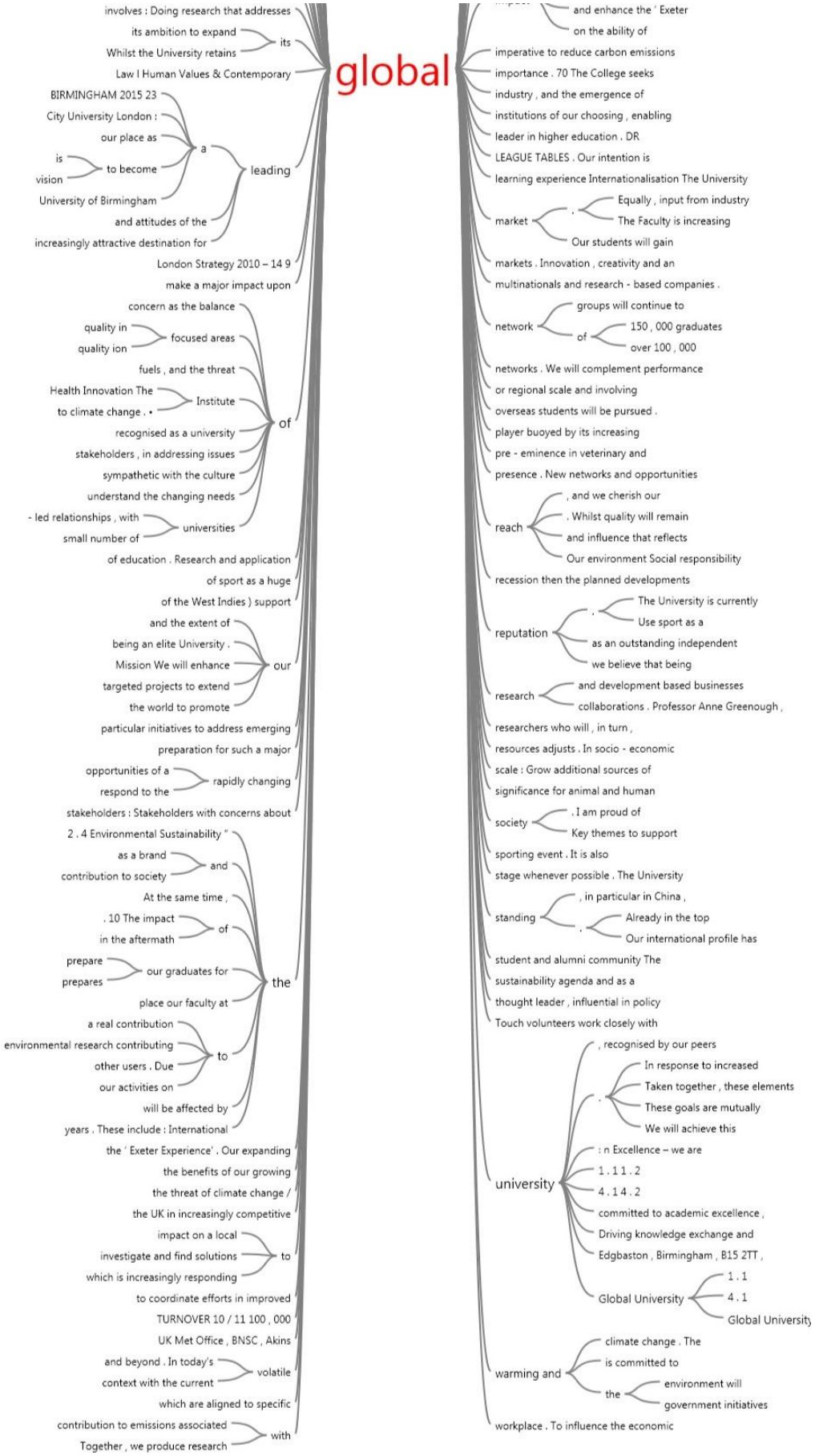

which provides for increased
and pollution , and to operate
associations and other interest groups
At Camden this is very
Consider the options for providing
are clear , DDA compliant
in a professional , efficient
,
a co - ordinated
fit for purpose
high quality , sustainable
the most appropriate
to ensure timely
and
it would not
is proved
is unlikely
to
be
for development and
million per annum .
more
and general inefficiencies .
points . It is
not
previous decisions which proved
physical environment
quality infrastructure
that is
compliance in
this proves
to deliver
the most
cost
aimed to be as
deliver
Delivering
an efficient
in a sustainable
and
it is no longer
planned in the most
segments . Achieve this through
to seek opportunities for
cost -
quality . To help to
to improve utilisation and
deliver
encourage our staff to develop
campus master plans
ESG7 , ESG8 , ESG11]
; To
effective
Education 5 . 3 Centre for
. OPPORTUNITIES AND OPTIONS 2011
operations and , in line
services in order to
that supports the on -
which supports the ongoing
estate
Estates and Facilities Management , deliver
external partnerships in order to
farm estate , but also by
fashion . During the extensive consultation
financial management and use our
fulfilment of other essential and
however at Hawkshead , the surrounding
if they are informed by
implementation of a new timetabling
improvements to the service . 10 .
managing facilities . To support
terms of future maintenance ;
transporting large stones and
in
information systems in place to
infrastructure with transparent decision - making
integration of backlog maintenance and
investment plan resulting in the
(a guide to 21st
space in 4th and
learning
programmes . Develop a framework
will protect the investment
maintenance
28 Staffing 30 Financial
development of the
performance of their
and
As part of the
, and a
and a
assets
risk I improve
suppliers . In addition ,
temperature , climate , lighting
the University's estate ,
of
systems for the University's
management


effective
to improve utilisation and
encourage our staff to develop
campus master plans
ESG7 , ESG8 , ESG11]
; To
Ensure
a 10 % net reduction
purpose . Sustainability . We will
Estates and Infrastructure Strategy remains
energy needs . Practical opportunities
estate is an issue
now recognised as essential
on a specific location
report on Designing Spaces
research centres and Institute
for
has been adopted . This ensures
intercultural respect and understanding . Ensuring
of some of the
the estate has become
less
should
to
ensure that we
equip its students
to be important
to
make
all year round
,
major build programmes
green agenda and
Space
management
threat . 8 . 2 Carbon
minimised by achieving improvements in
facility to provide
intends to create
up of aspiration ,
a
all managers to be
and colleagues , and provide
as a result of
47
has
been accommodated through
clear opportunities to make
closely together to ensure
communication , including electronic , is
good reasons to employ
increasingly need to find
issue for the institution .
has been on
in terms of
making
there are tensions between
will be to achieve
more
and security , will be
by 2020 . The single
assess which presents
equitable . Recognise that
estate development and
the
are purchased
being achieved
in
this waste
most
Customer Care – By means
Evolving to a culture
of
outputs Professional Services & infrastructure 26
suppliers . In addition ,
temperature , climate , lighting
the University's estate ,
systems for the University's
to reduce carbon emissions .
manner' . A detailed report is
marketing activities . Communications We will :
measures in the period to
operating practice designed to minimise
operational policies to ensure co -
option
. The strategy will seek
the University can construct
partnerships ; and Sustainable investment . The
performance management , encouraging all staff
planning
, the management of information
and change management processes
of waste management and
programme / project management and programme
promotion to external funding sources
provision of World Class facilities
public transport . The West Guildford
reception
areas 72 PROBLEMS MOULSECOOMB
facilities
for the campus
on the campus .
reductions in those areas of
relations with recognised trade unions ,
research the emergence of new
resource and project management will
services , within a culture of
solution
, in terms of both
based on a case
space
allocation . and 1 . Develop
charging would have the
management
,
2 . Review the
9 . 2 Strategy
is essential in
techniques and adaptation
will be an
planning and management . 6 .
utilisation is essential for
spatial use Costs of maintaining
strategic management of the University's
strategies in place to ensure
succession planning . Promoting the University
systems for the reward of
teaching methods . 38 Estate Strategy
team
is one in which
working and changes in
their use should be mandatory .
to
invest substantial sums in
replace rather than refurbish
try and pre - empt
training and support framework will
UK and international networks , working
University Estate with lower operating


this waste
Customer Care – By means
Evolving to a culture
of
outputs Professional Services & infrastructure 26
overcome disciplinary boundaries and establish
point of view of making
previous ideas were not particularly
Strategy 2011 – 2016 - Draft 11
support the processes that underpin
term ? vii) Do we have
13 . 4 % stake 39
Estate which contributes to
Estates infrastructure allowing
holding managers accountable
they are designed
for
Group) measures for maximising
professional skills development and
recognises the importance of
Strategic Framework n Ensure
theoretically this will reduce
This Governance hierarchy ensures
to identify progress in
University . This does require
will be placed on
the
the estate are to encourage
ensure that :
Purpose Ensure
the Trust has
This does rely on considerably
improve its energy efficiency
The aim will be
with King's employees , notably
through
into annual plans
Office will strive
to facilitate
and effectively . n
beyond . A
it will
need
To implement
of small extensions
required on how
utilisation of space
to provide
tools . Finally , we will install
used by school / departments . 40
Validation by UEG and SMT
with the necessity of maintaining


try and pre - empt
training and support framework will
UK and international networks , working
University Estate with lower operating
. It is acknowledged that
and
access to general
management of the
including management of the
is made of estate
accommodation or to
all
accommodation . 38
teaching rooms .
capital funding resources ;
existing
accommodation on
space and
its physical resources .
land , including re -
learning technologies can
limited financial resources .
our
estate assets .
existing buildings .
use
of
space
. 5 . 6 .
and , as
by the
The strategy
teaching
and research
space and
the
buildings ; The
existing built
institution " s
Langford site ,
University College "
utilisation of space A Strategic
waste management procedures ; to reduce
water management have been and
,
The provision of unhindered
This review process will
way
of doing this is
possible . There is increasing
ways to provide and use
Will not provide total space
working , such as Estates and

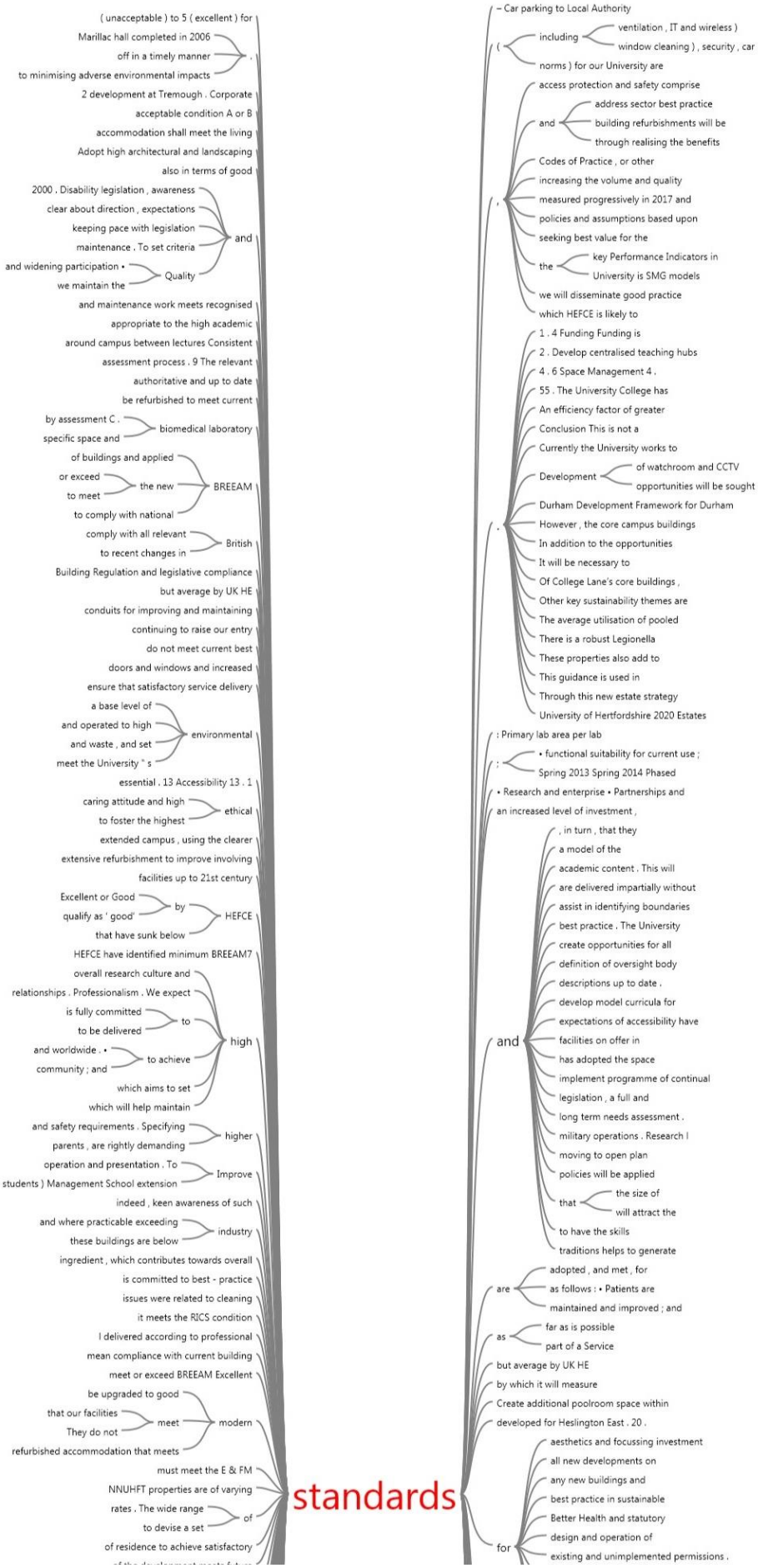

(core disciplines , multidisci - plinary research
capture and storage , photovoltaic systems
roles in international public policy
approach for the foreseeable future
association with cognate University activities
' smaller' place , enabling an enhanced
- wide . We will remain
/ 13 and to become
performance Positioning ourselves
that Exeter enjoys
countries , the University has
edge communities' , often on
that seeks to
years we will
Employability Strategy . Succeeding
necessary to succeed
of research income .
succeed and flourish
Liverpool graduate will be
n Develop and implement
a contributing member
we are part
or financial need Offer
The University is already
activity to help prevent runaway
adop - tion will create new
against a group of prominent
An interdisciplinary approach to tackling
as a civic , national ,
as climate change , sustainability
expand our international outlook
against the current
numbers due to
and become
will have
contribute to
POSITION IN
professions and
civic roots ,
university of
is to influence
links with international
reduce greenhouse gas emissions
stems from both local
the University's international profile
them increase their income
under pressure from climate
century university , we will have
collaborations with leading international universities
enable the College to achieve
Enabling Projects Extending Widening participation
Excellence in Education University life
experience , and empowered to address
experience Knowledge Exchange Knowledge Exchange
Exchange Knowledge Exchange
Extending Widening participation
Exchange
participation
University
Global University
higher education has become truly
important role to play . Exeter's
in industry . Subjected oriented alumni
institutions , our reach is already
involves : Doing research that addresses
its ambition to expand
Whilst the University retains
Law I Human Values & Contemporary
BIRMINGHAM 2015 23
City University London :
global
, Willis Re , Telefonica , ESA , Wheb
King's strengthening of its world -
Our strategy is to focus
activities , encompassing climate change research
ALUMNI 6 . 5 MILLION PASSENGERS
national access to funds
UK government position on
benefit of that experience having
centre of excellence in its
} . Many of our academics
, can be developed only
These provide a focal
We will strive to
Cross - cutting themes FACULTY
faced by rural areas
in health , energy , the
Multi - disciplinary Core disciplines
Multidisciplinary research Core disciplines
Our commitment to leading
challenges
change like human migration and
changes in : - trade , industry , commerce
citizen benefiting from an international
, reducing our energy
Ensuring full compliance
modelling and research
climate change
contacts . We will
that we have
community
takes pride in us
companies . The College will consistently
connections of research , business partners
context where knowledge innovation is
corporations are carrying out more
decision - making through publications , media
dimensions . 7 In 2007 the
dynamics in the operating environment
, the graduate labour market
Increase the opportunities for
Our graduates are critical
Vision In this framework ,
economy
effectiveness , we want to be
effort to reduce the risks
employment markets , and thereby better
engagement strategy n Develop and
enhancement of the environmental knowledge
By 2016 we will
Continue to work with
that they will be
environment
Ethics I International Peace & Security
finance and communications . Already truly
, short - term increases
the Innovation Centre
financial crisis
flow of knowledge and ideas ,
footprint . 8 SHAPING OUR FUTURE :
forefront of their disciplines , will
growth in per capita income .
, inform inter - national policy -
. International in outlook and
aims to improve
The Institute of
Innovation
health
human concerns and social problems
In the next five
These lenses offer important
and enhance the ' Exeter
on the ability of
impact
imperative to reduce carbon emissions
importance . 70 The College seeks
industry , and the emergence of
institutions of our choosing , enabling

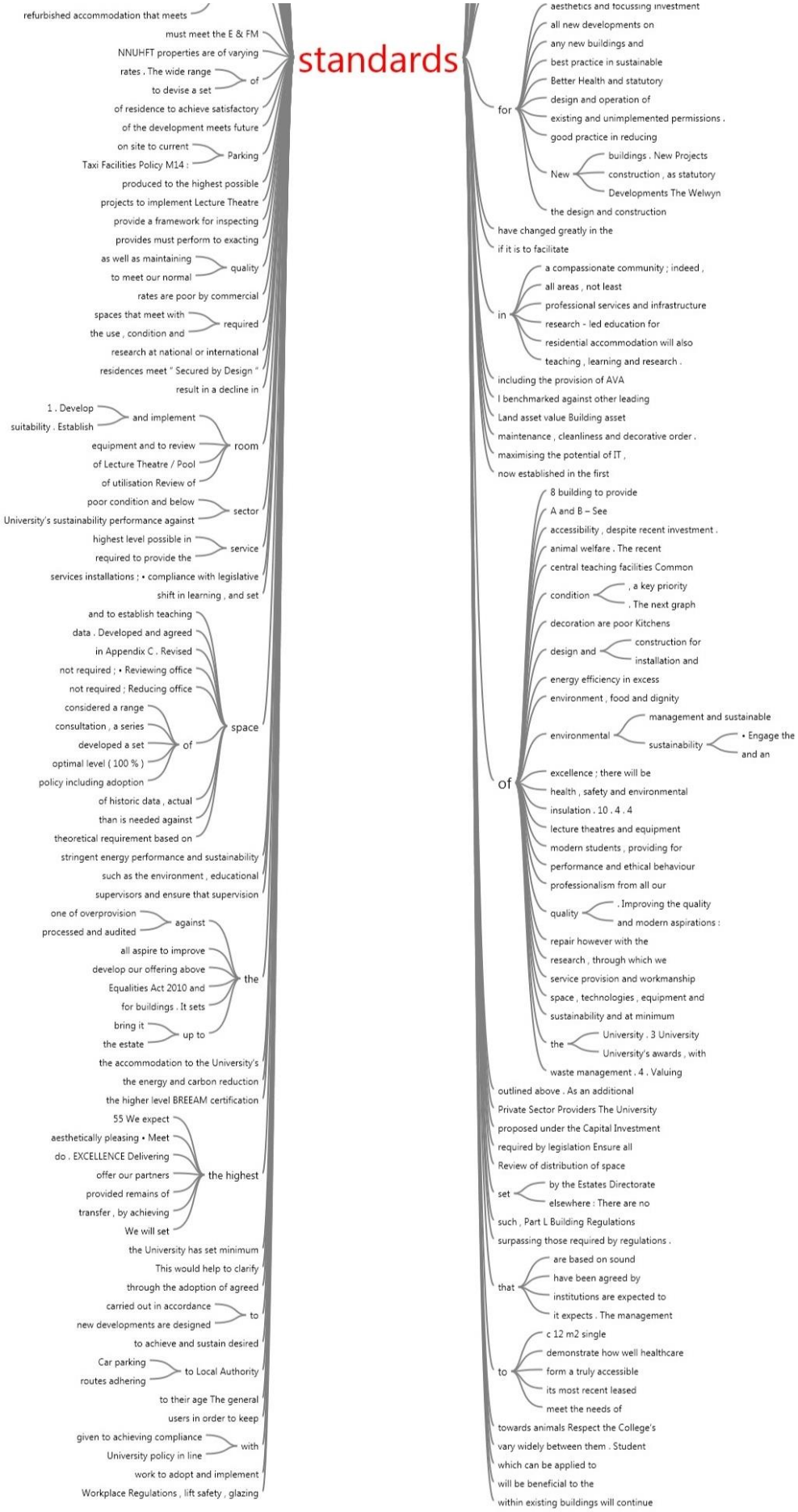

global
involves : Doing research that addresses
its ambition to expand
its
Whilst the University retains
Law I Human Values & Contemporary
BIRMINGHAM 2015 23
City University London :
our place as
a
is
to become
vision
University of Birmingham
leading
and attitudes of the
increasingly attractive destination for
London Strategy 2010 – 14 9
make a major impact upon
concern as the balance
quality in
focused areas
quality ion
fuels , and the threat
Health Innovation The
Institute
to climate change . •
recognised as a university
stakeholders , in addressing issues
sympathetic with the culture
understand the changing needs
- led relationships , with
universities
small number of
of
of education . Research and application
of sport as a huge
of the West Indies) support
and the extent of
being an elite University .
Mission We will enhance
our
targeted projects to extend
the world to promote
particular initiatives to address emerging
preparation for such a major
opportunities of a
rapidly changing
respond to the
stakeholders : Stakeholders with concerns about
2 . 4 Environmental Sustainability "
as a brand
and
contribution to society
At the same time ,
. 10 The impact
of
in the aftermath
prepare
our graduates for
prepares
place our faculty at
the
a real contribution
environmental research contributing
to
other users . Due
our activities on
will be affected by
years . These include : International
the ' Exeter Experience' . Our expanding
the benefits of our growing
the threat of climate change /
the UK in increasingly competitive
impact on a local
investigate and find solutions
to
which is increasingly responding
to coordinate efforts in improved
TURNOVER 10 / 11 100 , 000
UK Met Office , BNSC , Akins
and beyond . In today's
volatile
context with the current
which are aligned to specific
contribution to emissions associated
with
Together , we produce research
and enhance the ' Exeter
on the ability of
imperative to reduce carbon emissions
importance . 70 The College seeks
industry , and the emergence of
institutions of our choosing , enabling
leader in higher education . DR
LEAGUE TABLES . Our intention is
learning experience Internationalisation The University
market
,
Equally , input from industry
The Faculty is increasing
Our students will gain
markets . Innovation , creativity and an
multinationals and research - based companies .
network
groups will continue to
of
150 , 000 graduates
over 100 , 000
networks . We will complement performance
or regional scale and involving
overseas students will be pursued .
player buoyed by its increasing
pre - eminence in veterinary and
presence . New networks and opportunities
reach
, and we cherish our
. Whilst quality will remain
and influence that reflects
Our environment Social responsibility
recession then the planned developments
reputation
,
The University is currently
Use sport as a
as an outstanding independent
we believe that being
research
and development based businesses
collaborations . Professor Anne Greenough ,
researchers who will , in turn ,
resources adjusts . In socio - economic
scale : Grow additional sources of
significance for animal and human
society
. I am proud of
Key themes to support
sporting event . It is also
stage whenever possible . The University
standing
, in particular in China ,
.
Already in the top
Our international profile has
student and alumni community The
sustainability agenda and as a
thought leader , influential in policy
Touch volunteers work closely with
university
, recognised by our peers
.
In response to increased
Taken together , these elements
These goals are mutually
We will achieve this
: n Excellence – we are
1 . 1 1 . 2
4 . 1 4 . 2
committed to academic excellence ,
Driving knowledge exchange and
Edgbaston , Birmingham , B15 2TT ,
Global University
1 . 1
4 . 1
Global University
warming and
climate change . The
is committed to
the
environment will
government initiatives
workplace . To influence the economic

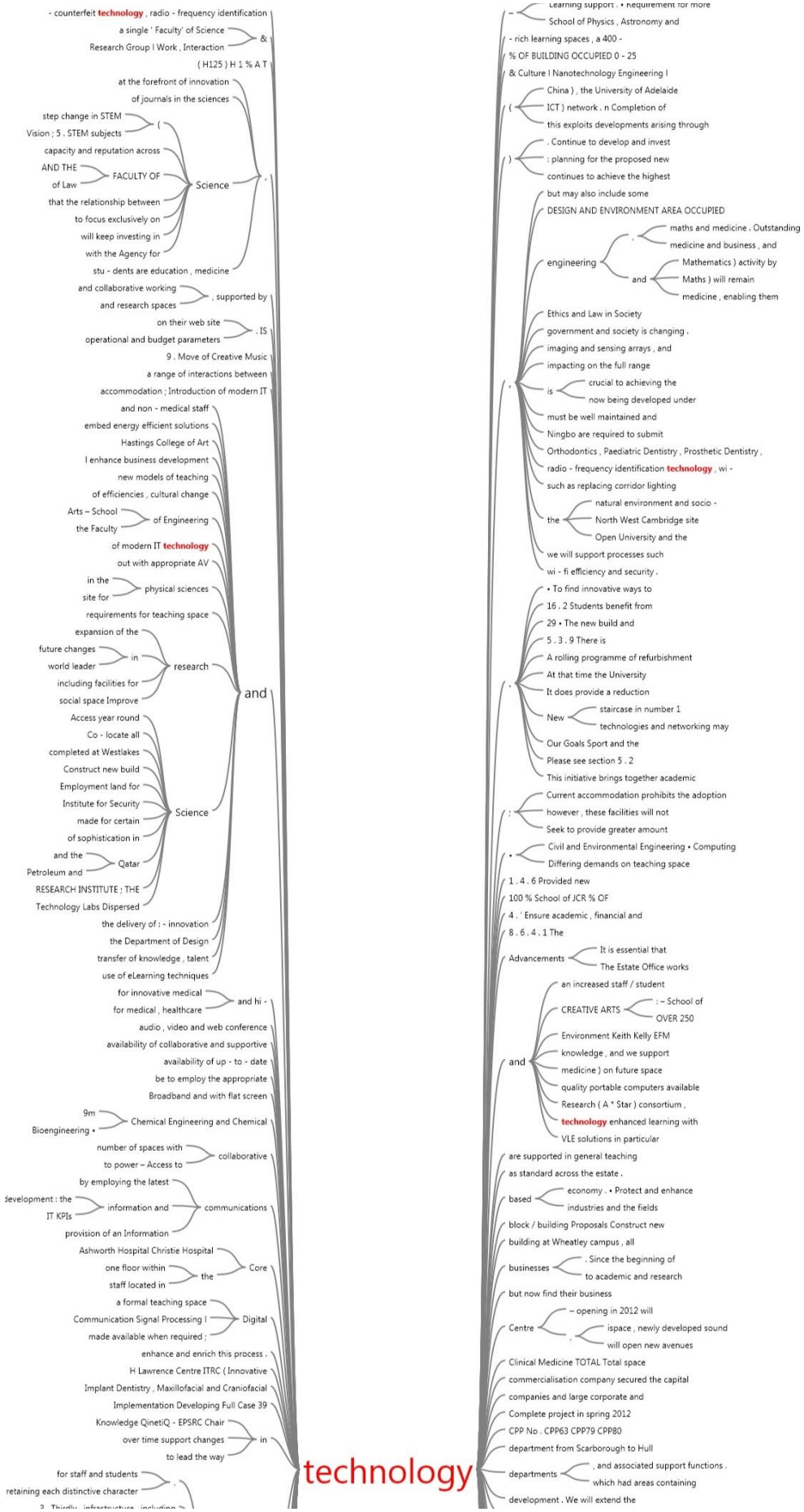

guidance
(as defined in Estate Code
a notable source of inspiration
as habitat creation and management
in good condition . More recently
,
. 4 The University has developed
adopt up to date BREEAM
already clear from applying HEFCE's
HE Space Management Project' ;
kinds of information , advice
legislation , policies , proposals , designations
provided by EMS data)
unit , with associated targets
with excellent teaching , support
and
Limitations These
The condition
appraisals provide general
been created following the available
Brief of 1995 provides some
accordance with
follows the
Department of Health
masterplan to provide the
nor desirable , to provide
detailed
Existing national , regional and local
four classifications of condition for
needs " Source : HEFCE
utilisation and producing
good practice
good Practice' contains the following
. 4 In line with
Strategy has followed current
HEFCE
in 2010 . Citywide policies include
in line with public sector
Infrastructure Strategy Committee for their
Management System . 3 . 7 Revised
methodology which follows HM Treasury
food safety legislation and
in the context of
such as students . Other
national
New Build Refurbishment published a
of Environmental and Pollution Prevention
(Encode) . • Developing and enhancing the
To eliminate 11 . 7
Estate Strategies , a Guide to
SPG) was developed by the
) . • To improve the overall energy
a ' Scoping and Specification' document
will set out how the
• Patients have access to food
The campus facilities and services
Strategy is meant as
An estate strategy draws its
Hatfield Aerodrome (including supporting Local
; ii) iii) Consideration of the
" Developing an Estates Strategy " and
00 / 04 It aims to
16 . 9 Previous Development Plans
advice from central Government
influence , with an increasingly
and support we offer students .
the lack of alternative
willingness to explore all
as follows : A As new
by drawing on work undertaken
contained in the Higher Education
Document . Project Manager's Guide to
relating to Sustainable Development
East Anglia (RPG6) was
education buildings . Energy Performance
successful long - term biodiversity
for
design and construction
the future development of
site . Furthermore , development
Building Research Establishment
DH and NHS
from the national to the
Unit , North Cumbria
has been used in the
further sharpened the focus

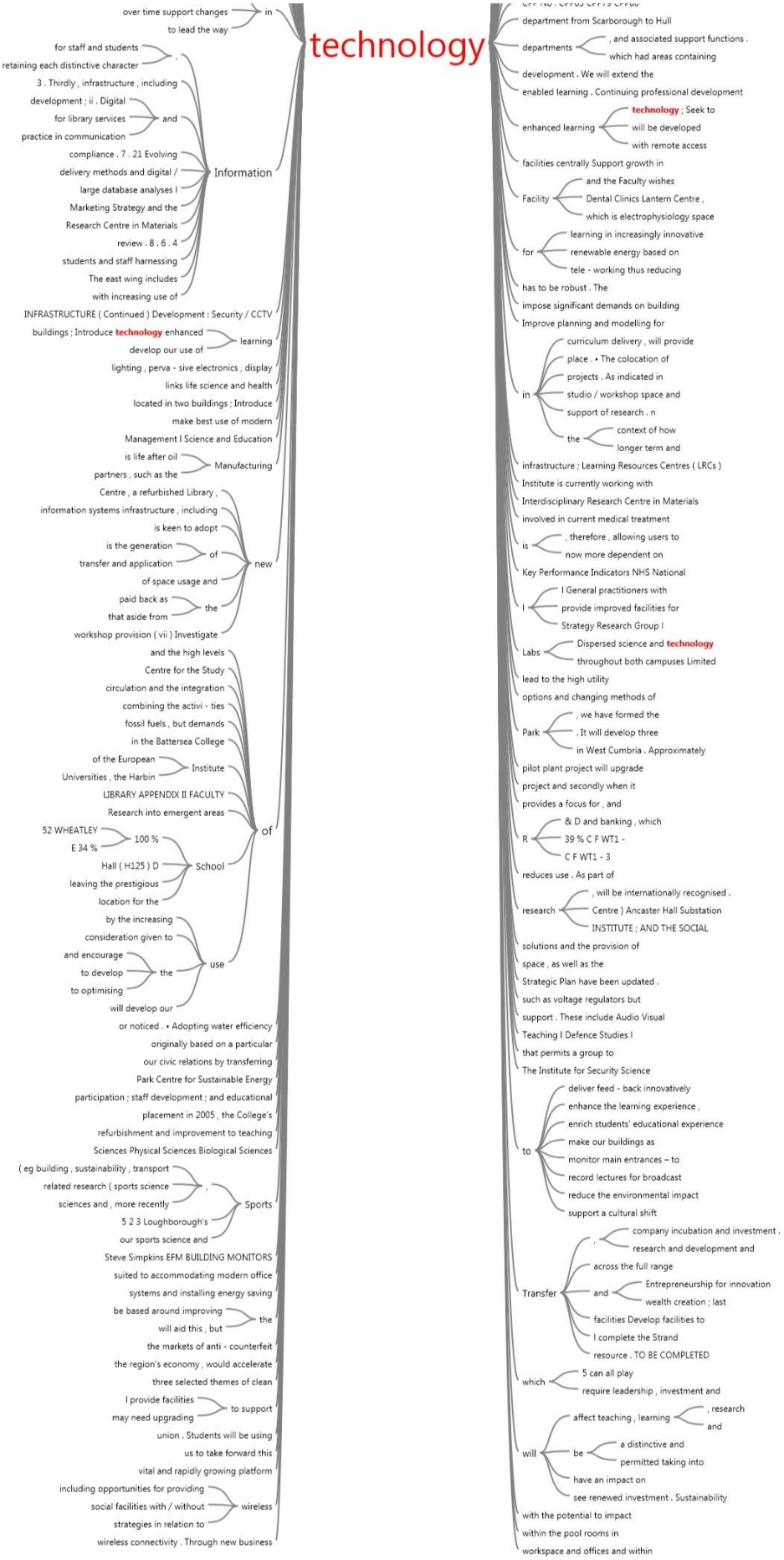

guidance
in the context of
national
such as students . Other
New Build Refurbishment published a
of Environmental and Pollution Prevention
of its activity . Working with
of new national and regional
Level 2 . 9 Regional
current planning policy) .
National
issue raised by
National Guidance UK Universities
Planning
be used as
accordance with
the
Plan Policies)
supplementary
Urban Open Land .
and the related National
continue to provide
against inappropriate
development .
planning
Policy
of sustainable
preparation of new Strategies . That
schools policy and provide expert
- Committee in December 2004
.
to utilise that development
in the context
of
the key elements
these works fall within
The
UK Universities Planning Guidance
buildings should comply
with
prepared in accordance
the academic advice and other
the Energy Consortium (Education) 2006 , '
the Trust have followed NHS
and biomedical laboratory standards
.
to the university campus
this
/ 04) . In line with
to show by 2011 . • Seeking
Trust Board . 2 . 2 Sustainability
Urban Design Framework will provide
Unit , North Cumbria
has
been used in the
further sharpened the focus
highlights universities as offering particular
accessible formats , and this
in
relation to continuing physical
Building Research Establishment
the
determination of any
a BREEAM assessment
is
that
of sustainable development .
used in consideration of
Note
13 - Transport , encourages local
2 Green Belts (PPG
Notes , which are available on
of the Conservation Development Strategy ,
disability access issues for
good practice . Key performance
infrastructure requirements that unless
investment appraisals , all major
on
content and exami -
the
environmental impact of
implementation at this
occupation of office
Tree protection and Biodiversity
what would be allowed
only to the
condition of
cost and
provided in connection with Transparent
provides the planning framework within
published by the Department of
recognises the lack of coherent
The guidance recognises the lack
UK Universities Planning Guidance The
up until they are replaced
will
be afforded more weight
play a key role
would point to the University's

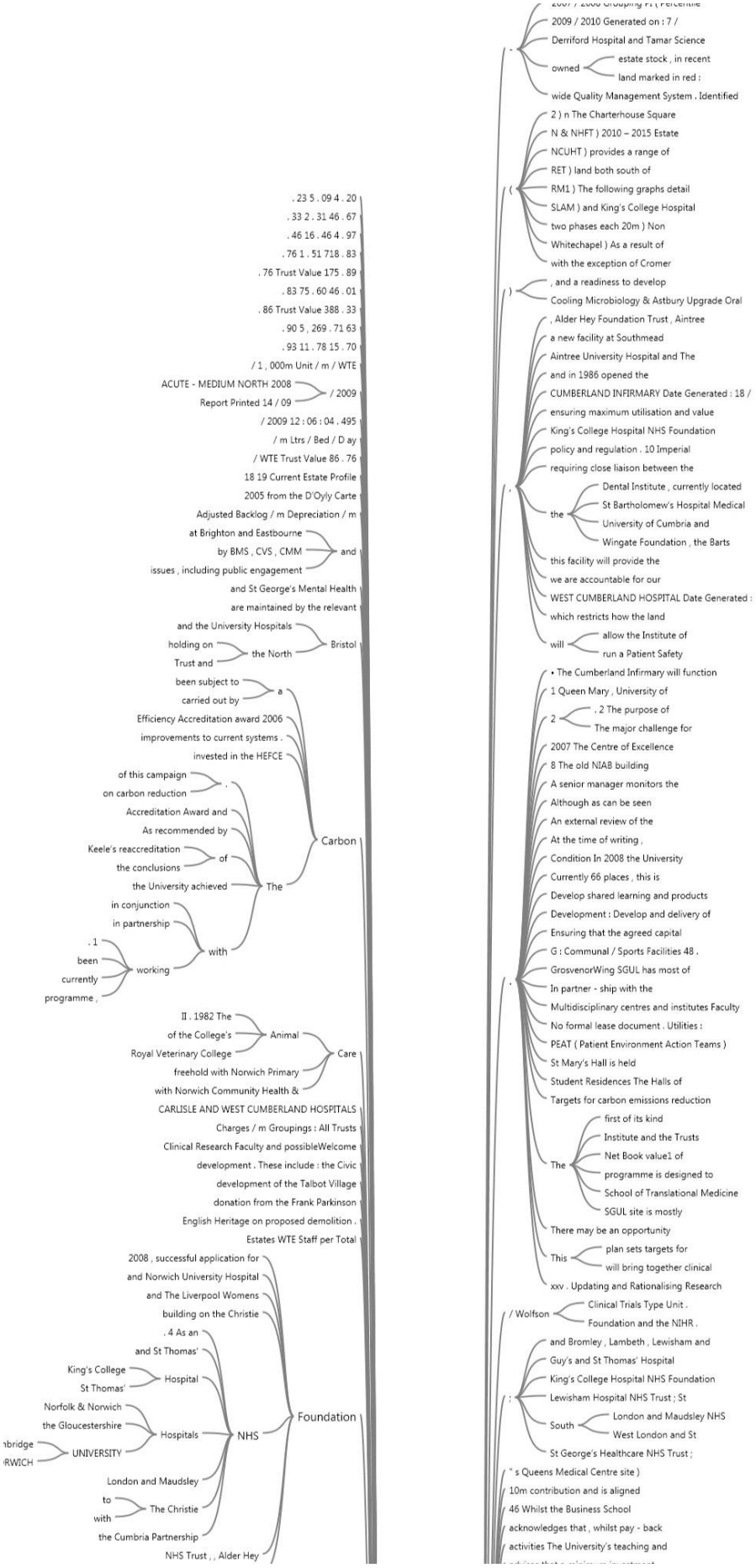

leadership
1 . 9m • Centre for Educational
College Deans implement
We look to
a distributed
aim is to extend that
always filters down from good
on positions of responsibility
the student experience . People
to supply - chain management
and
by : • Taking account in future
careers at the College . 54
change and technology which require
courses , and will provide environmental
disseminate good practice in research
effect . We will provide strong
College's business . The need
of the National College
probation , promotion , and reward
for
for
of
the London Centre
for
gain employment - based experience . Our
Higher Education Outstanding Contribution to
informed risks . We have decisive
is also reflected in its
Mission Vision To provide visionary
new appraisal system I introduce
biological sciences ; an institute
business through the provision
given to the importance
of
of , excellence . We will value
of hosting the UK election's
of the University's Professional Services
people management and a new
performance with supportive and receptive
and celebrate our achievements .
Sustainability Partnership Adaptability Inclusivity
Personal
relish the opportunity to demonstrate
staff and recruit appropriate lay
only achieve this through
Professional Services staff with
the
will provide opportunities to develop
- 1 . 5m • Landscape depot - 1 .
,
and this is true in
investment and operational change . The
management and excellence in learning
training and support to deliver
.
Commercial Services In our drive
The Students as Change Agents
and
a progressive approach to
continued commitment of our
create a culture where
enterprise education through a
management
. When appointing new
development programme . TO
in healthcare and
skills . We will
team working across the
debate in 2010 and the
development
(being awarded in November
and management training plays
of the organisational and
programme are being put
in
Learning
, the College of
will require an
roles at every level
Veterinary Science and education
management and operational skills over
model
and we have more
throughout the University . Our
to ensure our staff
of
Schools and Children " s
sporting research , teaching , enterprise
the REEDNet programme which
studies . We will identify work
Team . 5 . 16 The day -
that remains open to ideas
to their peers and colleagues .
We have a clear sense
when required , and I know
Working Together
, and with our
Some facts and

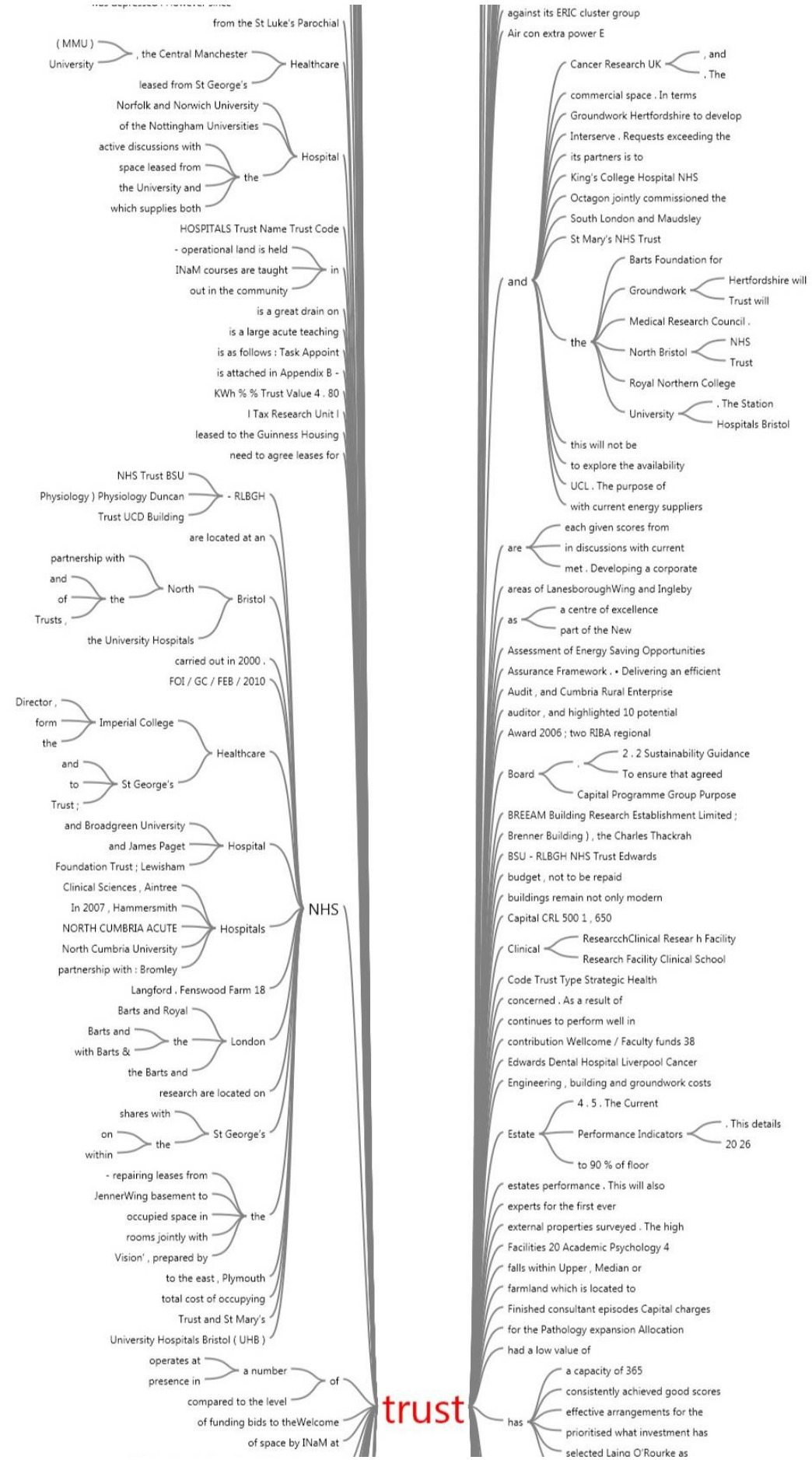

standards
(unacceptable) to 5 (excellent) for
Marillac hall completed in 2006
off in a timely manner
to minimising adverse environmental impacts
2 development at Tremough . Corporate
acceptable condition A or B
accommodation shall meet the living
Adopt high architectural and landscaping
also in terms of good
2000 . Disability legislation , awareness
clear about direction , expectations
keeping pace with legislation
maintenance . To set criteria
and widening participation •
we maintain the
Quality
and
and maintenance work meets recognised
appropriate to the high academic
around campus between lectures Consistent
assessment process . 9 The relevant
authoritative and up to date
be refurbished to meet current
by assessment C .
specific space and
biomedical laboratory
of buildings and applied
or exceed
to meet
the new
to comply with national
BREEAM
comply with all relevant
to recent changes in
British
Building Regulation and legislative compliance
but average by UK HE
conduits for improving and maintaining
continuing to raise our entry
do not meet current best
doors and windows and increased
ensure that satisfactory service delivery
a base level of
and operated to high
and waste , and set
meet the University " s
environmental
essential . 13 Accessibility 13 . 1
caring attitude and high
to foster the highest
ethical
extended campus , using the clearer
extensive refurbishment to improve involving
facilities up to 21st century
Excellent or Good
qualify as ' good'
by
that have sunk below
HEFCE
HEFCE have identified minimum BREEAM7
overall research culture and
relationships . Professionalism . We expect
is fully committed
to be delivered
to
and worldwide . •
community ; and
to achieve
which aims to set
which will help maintain
high
and safety requirements . Specifying
parents , are rightly demanding
higher
operation and presentation . To
students) Management School extension
Improve
indeed , keen awareness of such
and where practicable exceeding
these buildings are below
industry
ingredient , which contributes towards overall
is committed to best - practice
issues were related to cleaning
it meets the RICS condition
I delivered according to professional
mean compliance with current building
meet or exceed BREEAM Excellent
be upgraded to good
that our facilities
They do not
meet
refurbished accommodation that meets
modern
must meet the E & FM
NNUHFT properties are of varying
rates . The wide range
to devise a set
of
of residence to achieve satisfactory
– Car parking to Local Authority
(
including
ventilation , IT and wireless)
window cleaning) , security , car
norms) for our University are
access protection and safety comprise
and
address sector best practice
building refurbishments will be
through realising the benefits
Codes of Practice , or other
increasing the volume and quality
measured progressively in 2017 and
policies and assumptions based upon
seeking best value for the
the
key Performance Indicators in
University is SMG models
we will disseminate good practice
which HEFCE is likely to
,
1 . 4 Funding Funding is
2 . Develop centralised teaching hubs
4 . 6 Space Management 4 .
55 . The University College has
An efficiency factor of greater
Conclusion This is not a
Currently the University works to
Development
of watchroom and CCTV
opportunities will be sought
Durham Development Framework for Durham
However , the core campus buildings
In addition to the opportunities
It will be necessary to
Of College Lane's core buildings ,
Other key sustainability themes are
The average utilisation of pooled
There is a robust Legionella
These properties also add to
This guidance is used in
Through this new estate strategy
University of Hertfordshire 2020 Estates
.
: Primary lab area per lab
;
• functional suitability for current use ;
Spring 2013 Spring 2014 Phased
• Research and enterprise • Partnerships and
an increased level of investment ,
, in turn , that they
a model of the
academic content . This will
are delivered impartially without
assist in identifying boundaries
best practice . The University
create opportunities for all
definition of oversight body
descriptions up to date .
develop model curricula for
expectations of accessibility have
and
facilities on offer in
has adopted the space
implement programme of continual
legislation , a full and
long term needs assessment .
military operations . Research I
moving to open plan
policies will be applied
that
the size of
will attract the
to have the skills
traditions helps to generate
are
adopted , and met , for
as follows : • Patients are
maintained and improved ; and
as
far as is possible
part of a Service
but average by UK HE
by which it will measure
Create additional poolroom space within
developed for Heslington East . 20 .
for
aesthetics and focussing investment
all new developments on
any new buildings and
best practice in sustainable
Better Health and statutory
design and operation of
existing and unimplemented permissions .

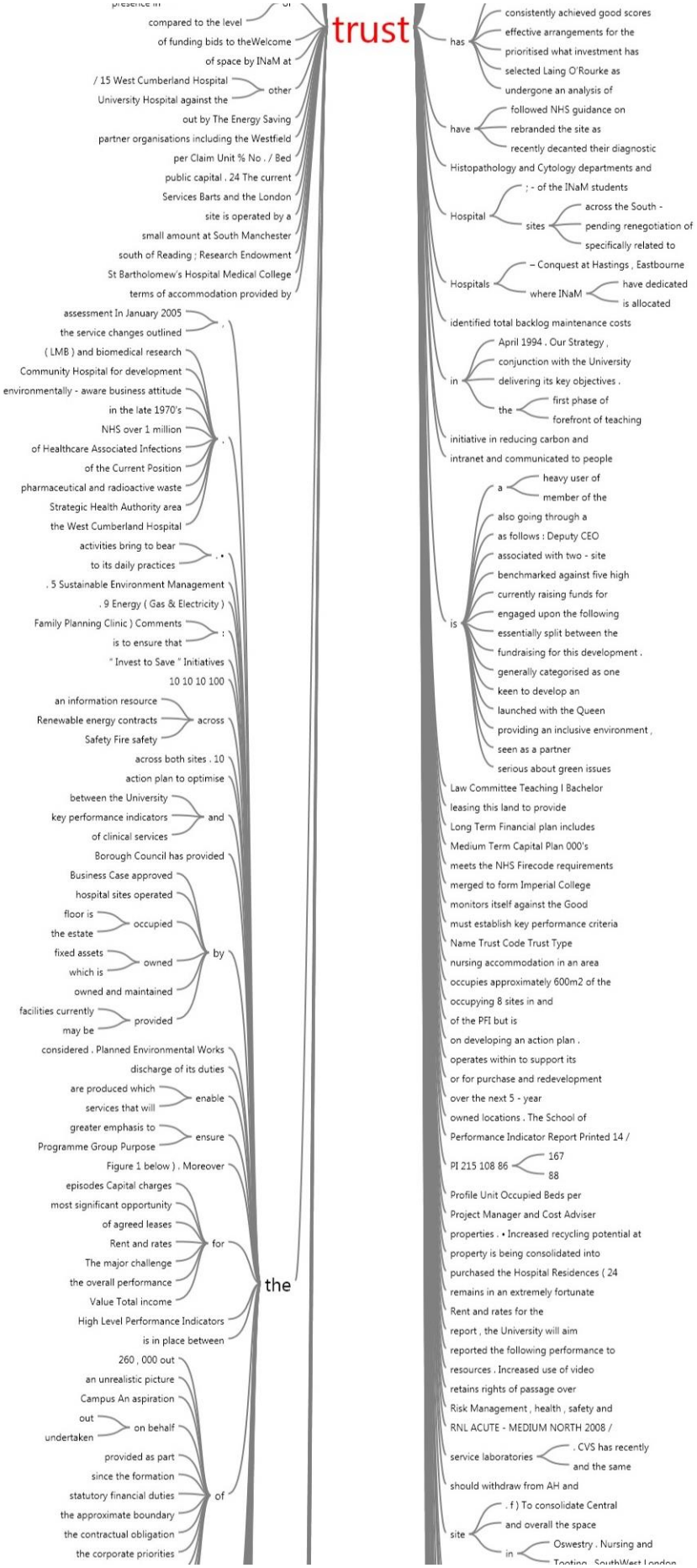

standards
refurbished accommodation that meets
must meet the E & FM
NNUHFT properties are of varying
rates . The wide range
of
to devise a set
of residence to achieve satisfactory
of the development meets future
on site to current
Parking
Taxi Facilities Policy M14 :
produced to the highest possible
projects to implement Lecture Theatre
provide a framework for inspecting
provides must perform to exacting
as well as maintaining
quality
to meet our normal
rates are poor by commercial
spaces that meet with
required
the use , condition and
research at national or international
residences meet " Secured by Design "
result in a decline in
1 . Develop
and implement
suitability . Establish
equipment and to review
room
of Lecture Theatre / Pool
of utilisation Review of
poor condition and below
sector
University's sustainability performance against
highest level possible in
service
required to provide the
services installations ; • compliance with legislative
shift in learning , and set
and to establish teaching
data . Developed and agreed
in Appendix C . Revised
not required ; • Reviewing office
not required ; Reducing office
considered a range
consultation , a series
developed a set
of
optimal level (100 %)
policy including adoption
space
of historic data , actual
than is needed against
theoretical requirement based on
stringent energy performance and sustainability
such as the environment , educational
supervisors and ensure that supervision
one of overprovision
against
processed and audited
all aspire to improve
develop our offering above
Equalities Act 2010 and
the
for buildings . It sets
bring it
up to
the estate
the accommodation to the University's
the energy and carbon reduction
the higher level BREEAM certification
55 We expect
aesthetically pleasing • Meet
do . EXCELLENCE Delivering
offer our partners
the highest
provided remains of
transfer , by achieving
We will set
the University has set minimum
This would help to clarify
through the adoption of agreed
carried out in accordance
to
new developments are designed
to achieve and sustain desired
Car parking
to Local Authority
routes adhering
to their age The general
users in order to keep
given to achieving compliance
with
University policy in line
work to adopt and implement
Workplace Regulations , lift safety , glazing
for
aesthetics and focussing investment
all new developments on
any new buildings and
best practice in sustainable
Better Health and statutory
design and operation of
existing and unimplemented permissions .
good practice in reducing
New
buildings . New Projects
construction , as statutory
Developments The Welwyn
the design and construction
have changed greatly in the
if it is to facilitate
in
a compassionate community ; indeed ,
all areas , not least
professional services and infrastructure
research - led education for
residential accommodation will also
teaching , learning and research .
including the provision of AVA
I benchmarked against other leading
Land asset value Building asset
maintenance , cleanliness and decorative order .
maximising the potential of IT ,
now established in the first
of
8 building to provide
A and B – See
accessibility , despite recent investment .
animal welfare . The recent
central teaching facilities Common
condition
, a key priority
. The next graph
decoration are poor Kitchens
design and
construction for
installation and
energy efficiency in excess
environment , food and dignity
environmental
management and sustainable
sustainability
• Engage the
and an
excellence ; there will be
health , safety and environmental
insulation . 10 . 4 . 4
lecture theatres and equipment
modern students , providing for
performance and ethical behaviour
professionalism from all our
quality
. Improving the quality
and modern aspirations :
repair however with the
research , through which we
service provision and workmanship
space , technologies , equipment and
sustainability and at minimum
the
University . 3 University
University's awards , with
waste management . 4 . Valuing
outlined above . As an additional
Private Sector Providers The University
proposed under the Capital Investment
required by legislation Ensure all
Review of distribution of space
set
by the Estates Directorate
elsewhere : There are no
such , Part L Building Regulations
surpassing those required by regulations .
that
are based on sound
have been agreed by
institutions are expected to
it expects . The management
to
c 12 m2 single
demonstrate how well healthcare
form a truly accessible
its most recent leased
meet the needs of
towards animals Respect the College's
vary widely between them . Student
which can be applied to
will be beneficial to the
within existing buildings will continue

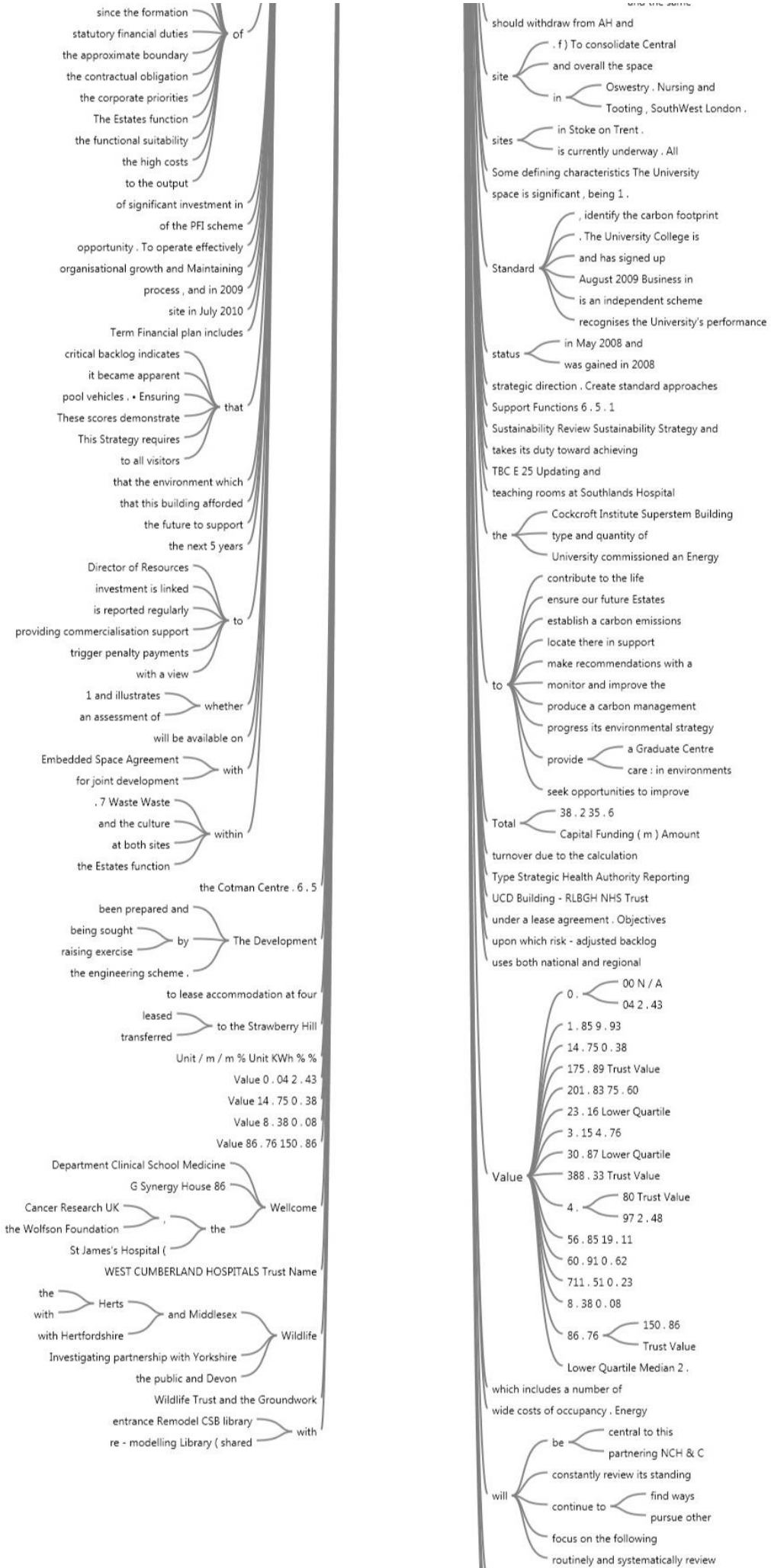

technology
- counterfeit technology , radio - frequency identification
a single ' Faculty' of Science
Research Group I Work , Interaction
&
(H125) H 1 % A T
at the forefront of innovation
of journals in the sciences
step change in STEM
Vision ; 5 . STEM subjects
(
capacity and reputation across
AND THE
of Law
FACULTY OF
that the relationship between
to focus exclusively on
will keep investing in
with the Agency for
Science
,
stu - dents are education , medicine
and collaborative working
and research spaces
, supported by
on their web site
operational and budget parameters
. IS
9 . Move of Creative Music
a range of interactions between
accommodation ; Introduction of modern IT
and non - medical staff
embed energy efficient solutions
Hastings College of Art
I enhance business development
new models of teaching
of efficiencies , cultural change
Arts – School
the Faculty
of Engineering
of modern IT technology
out with appropriate AV
in the
site for
physical sciences
requirements for teaching space
expansion of the
future changes
world leader
including facilities for
social space Improve
in
research
and
Access year round
Co - locate all
completed at Westlakes
Construct new build
Employment land for
Institute for Security
made for certain
of sophistication in
and the
Petroleum and
Qatar
RESEARCH INSTITUTE ; THE
Technology Labs Dispersed
Science
the delivery of : - innovation
the Department of Design
transfer of knowledge , talent
use of eLearning techniques
for innovative medical
for medical , healthcare
and hi -
audio , video and web conference
availability of collaborative and supportive
availability of up - to - date
be to employ the appropriate
Broadband and with flat screen
9m
Bioengineering •
Chemical Engineering and Chemical
number of spaces with
to power – Access to
collaborative
by employing the latest
development : the
IT KPIs
information and
provision of an Information
communications
Ashworth Hospital Christie Hospital
one floor within
staff located in
the
Core
a formal teaching space
Communication Signal Processing I
made available when required ;
Digital
enhance and enrich this process .
H Lawrence Centre ITRC (Innovative
Implant Dentistry , Maxillofacial and Craniofacial
Implementation Developing Full Case 39
Knowledge QinetiQ - EPSRC Chair
over time support changes
to lead the way
in
for staff and students
,
retaining each distinctive character
– Learning support . • Requirement for more
School of Physics , Astronomy and
- rich learning spaces , a 400 -
% OF BUILDING OCCUPIED 0 - 25
& Culture I Nanotechnology Engineering I
(
China) , the University of Adelaide
ICT) network . n Completion of
this exploits developments arising through
)
. Continue to develop and invest
: planning for the proposed new
continues to achieve the highest
but may also include some
DESIGN AND ENVIRONMENT AREA OCCUPIED
engineering
,
maths and medicine . Outstanding
medicine and business , and
and
Mathematics) activity by
Maths) will remain
medicine , enabling them
Ethics and Law in Society
government and society is changing .
imaging and sensing arrays , and
impacting on the full range
,
is
crucial to achieving the
now being developed under
must be well maintained and
Ningbo are required to submit
Orthodontics , Paediatric Dentistry , Prosthetic Dentistry ,
radio - frequency identification technology , wi -
such as replacing corridor lighting
the
natural environment and socio -
North West Cambridge site
Open University and the
we will support processes such
wi - fi efficiency and security .
• To find innovative ways to
16 . 2 Students benefit from
29 • The new build and
5 . 3 . 9 There is
A rolling programme of refurbishment
At that time the University
It does provide a reduction
.
New
staircase in number 1
technologies and networking may
Our Goals Sport and the
Please see section 5 . 2
This initiative brings together academic
;
Current accommodation prohibits the adoption
however , these facilities will not
Seek to provide greater amount
•
Civil and Environmental Engineering • Computing
Differing demands on teaching space
1 . 4 . 6 Provided new
100 % School of JCR % OF
4 . ' Ensure academic , financial and
8 . 6 . 4 . 1 The
Advancements
It is essential that
The Estate Office works
an increased staff / student
CREATIVE ARTS
: – School of
OVER 250
Environment Keith Kelly EFM
knowledge , and we support
medicine) on future space
quality portable computers available
Research (A * Star) consortium ,
technology enhanced learning with
VLE solutions in particular
and
are supported in general teaching
as standard across the estate .
based
economy . • Protect and enhance
industries and the fields
block / building Proposals Construct new
building at Wheatley campus , all
businesses
. Since the beginning of
to academic and research
but now find their business
Centre
– opening in 2012 will
,
ispace , newly developed sound
will open new avenues
Clinical Medicine TOTAL Total space
commercialisation company secured the capital
companies and large corporate and
Complete project in spring 2012
CPP No . CPP63 CPP79 CPP80
department from Scarborough to Hull
departments
, and associated support functions .
which had areas containing
development . We will extend the


technology
over time support changes
to lead the way
in
for staff and students
retaining each distinctive character
.
3 . Thirdly , infrastructure , including
development ; ii . Digital
for library services
and
practice in communication
compliance . 7 . 21 Evolving
delivery methods and digital /
large database analyses I
Marketing Strategy and the
Research Centre in Materials
review . 8 . 6 . 4
students and staff harnessing
The east wing includes
with increasing use of
Information
INFRASTRUCTURE (Continued) Development : Security / CCTV
buildings ; Introduce technology enhanced
develop our use of
learning
lighting , perva - sive electronics , display
links life science and health
located in two buildings ; Introduce
make best use of modern
Management I Science and Education
is life after oil
partners , such as the
Manufacturing
Centre , a refurbished Library ,
information systems infrastructure , including
is keen to adopt
is the generation
transfer and application
of
of space usage and
paid back as
that aside from
the
workshop provision (vii) Investigate
new
and the high levels
Centre for the Study
circulation and the integration
combining the activi - ties
fossil fuels , but demands
in the Battersea College
of the European
Universities , the Harbin
Institute
LIBRARY APPENDIX II FACULTY
Research into emergent areas
52 WHEATLEY
E 34 %
100 %
Hall (H125) D
leaving the prestigious
location for the
School
by the increasing
consideration given to
and encourage
to develop
to optimising
the
will develop our
use
of
or noticed . • Adopting water efficiency
originally based on a particular
our civic relations by transferring
Park Centre for Sustainable Energy
participation ; staff development ; and educational
placement in 2005 , the College's
refurbishment and improvement to teaching
Sciences Physical Sciences Biological Sciences
(eg building , sustainability , transport
related research (sports science
sciences and , more recently
,
5 2 3 Loughborough's
our sports science and
Sports
Steve Simpkins EFM BUILDING MONITORS
suited to accommodating modern office
systems and installing energy saving
be based around improving
will aid this , but
the
the markets of anti - counterfeit
the region's economy , would accelerate
three selected themes of clean
I provide facilities
may need upgrading
to support
union . Students will be using
us to take forward this
vital and rapidly growing platform
including opportunities for providing
social facilities with / without
strategies in relation to
wireless
wireless connectivity . Through new business
department from Scarborough to Hull
departments
, and associated support functions .
which had areas containing
development . We will extend the
enabled learning . Continuing professional development
enhanced learning
technology ; Seek to
will be developed
with remote access
facilities centrally Support growth in
Facility
and the Faculty wishes
Dental Clinics Lantern Centre ,
which is electrophysiology space
for
learning in increasingly innovative
renewable energy based on
tele - working thus reducing
has to be robust . The
impose significant demands on building
Improve planning and modelling for
in
curriculum delivery , will provide
place . • The colocation of
projects . As indicated in
studio / workshop space and
support of research . n
the
context of how
longer term and
infrastructure ; Learning Resources Centres (LRCs)
Institute is currently working with
Interdisciplinary Research Centre in Materials
involved in current medical treatment
is
, therefore , allowing users to
now more dependent on
Key Performance Indicators NHS National
I
I General practitioners with
provide improved facilities for
Strategy Research Group I
Labs
Dispersed science and technology
throughout both campuses Limited
lead to the high utility
options and changing methods of
Park
, we have formed the
. It will develop three
in West Cumbria . Approximately
pilot plant project will upgrade
project and secondly when it
provides a focus for , and
R
& D and banking , which
39 % C F WT1 -
C F WT1 - 3
reduces use . As part of
research
, will be internationally recognised .
Centre) Ancaster Hall Substation
INSTITUTE ; AND THE SOCIAL
solutions and the provision of
space , as well as the
Strategic Plan have been updated .
such as voltage regulators but
support . These include Audio Visual
Teaching I Defence Studies I
that permits a group to
The Institute for Security Science
to
deliver feed - back innovatively
enhance the learning experience ,
enrich students' educational experience
make our buildings as
monitor main entrances – to
record lectures for broadcast
reduce the environmental impact
support a cultural shift
Transfer
,
company incubation and investment ,
research and development and
across the full range
and
Entrepreneurship for innovation
wealth creation ; last
facilities Develop facilities to
I complete the Strand
resource . TO BE COMPLETED
which
5 can all play
require leadership , investment and
will
affect teaching , learning
, research
and
be
a distinctive and
permitted taking into
have an impact on
see renewed investment . Sustainability
with the potential to impact
within the pool rooms in
workspace and offices and within


2009 / 2010 Generated on : 7 /
Derriford Hospital and Tamar Science
owned
estate stock , in recent
land marked in red :
wide Quality Management System . Identified
2) n The Charterhouse Square
N & NHFT) 2010 – 2015 Estate
NCUHT) provides a range of
RET) land both south of
RM1) The following graphs detail
SLAM) and King's College Hospital
two phases each 20m) Non
Whitechapel) As a result of
with the exception of Cromer
, and a readiness to develop
Cooling Microbiology & Astbury Upgrade Oral
, Alder Hey Foundation Trust , Aintree
a new facility at Southmead
Aintree University Hospital and The
and in 1986 opened the
CUMBERLAND INFIRMARY Date Generated : 18 /
ensuring maximum utilisation and value
King's College Hospital NHS Foundation
policy and regulation . 10 Imperial
requiring close liaison between the
the
Dental Institute , currently located
St Bartholomew's Hospital Medical
University of Cumbria and
Wingate Foundation , the Barts
this facility will provide the
we are accountable for our
WEST CUMBERLAND HOSPITAL Date Generated :
which restricts how the land
will
allow the Institute of
run a Patient Safety
• The Cumberland Infirmary will function
1 Queen Mary , University of
2
. 2 The purpose of
The major challenge for
2007 The Centre of Excellence
8 The old NIAB building
A senior manager monitors the
Although as can be seen
An external review of the
At the time of writing ,
Condition In 2008 the University
Currently 66 places , this is
Develop shared learning and products
Development : Develop and delivery of
Ensuring that the agreed capital
G : Communal / Sports Facilities 48 .
GrosvenorWing SGUL has most of
In partner - ship with the
Multidisciplinary centres and institutes Faculty
No formal lease document . Utilities :
PEAT (Patient Environment Action Teams)
St Mary's Hall is held
Student Residences The Halls of
Targets for carbon emissions reduction
The
first of its kind
Institute and the Trusts
Net Book value1 of
programme is designed to
School of Translational Medicine
SGUL site is mostly
There may be an opportunity
This
plan sets targets for
will bring together clinical
xxv . Updating and Rationalising Research
/ Wolfson
Clinical Trials Type Unit .
Foundation and the NIHR .
and Bromley , Lambeth , Lewisham and
Guy's and St Thomas' Hospital
King's College Hospital NHS Foundation
Lewisham Hospital NHS Trust ; St
South
London and Maudsley NHS
West London and St
St George's Healthcare NHS Trust ;
" s Queens Medical Centre site)
10m contribution and is aligned
46 Whilst the Business School
acknowledges that , whilst pay - back
activities The University's teaching and
. 23 5 . 09 4 . 20
. 33 2 . 31 46 . 67
. 46 16 . 46 4 . 97
. 76 1 . 51 718 . 83
. 76 Trust Value 175 . 89
. 83 75 . 60 46 . 01
. 86 Trust Value 388 . 33
. 90 5 , 269 . 71 63
. 93 11 . 78 15 . 70
/ 1 , 000m Unit / m / WTE
ACUTE - MEDIUM NORTH 2008
/ 2009
Report Printed 14 / 09
/ 2009 12 : 06 : 04 . 495
/ m Ltrs / Bed / D ay
/ WTE Trust Value 86 . 76
18 19 Current Estate Profile
2005 from the D'Oyly Carte
Adjusted Backlog / m Depreciation / m
at Brighton and Eastbourne
by BMS , CVS , CMM
and
issues , including public engagement
and St George's Mental Health
are maintained by the relevant
and the University Hospitals
holding on
the North
Bristol
Trust and
been subject to
a
carried out by
Efficiency Accreditation award 2006
improvements to current systems .
invested in the HEFCE
of this campaign
on carbon reduction
Carbon
Accreditation Award and
As recommended by
Keele's reaccreditation
of
the conclusions
the University achieved
The
in conjunction
in partnership
with
. 1
been
currently
working
programme ,
II . 1982 The
of the College's
Animal
Care
Royal Veterinary College
freehold with Norwich Primary
with Norwich Community Health &
CARLISLE AND WEST CUMBERLAND HOSPITALS
Charges / m Groupings : All Trusts
Clinical Research Faculty and possibleWelcome
development . These include : the Civic
development of the Talbot Village
donation from the Frank Parkinson
English Heritage on proposed demolition .
Estates WTE Staff per Total
2008 , successful application for
and Norwich University Hospital
and The Liverpool Womens
building on the Christie
. 4 As an
and St Thomas'
King's College
Hospital
St Thomas'
Norfolk & Norwich
the Gloucestershire
Hospitals
NHS
Foundation
abridge
UNIVERSITY
RWICH
London and Maudsley
to
The Christie
with
the Cumbria Partnership
NHS Trust , , Alder Hey


from the St Luke's Parochial
(MMU) University , the Central Manchester Healthcare leased from St George's
Norfolk and Norwich University of the Nottingham Universities active discussions with space leased from the University and which supplies both the Hospital
HOSPITALS Trust Name Trust Code - operational land is held INaM courses are taught out in the community in
is a great drain on
is a large acute teaching
is as follows : Task Appoint
is attached in Appendix B -
KWh % % Trust Value 4 . 80
I Tax Research Unit I
leased to the Guinness Housing
need to agree leases for
NHS Trust BSU Physiology) Physiology Duncan Trust UCD Building - RLBGH
are located at an
partnership with and of Trusts , the North Bristol the University Hospitals
carried out in 2000 .
FOI / GC / FEB / 2010
Director , form the Imperial College and to Trust ; St George's Healthcare
and Broadgreen University and James Paget Foundation Trust ; Lewisham Hospital
Clinical Sciences , Aintree In 2007 , Hammersmith NORTH CUMBRIA ACUTE North Cumbria University partnership with : Bromley Hospitals
Langford , Fenswood Farm 18
Barts and Royal Barts and with Barts & the the Barts and London
research are located on
shares with on within the St George's
- repairing leases from JennerWing basement to occupied space in rooms jointly with Vision' , prepared by the
to the east , Plymouth
total cost of occupying
Trust and St Mary's
University Hospitals Bristol (UHB)
NHS
operates at presence in a number of
compared to the level
of funding bids to theWelcome
of space by INaM at
trust
against its ERIC cluster group
Air con extra power E
Cancer Research UK , and . The
commercial space . In terms
Groundwork Hertfordshire to develop
Interserve . Requests exceeding the
its partners is to
King's College Hospital NHS
Octagon jointly commissioned the
South London and Maudsley
St Mary's NHS Trust
Barts Foundation for
Groundwork Hertfordshire will Trust will
Medical Research Council .
North Bristol NHS Trust
Royal Northern College
University . The Station Hospitals Bristol
and the
this will not be
to explore the availability
UCL . The purpose of
with current energy suppliers
each given scores from
in discussions with current
met . Developing a corporate
are
areas of LanesboroughWing and Ingleby
a centre of excellence
part of the New
as
Assessment of Energy Saving Opportunities
Assurance Framework . • Delivering an efficient
Audit , and Cumbria Rural Enterprise
auditor , and highlighted 10 potential
Award 2006 ; two RIBA regional
2 . 2 Sustainability Guidance
To ensure that agreed
Capital Programme Group Purpose
Board .
BREEAM Building Research Establishment Limited ;
Brenner Building) , the Charles Thackrah
BSU - RLBGH NHS Trust Edwards
budget , not to be repaid
buildings remain not only modern
Capital CRL 500 1 , 650
ResearcchClinical Resear h Facility
Research Facility Clinical School
Clinical
Code Trust Type Strategic Health
concerned . As a result of
continues to perform well in
contribution Wellcome / Faculty funds 38
Edwards Dental Hospital Liverpool Cancer
Engineering , building and groundwork costs
4 . 5 . The Current
Performance Indicators . This details 20 26
to 90 % of floor
Estate
estates performance . This will also
experts for the first ever
external properties surveyed . The high
Facilities 20 Academic Psychology 4
falls within Upper , Median or
farmland which is located to
Finished consultant episodes Capital charges
for the Pathology expansion Allocation
had a low value of
a capacity of 365
consistently achieved good scores
effective arrangements for the
prioritised what investment has
selected Laing O'Rourke as
has


trust
has
consistently achieved good scores
effective arrangements for the
prioritised what investment has
selected Laing O'Rourke as
undergone an analysis of
have
followed NHS guidance on
rebranded the site as
recently decanted their diagnostic
Histopathology and Cytology departments and
Hospital
; - of the INaM students
sites
across the South -
pending renegotiation of
specifically related to
Hospitals
– Conquest at Hastings , Eastbourne
where INaM
have dedicated
is allocated
identified total backlog maintenance costs
in
April 1994 . Our Strategy ,
conjunction with the University
delivering its key objectives .
the
first phase of
forefront of teaching
initiative in reducing carbon and
intranet and communicated to people
is
a
heavy user of
member of the
also going through a
as follows : Deputy CEO
associated with two - site
benchmarked against five high
currently raising funds for
engaged upon the following
essentially split between the
fundraising for this development .
generally categorised as one
keen to develop an
launched with the Queen
providing an inclusive environment ,
seen as a partner
serious about green issues
Law Committee Teaching I Bachelor
leasing this land to provide
Long Term Financial plan includes
Medium Term Capital Plan 000's
meets the NHS Firecode requirements
merged to form Imperial College
monitors itself against the Good
must establish key performance criteria
Name Trust Code Trust Type
nursing accommodation in an area
occupies approximately 600m2 of the
occupying 8 sites in and
of the PFI but is
on developing an action plan .
operates within to support its
or for purchase and redevelopment
over the next 5 - year
owned locations . The School of
Performance Indicator Report Printed 14 /
PI 215 108 86
167
88
Profile Unit Occupied Beds per
Project Manager and Cost Adviser
properties . • Increased recycling potential at
property is being consolidated into
purchased the Hospital Residences (24
remains in an extremely fortunate
Rent and rates for the
report , the University will aim
reported the following performance to
resources . Increased use of video
retains rights of passage over
Risk Management , health , safety and
RNL ACUTE - MEDIUM NORTH 2008 /
service laboratories
. CVS has recently
and the same
should withdraw from AH and
site
. f) To consolidate Central
and overall the space
in
Oswestry . Nursing and
Tooting . SouthWest London
the
compared to the level
of funding bids to theWelcome
of space by INaM at
other
/ 15 West Cumberland Hospital
University Hospital against the
out by The Energy Saving
partner organisations including the Westfield
per Claim Unit % No . / Bed
public capital . 24 The current
Services Barts and the London
site is operated by a
small amount at South Manchester
south of Reading ; Research Endowment
St Bartholomew's Hospital Medical College
terms of accommodation provided by
,
assessment In January 2005
the service changes outlined
.
(LMB) and biomedical research
Community Hospital for development
environmentally - aware business attitude
in the late 1970's
NHS over 1 million
of Healthcare Associated Infections
of the Current Position
pharmaceutical and radioactive waste
Strategic Health Authority area
the West Cumberland Hospital
. •
activities bring to bear
to its daily practices
. 5 Sustainable Environment Management
. 9 Energy (Gas & Electricity)
:
Family Planning Clinic) Comments
is to ensure that
" Invest to Save " Initiatives
10 10 10 100
across
an information resource
Renewable energy contracts
Safety Fire safety
across both sites . 10
action plan to optimise
and
between the University
key performance indicators
of clinical services
Borough Council has provided
by
Business Case approved
hospital sites operated
occupied
floor is
the estate
owned
fixed assets
which is
owned and maintained
provided
facilities currently
may be
considered . Planned Environmental Works
discharge of its duties
enable
are produced which
services that will
ensure
greater emphasis to
Programme Group Purpose
Figure 1 below) . Moreover
for
episodes Capital charges
most significant opportunity
of agreed leases
Rent and rates
The major challenge
the overall performance
Value Total income
High Level Performance Indicators
is in place between
of
260 , 000 out
an unrealistic picture
Campus An aspiration
on behalf
out
undertaken
provided as part
since the formation
statutory financial duties
the approximate boundary
the contractual obligation
the corporate priorities


since the formation
statutory financial duties
the approximate boundary
the contractual obligation
the corporate priorities
The Estates function
the functional suitability
the high costs
to the output
of
of significant investment in
of the PFI scheme
opportunity . To operate effectively
organisational growth and Maintaining
process , and in 2009
site in July 2010
Term Financial plan includes
critical backlog indicates
it became apparent
pool vehicles . • Ensuring
These scores demonstrate
This Strategy requires
to all visitors
that
that the environment which
that this building afforded
the future to support
the next 5 years
Director of Resources
investment is linked
is reported regularly
providing commercialisation support
trigger penalty payments
with a view
to
1 and illustrates
an assessment of
whether
will be available on
Embedded Space Agreement
for joint development
with
. 7 Waste Waste
and the culture
at both sites
the Estates function
within
the Cotman Centre . 6 . 5
been prepared and
being sought
raising exercise
by
the engineering scheme .
The Development
to lease accommodation at four
leased
transferred
to the Strawberry Hill
Unit / m / m % Unit KWh % %
Value 0 . 04 2 . 43
Value 14 . 75 0 . 38
Value 8 . 38 0 . 08
Value 86 . 76 150 . 86
Department Clinical School Medicine
G Synergy House 86
Cancer Research UK
the Wolfson Foundation
,
the
St James's Hospital (
Wellcome
WEST CUMBERLAND HOSPITALS Trust Name
the
with
Herts
with Hertfordshire
and Middlesex
Investigating partnership with Yorkshire
the public and Devon
Wildlife
Wildlife Trust and the Groundwork
entrance Remodel CSB library
re - modelling Library (shared
with
should withdraw from AH and
site
. f) To consolidate Central
and overall the space
in
Oswestry . Nursing and
Tooting , SouthWest London .
sites
in Stoke on Trent .
is currently underway . All
Some defining characteristics The University
space is significant , being 1 .
Standard
, identify the carbon footprint
. The University College is
and has signed up
August 2009 Business in
is an independent scheme
recognises the University's performance
status
in May 2008 and
was gained in 2008
strategic direction . Create standard approaches
Support Functions 6 . 5 . 1
Sustainability Review Sustainability Strategy and
takes its duty toward achieving
TBC E 25 Updating and
teaching rooms at Southlands Hospital
the
Cockcroft Institute Superstem Building
type and quantity of
University commissioned an Energy
to
contribute to the life
ensure our future Estates
establish a carbon emissions
locate there in support
make recommendations with a
monitor and improve the
produce a carbon management
progress its environmental strategy
provide
a Graduate Centre
care : in environments
seek opportunities to improve
Total
38 . 2 35 . 6
Capital Funding (m) Amount
turnover due to the calculation
Type Strategic Health Authority Reporting
UCD Building - RLBGH NHS Trust
under a lease agreement . Objectives
upon which risk - adjusted backlog
uses both national and regional
Value
0 .
00 N / A
04 2 . 43
1 . 85 9 . 93
14 . 75 0 . 38
175 . 89 Trust Value
201 . 83 75 . 60
23 . 16 Lower Quartile
3 . 15 4 . 76
30 . 87 Lower Quartile
388 . 33 Trust Value
4 .
80 Trust Value
97 2 . 48
56 . 85 19 . 11
60 . 91 0 . 62
711 . 51 0 . 23
8 . 38 0 . 08
86 . 76
150 . 86
Trust Value
Lower Quartile Median 2 .
which includes a number of
wide costs of occupancy . Energy
will
be
central to this
partnering NCH & C
constantly review its standing
continue to
find ways
pursue other
focus on the following
routinely and systematically review

APPENDIX II DATA SOURCES

Cite Ref	Description	Date	Access Date
AD/	Association of University Directors of Estates		
001	Estates Strategy Good Practice Guidance 2013	2013	09/09/2013
B1/	University of B1		
B1/01/	Internet		
B1/01/01/	Estates and Property		
001	Carbon Management Plan	26/03/12	09/09/2013
002	Asbestos Management Plan	1/06/10	09/09/2013
003	Sustainable Development Strategy 2013-2015	Blank	09/09/2013
004	Sustainable Development Action Plan 2013-15	20/3/13	09/09/2013
005	Environmental Policy 2013-15	01/03/2013	09/09/2013
006	Environmental Policy Action Plan 2013-15	20/03/2013	09/09/2013
B1/01/02/	Health and Safety		
001	Health and Safety Policy	01/02/2011	19/9/2013
002	Code of Practice on Asbestos Containing Materials (ACMs) for Schools and Departments	01/12/06	19/9/2013
003	Management of Contractors	Blank	19/9/2013
B1/01/03/	Governance, Equality and Diversity		
001	Equality and Diversity Policy	Blank	19/9/2013
002	Statutory and General Regulations	1/06/2012	25/09/2013
B1/01/04/	Sustainability		
001	Carbon Management Plan	Blank	20/09/2013
002	Cutting Carbon	Blank	20/09/2013
003	Biodiversity Action Plan	01/06/2009	20/09/2013
CE	Constructing Excellence		
CE/01/	Demonstration Projects		
001	Lecture Theatre S1	01/01/2009	09/09/2013
CH	North West Construction Hub		
CH/01/	Case Studies		
001	A. T. Building	01/01/2009	09/09/2013
EU/	OJEU Notices		
EU/01/	University of Birmingham Biomedical Innovation Hub		
001	Contract award notice	12/09/2013	18/09/2013
002	Tender Management	21/08/2013	17/09/2013
EU/02/	University of Bristol		
001	Prior Information Notice	21.6.2013	17/09/2013
002	Procontract	Blank	18/09/2013
EU/03/	University of Liverpool Framework		
001	Contract award notice	26/7/2013	17/09/2013
002	eSourcing	Blank	18/09/2013
EU/04/	University of Liverpool Framework		
001	Contract award notice	26/7/2013	17/09/2013

Cite Ref	Description	Date	Access Date
002	eSourcing	Blank	18/09/2013
EU/05/	University of Liverpool Energy Company Limited Combined Heating and Power Plant		
001	Contract award notice	14/6/2013	17/09/2013
002	Electronic Tendering Site	Blank	18/09/2013
EU/06/	University of Manchester National Graphene Institute		
001	Contract award notice	29.8.2013	17/09/2013
002	Electronic Tendering Site	Blank	17/09/2013
003	Procurement	Blank	17/09/2013
EU/07/	Manchester City Council		
001	Contract notice	28/8/2013	17/09/2013
EU/08/	University of Nottingham New Amenities Building		
001	Contract award notice	16/8/2013	17/09/2013
EU/09/	University College London New Student Centre - Enabling Works Package		
001	Contract notice	23/8/2013	17/09/2013
002	Electronic Tendering site	Blank	18/09/2013
EU/10/	University of Warwick WBS Phase 3b Construction Works		
001	Contract award notice	4/9/2013	17/09/2013
002	Electronic tendering site	Blank	18/09/13
EU/11/	University of Wolverhampton		
001	Contract award notice	16/8/2013	17/09/2013
002	Electronic tendering site	Blank	18/09/2013
H1/	University of H1.		
H1/01/	Internet		
H1/01/01/	Estates and Buildings		
101	Approved Contractors	20/01/10	09/09/2013
102	Estates Project Process	17/04/2007	10/09/2013
201	Pre-Start Standard Checklist	1/02/2010	10/09/2013
202	Client Satisfaction Survey (Project Evaluation Form)	10/02/2010	10/09/2013
203	Minor Works Request for Building and/or Supply of Furniture	01/05/2010	10/09/2013
301	Procurement Polices	10/02/2010	10/09/2013
401	Specification of Works and Materials	Blank	10/09/2013
501	Equal Opportunities and Race Relations Policy	1/08/04	19/09/2013
502	Equal Opportunities and Race Relations Questionnaire	1/02/10	19/09/2013
601	Code of Practice for Management of Asbestos in buildings	Blank	10/09/2013
602	Contractors and Sub-contractors Safety Rules and Conditions	Blank	10/09/2013
H1/01/02/	Health and Safety		
001	Health and Safety Policy	16/01/2012	10/09/2013
H1/01/03/	Governance, Equality and Diversity		
001	Equality and Diversity	01/07/2013	19/09/2013
H1/01/04/	Sustainability		

Cite Ref	Description	Date	Access Date
001	Sustainability Policy	15/03/2012	20/09/2013
002	Biodiversity Policy	27/03/2013	20/09/2013
003	Waste management	27/03/2013	20/09/2013
L1/	University of L1.		
L1/01/	Internet		
L1/01/01/	Facilities Management		
001	Code of Safe Working Practices for Contractors	01/10/2008	10/09/2013
002	External signage guidelines	01/01/2008	10/09/2013
003	Estates Strategy	Blank	10/09/2013
004	University Policy on Space Management	27/04/2011	10/09/2013
005	Project Electrical Briefing Document	20/08/2012	10/09/2013
006	Space referencing and room numbering procedure	Blank	10/09/2013
007	Permit to work	Blank	10/09/2013
008	RIBA work stages	Blank	10/09/2013
009	Standard Specification for Electrical Installation Work	Blank	10/09/2013
010	Facilities Management Asbestos Policy & Management Plan	01/02/12	10/09/2013
011	Internal Signage Guidelines	1/05/2008	10/09/2013
L1/01/02/	Health and Safety		
001	Policy on Health and Safety at Work	1/07/2013	19/09/2013
L1/01/03/	Governance, Equality and Diversity		
001	Diversity & Equality of Opportunity Policy	01/09/2011	19/09/2013
L1/01/04/	Sustainability		
001	Sustainability Strategy	Blank	19/09/2013
002	Carbon Management Plan 2010-2015	1/03/2011	19/09/2013
003	Environmental & Social Responsibility Policy	14/09/10	19/09/2013
004	Procurement Policy	Blank	19/09/2013
005	Sustainability Policy	Blank	19/09/2013
006	Waste management Policy	06/09/2007	19/09/2013
L1/02/	Intranet		
L1/02/00/	General		
001	Staff Digital University		20/09/2013
LA/	Local Authority		
001	Waste Storage and Collection Guidance for New Developments”	Blank	Link does not work
002	Waste Management Strategy Template	2013	24/04/2013
M1	Case Study 1		
M1/02/	Interview Data		
M1/02/OR/	Organization Viewpoint		
ADE	Associate Director of Estate	2012	Not applicable
MC1	Director; contractor, national organisation with an international parent company	2012	Not applicable

Cite Ref	Description	Date	Access Date
MC2	Director; contractor; small to medium enterprise	2012	Not applicable
PM1	Director; project manager; national consultancy	2012	Not applicable
M1/02/PR/	Project Viewpoint		
CM1	Construction manager; small to medium sized enterprise	2012	Not applicable
EPM1	Estates project manager	2012	Not applicable
SUB1	Director; sub-contractor; small to medium sized enterprise	2012	Not applicable
USR1	User; department representative receiving benefit of works	2012	Not applicable
M1/03/	Procedures Manual		
M1/03/01/	Projects		
001	Unit's Procedures Manual Flow Chart	2012	06/09/2012
002	Stage Approval documentation	2010	06/09/2012
M1/03/02/	Feasibility		
001	Directorate of Estates' Quality Manual Design Teams Guide	2009	06/09/2012
002	Professional Appointment Contract	2011	06/09/2012
003	Project Directory	2010	06/09/2012
004	Sub-consultants Collateral Warranty	2011	06/09/2012
005	Schedule of Services	2012	06/09/2012
M1/03/03/	Design		
001	Specification for the Design and Installation of Structured Cabling, Fibre Optic and Voice Cabling	2012	06/09/2012
002	Stage report (proforma)	2012	06/09/2012
003	Telecoms request	unknown	06/09/2012
M1/03/05/	Tender		
001	Framework Contractors List	2012	06/09/2012
002	Tender return labels	Unknown	06/09/2012
003	Construction Works Framework Contract Issue Letter	2012	06/09/2012
004	Construction works Framework Invitation to Quote Evaluation Matrix	2012	06/09/2012
005	Framework Operating Guidelines	2012	06/09/2012
006	Generic preliminaries	2011	06/09/2012
007	Invitation to Quote	2012	06/09/2012
008	Invitation to Quote Addendum letter	2011	06/09/2012
009	Invitation to Tender Named Sub-contractor	Unknown	06/09/2012
010	Letter advising unsuccessful tenders	2011	06/09/2012
011	Schedule of Tender Documents Named Sub-contractors	Unknown	06/09/2012
012	Letter advising unsuccessful tenders	2012	06/09/2012

Cite Ref	Description	Date	Access Date
013	Main contractor invitation to quote tender report	2012	06/09/2012
014	Unit Procedures Manual Desktop Systems instructions	Unknown	06/09/2012
015	Pro forma Schedule of Work and Form of Tender	2012	06/09/2012
016	Preliminaries intermediate building contract Joint Contracts Tribunal 2011	2011	06/09/2012
017	Preliminaries intermediate building contract with design Joint Contracts Tribunal 2011	2011	06/09/2012
018	Preliminaries minor works building contract with contractor's design Joint Contracts Tribunal 2011	2011	06/09/2012
019	Preliminaries minor works building contract Joint Contracts Tribunal 2011	2011	06/09/2012
020	Preliminaries Standard Building Contracts Without Quantities	2011	06/09/2012
021	Project Specific Preliminaries	2012	06/09/2012
M1/03/06/	Construction		
001	Change Control Pro forma	2012	06/09/2012
002	Contractors Non Performance	Unknown	06/09/2012
003	Variation Schedule	Unknown	06/09/2012
M1/03/08/	General		
001	Agenda for design team meeting	2012	06/09/2012
002	Agenda for prestart meeting	2012	06/09/2012
003	Standard Format for Site Progress Meeting	2009	06/09/2012
004	Not used		
005	List of approved technologies	2012	06/09/2012
006	Protocol for entry to students rooms	2012	06/09/2012
007	Terms and Conditions of Purchase Form of Contract Variations	Unknown	06/09/2012
008	Waste Minimisation and Management procedure	Unknown	06/09/2012
009	Waste Reporting Form	Unknown	06/09/2012
M1/04	Project		
M1/04/01/	Pre-contract		
001	Stage one tender document	January 2011	January 2011
002	Stage C Report	November 2010	November 2010
003	Tender Report	January 2011	January 2011
M1/04/02/	Contract		
001	Construction Contract Schedule include Preliminaries and Phase 1 Work	June 2011	June 2011
002	Construction Contract Appendix A Drawings Part 1 of 2	June 2011	June 2011
003	Construction Contract Appendix A Drawings Part 2 of 2	June 2011	June 2011

Cite Ref	Description	Date	Access Date
004	Construction Contract Appendix B Specification Part 1 of 2	June 2011	June 2011
005	Construction Contract Appendix B Specification Part 2 of 2	June 2011	June 2011
006	Construction Contract Appendix C Supporting Cost Information	June 2011	June 2011
007	Construction Contract Appendix D Health and Safety	June 2011	June 2011
008	Contract Form of Agreement and Attestation	June 2011	June 2011
M1/O4/03/	Post-contract		
001	Valuation	2012	Not applicable
002	Pre-start minutes	2011	Not applicable
003	Progress Team Minutes 8 Feb 2011	2011	Not applicable
004	Progress Team Minutes 15 Feb 2011	2011	Not applicable
M1/04A/	Other Projects		
M1/04A/01/	Pre-contract		
001	Tender Report Fitness Centre	29 June 2011	Not applicable
002	Tender Report Laboratory	April 2011	Not applicable
003	Tender Return Form Library	April 2011	Not applicable
M1/04A/02/	Contract		
001	Contract Document Fitness Centre Centre	June 2011	June 2011
002	Contract Document Fitness Centre	June 2011	June 2011
003	Contract Document Laboratory	July 2011	July 2011
004	Contract Document Laboratory	July 2011	July 2011
005	Contract Document Library	May 2011	May 2011
006	Contract Document Library	May 2011	May 2011
007	Contract Document Library	May 2011	May 2011
M1/05	Institutional Web Content		
M1/05/01/	General		
001	Annual Review 2010-11	2011	06/05/2013
002	Uni Mag	Unknown	23/04/2013
003	Code of Practice for Suppliers	22/12/2009	10/05/2013
004	Strategic Plan for the University of M1.	2012	24/04/2013
005	Contracts Governance Policy	2012	10/05/2013
006	Policy framework	2011	29/05/2013
M1/05/02/	Sustainability		
001	Construction Waste	Not available	23/04/2013
002	Energy Policy	2007	06/09/2012
003	Code of Practice Relating to Construction Waste	2011	23/04/2013

Cite Ref	Description	Date	Access Date
M1/05/03/	Equality and diversity		
001	Equality and Diversity Policy	2010	03/05/2013
002	Dignity at Work and Study Policy	2012	29/05/2013
003	Career Break Policy	2011	29/05/2013
004	HIV/AIDS Policy	2009	29/05/2013
005	Parental Leave Policy	2013	29/05/2013
M1/05/04/	Estates		
001	Estates Strategy 2010-2020	2010	03/05/2013
002	Directorate of Estates and Facilities	Unknown	10/05/2013
M1/05/05/	Human Resources		
001	Disciplinary	October 2011	21/06/13
002	Particulars of appointment, Project Quantity Surveyor	September 2012	27/06/13
M1/06/	The Directorate of Estates and Facilities Procedure and Information Manual		
M1/06/01/	Health and Safety		
001	Health & Safety Policy Statement	2009	23/04/2013
002	Guidance Notes for Staff	2008	23/04/2013
003	Health and Safety Passport for Unit Managers	2008	23/04/2013
004	Health and Safety Passport for Managers and Supervisors	2008	23/04/2013
005	Health and Safety Passport for Estates Staff	2008	23/04/2013
006	Health and Safety Services and Estates Interface	2006	23/04/2013
007	Fire Safety Interface	2006	23/04/2013
008	The Management of Water Systems and Control of Legionella.	2007	23/04/2013
009	Ladder & Scaffold Procedure	2006	23/04/2013
010	Health & Safety Training Policy	2006	23/04/2013
011	Roof Access Procedure	2006	23/04/2013
012	Contractor Selection and H&S Monitoring Procedure	2006	23/04/2013
014	Managing Health & Safety in Project Work	2006	23/04/2013
015	Working on Underground Services Procedure	2006	23/04/2013
016	Permit to Access & Permit to Work	2012	3 May 2013
017	Construction (Design and Management) Regulations 2007 Procedures	2013	3 May 2013
018	Construction (Design and Management) Regulations 2007 Appendices to Procedures	2013	3 May 2013
019	Asbestos Management Plan	2012	3 May 2013
020	Accessing and Working in Containment Laboratories Policy	2006	23/04/2013
021	Accessing and Working in Containment Laboratories Procedure	2006	23/04/2013
022	Work in Confined Spaces Policy	2006	23/04/2013
023	Work in Confined Spaces Procedure	2006	23/04/2013

Cite Ref	Description	Date	Access Date
024	The Management of Fire Alarm Systems	2011	3/05/2013
025	Asbestos Management Operational Procedure	2006	24/04/2013
026	Electrical Shutdown Procedure	2013	3/05/2013
M1/06/02/	Project Management		
001	Project Communication Procedure	2006	24/04/2013
002	Project Allocation and Project Monitoring Process	2006	5/05/2013
003	Project Procedures flowchart	Unknown	5/05/2013
004	Client Representative (University Project Manager) for Capital Projects	2012	5/05/2013
005	Code for Contractors on Campus	2010	5/05/2013
006	Standard Electrical Specification	2010	5/05/2013
007	Standard Lift Specification	2009	5/05/2013
008	Disabled Access Guidelines	2006	24/04/2013
M1/06/03/	General Management		
001	Signage Strategy	2007	24/04/2013
M1/06/04/	Pre-Qualification		
001	Pre-Qualification Questionnaire Professional Services Framework	2009	20/06/2009
MM/	MM University		
MM/01/	Internet		
MM/01/01/	Facilities		
001	Strategic Framework	Blank	10/9/2013
MM/01/02/	Health and Safety		
001	Health and Safety Procedures Major Projects	2006	10/9/2013
002	Contractors Code of Safe Practice	2003	10/9/2013
003	Control of Substances Hazardous to Health	2012	10/9/2013
004	Fire Safety Policy	Blank	10/9/2013
005	A University Guide to Practical Risk Assessment under the Management of Health and Safety at Work Regulations 1992	2006	10/9/2013
006	Guidance Notes for Waste Management	2006	10/9/2013
007	Health and Safety Policy	Blank	10/9/2013
008	Personal Protective Equipment	2007	10/9/2013
009	Policy for the Reporting and Investigation of Accidents and Incidents	Blank	10/9/2013
MM/01/03/	Governance, Equality and Diversity		
001	Capability Procedure	1/11/11	10/9/2013
002	Dignity at Work Policy	Blank	10/9/2013
003	Dignity at Work Procedure	Blank	10/9/2013
004	Disciplinary Procedure	Blank	10/9/2013
005	Fair treatment at Work	Blank	10/9/2013
006	Guidance on Cyber Bullying	Blank	10/9/2013
007	Staff grievance procedure	Blank	10/9/2013
101	Articles of Government	Blank	25/09/2013

Cite Ref	Description	Date	Access Date
MM/01/04/	Sustainability		
001	Environment strategy	22/09/2008	20/09/2013
002	Environment Policy	01/06/2010	20/09/2013
003	Carbon Management Plan	Blank	20/09/2013
004	6 Monthly Report on Carbon Management Plan	01/06/2011	20/09/2013
MM/02/	Internal Drive		
MM/02/01/	Procedures		
001	Building and Engineering Services Procedure and Information Manual	16/01/2009	01/09/2013
002	Procedure and informational manual Part B Standard Mechanical Engineering Services Specification	25/02/2010	01/09/2013
003	Procedure and informational manual Part C Standard Electrical Engineering Services Specification	28/03/2013	01/09/2013
004	Procedure and informational manual Part D Standard Environmental Controls Engineering Services Specification	05/07/2007	01/09/2013
005	Procedure and informational manual Part E Standard Lift Specification	28/01/2009	01/09/2013
006	Procedure and informational manual Part F Procedure for General Design of Specialist Installations and Equipment	1/03/2013	01/09/2013
007	Standard Project Handover Arrangements	1/05/11	01/09/2013
MM/03/	Projects		
MM/03/01/	Tender		
001	Tender Document		
002	Tender Document		
S1/	University of S1		
S1/01/	Internet		
S1/01/01/	Estates		
101	Service Level Agreements Monthly Performance Indicators	1/04/13	10/9/2013
102	Service Level Agreements Monthly Performance Indicators	1/05/13	10/9/2013
103	Service Level Agreements Monthly Performance Indicators	1/06/13	10/9/2013
104	Service Level Agreements Monthly Performance Indicators	1/7/13	10/9/2013
111	Estate management	1/7/12	10/9/2013
112	Estate management	1/3/12	10/9/2013
201	Carbon Management	Blank	12/09/13
202	Sustainable Construction Policy	1/10/11	12/09/13
203	Sustainable Procurement	Blank	20/09/2013
301	Environmental Sustainability Policy Statement	Blank	12/09/2013

Cite Ref	Description	Date	Access Date
S1/01/02/	Health and Safety		
001	Health and Safety policy 2012	1/05/12	19/09/13
002	Legionella Policy Nov 11 V2	1/11/11	19/09/13
S1/01/03/	Governance, Equality and Diversity		
001	Dignity at Work and Study Policy	16/09/2013	16/09/2013
002	Tendering Policy	10/09/2007	12/09/2013
003	Statutes	1/11/11	12/09/2013
004	The Campus Plan	1/04/2011	12/09/2013
005	Financial Regulations	Blank	25/09/2013
101	Benefits for Salford	Blank	12/09/2013
S1/01/04/	Sustainability		
	See above		
S1/02/	Intranet		
S1/02/01/	Estates and Property		
001	Variation order form	Blank	12/09/2013
002	Approval for works to commence	20/01/2005	12/09/2013
003	Certificate of making goods	Blank	12/09/2013
004	Certificate of non-completion	Blank	12/09/2013
005	Certificate of practical completion	Blank	12/09/2013
006	Consultants briefing sheet	Blank	12/09/2013
007	Contract administrators instruction	Blank	12/09/2013
008	Final account summary form	Blank	12/09/2013
009	Notification of Building and Engineering Works	Blank	12/09/2013
010	Hazard notification sheet	Blank	12/09/2013
011	Method statement appraisal form	Blank	12/09/2013
012	Project Communication Protocol	Blank	12/09/2013
013	Pre-tender health and safety plan pro-forma	Blank	12/09/2013
014	Post Contract Review Consultants	Blank	12/09/2013
015	Post completion appraisal of contractor	Blank	12/09/2013
016	Project Management System Pro-forma	Blank	12/09/2013
017	Approval to temporally disconnect or interrupt supply	Blank	12/09/2013
018	Proposed tender list	Blank	12/09/2013
S1/02/03/	Estates and Property Administration		
001	Building Directory	1/01/2006	12/09/2013
S1/02/05/	Purchasing		
001	Hand Dryers - Supply, Installation and Maintenance	Blank	22/09/2013
S1/04/	Interview		
S1/04/01/	Organisational View Point		
ADE2	Associate Director of Estates	2012	Not applicable
S2/	University of S2		
S2/01/	Internet		
S2/01/01/	Estates		
001	Briefing notes for electrical services	28/03/2011	16/09/13

Cite Ref	Description	Date	Access Date
002	Specification for Domestic Heating Installation	23/7/2010	16/09/13
003	Specification for Domestic Electrical Installation	23/7/2010	16/09/13
004	As built documentation	2/2/2006	16/09/13
005	Consulting Engineers and University Liaison Engineers	15/11/2012	16/09/13
006	Lift Hand Over Document	13/02/2006	16/09/13
007	Standard Lift Specification	19/07/2011	16/09/13
008	Specification for Washrooms	Blank	16/09/13
101	Asbestos Policy	15/08/05	16/09/13
102	Control of Contractors	26/02/2006	16/09/13
103	Health and Safety Policy	12/01/09	16/09/13
104	Health and Safety Manual for Estates and Facilities	14/01/2009	16/09/13
S2/01/02/	Health and Safety Policies and Procedures		
001	Contractor Health and Safety	Blank	20/09/2013
S2/01/03/	Governance, Equality and Diversity		
001	The Equality Plan Advancing Equality and Diversity for 2010-2013	Blank	20/09/13
S2/01/04/	Sustainability		
001	Biodiversity Plan	1/05/2012	20/09/13
002	Biodiversity Policy	1/06/2012	20/09/13
003	Sustainable Construction	17/10/2008	20/09/13
004	Guidance to Contractors	06/07/2007	20/09/13
S2/02/	Intranet		
S2/02/00	General		
001	Portal	Blank	20/09/13
UE/	English Universities		
001	Bournemouth University Estates Strategy 2010-19	01/04/2010	09/09/2013
002	City University Estates Strategy 2012-2017	01/03/2012	09/09/2013
003	Harper Adams University College Estates Strategy 2010-2020	01/10/2010	11/09/2013
004	Imperial College London Strategy 2010-14	Blank	12/09/2013
005	Institute of Education Estates Strategy 2005-2010	Blank	13/09/2013
006	King's College London 006-16 Strategic Plan	Blank	09/09/2013
007	Kingston University The University Plan 2005/06-2009/10	Blank	10/09/2013
008	Liverpool Hope University Estates Strategy 2012-2017	23/05/2012	10/09/2013
009	Loughborough University Strategic Plan 2006/7	Blank	09/09/2013
010	Norfolk and Norwich University Hospitals Estates Strategy 2010-15	Blank	09/09/2013

Cite Ref	Description	Date	Access Date
011	North Cumbria University Hospitals Estates Strategy 2009-14	01/09/2009	09/09/2013
012	Oxford Brookes University Towards a University Estates Strategy 2011-15	Blank	09/09/2013
013	Queen Mary Estates Strategy 2011-2020	Blank	09/09/2013
014	Royal College Music Estates Strategy 2010-2017	06/05/2010	09/09/2013
015	Royal Holloway Estates Strategy 2003	01/02/2003	09/09/2013
016	Royal Veterinary College Estates Strategy 2009-2018	Blank	09/09/2013
017	School of Oriental and African Studies Estates & Infrastructure Strategy 2010–2016	Blank	09/09/2013
018	Sheffield Hallam University Sheffield Hallam University Masterplan Estates Strategy	Blank	09/09/2013
019	Southampton Solent University Estate Strategy 2008-2013	Blank	09/09/2013
020	St Georges University London Estate Strategy 2010-2015	01/02/2010	09/09/2013
021	St Mary's University College, Twickenham Estate Strategy 2008-2012	Blank	09/09/2013
022	University College Falmouth Estate Strategy 2009-2014	01/03/2010	09/09/2013
023	University College Plymouth St Mark and St John Property Strategy 2008-18	31/03/2008	09/09/2013
024	University of Birmingham Estate Development framework	Blank	09/09/2013
025	University of Bradford Estates Strategy 2004/2014 Revision December 2009	Blank	09/09/2013
026	University of Brighton Estates Strategy 2006 - 2010	01/01/2006	09/09/2013
027	University of Bristol Estates Strategy 2013 - 2018	Blank	09/09/2013
028	University of Cambridge Estate Strategy 2007	Blank	09/09/2013
029	University of Durham Estates Strategy 2011 - 2020	Blank	09/09/2013
030	University of East Anglia Estate Development Strategy	01/08/2008	09/09/2013
031	University of Exeter 2015: Our vision, Our Strategy	Blank	09/09/2013
032	University of Gloucestershire Estates Strategy 2005 - 2011	Blank	09/09/2013
033	University of Hertfordshire 2020 Estates Vision	Blank	09/09/2013
034	University of Hull Estate Strategy	Blank	09/09/2013
035	University of Keele Estates Strategy 2011 - 2015	Blank	09/09/2013

Cite Ref	Description	Date	Access Date
036	University of Leeds Estates Strategy 2009	Blank	09/09/2013
037	University of Leicester The University's Estate Strategy to 2015	Blank	09/09/2013
038	University of Liverpool Estates Strategy 2011-2016	Blank	09/09/2013
039	University of Manchester Estates Strategy 2010-2020	Blank	09/09/2013
040	University of Nottingham Estates Strategy 2010-2020	Blank	09/09/2013
041	University of Reading Estates Strategy 2004-2013	10/03/2004	09/09/2013
042	University of Sheffield Estates Strategy 2010-2015	01/01/2011	09/09/2013
043	University of Surrey Estates Strategy 2009-2019	Blank	09/09/2013
044	University of York Estates Strategy 2011-2020	Blank	09/09/2013
UI/	International Universities Estate Strategies		
001	Napier University Estates Strategy 2006-2016		