Student Experience and the Design of Campus Outdoor Spaces

An Optimized Assessment and Comparative Cross-Case Analysis at Universities from two Leading Nations – England, UK & California, US

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IN THE NAME OF ALLAH

بسم الله الرحمن الرحيم

THE GRACIOUS, THE MERCIFUL

DECLARATION

I declare that this thesis has been composed solely by myself and that it has not been submitted, in whole or in part, in any previous application for a degree. Except where states otherwise by reference or acknowledgment, the work presented is entirely my own.

Name : Mohammed Mahmoud Mohammed Gabr

Date : 21/05/2021

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I hope this final product makes you all proud.

M.Gabr

DEDICATION

To

My Beloved Parents,

My Wife Alaa,

Mozy, Rozy, Mika & Rony

I have been indelibly impacted by your continuous love, support and encouragement. I love you so much

ABSTRACT

Universities are recently pressured to attracting more students and achieving higher rankings. Students' experience is found to be one of the keyways universities are differentiating themselves. Universities aim to offer diverse landscape settings to enhance the students' experience, from formal-studying to informal-break; from individual-private to social-multipurpose; from active-energetic to relaxing-quiet. In that respect, the spatial configurations of university campuses play a critical role in the future of their urban plan and evolving visions. Yet, research studies as well as recent investments and developments are generally more technology-directed buildings and neglecting to a degree the planning for advanced levels of social and physical outdoor activities. The aim of this study is therefore to support appraisal framework for experience-led design by forecasting and prioritizing key elements of campus physical design that stimulates the greatest experience to its users and redeems budgets. As such, the study makes a case for data-driven quantification to aid in fostering development change and facilitating tomorrow's innovative experiences for the desired interaction of student-staff-community, whilst realizing today's market realities to target more effective university investments. To successfully plan for and measure such change, the literature examines three multi-disciplinary levels from educational/social, urban, and investment perspectives in order to develop a unique integrative framework. Subsequently, a comparative analysis of two case studies in different contexts is presented to illustrate the value of the framework and the relevance of the context: UOS (University of Salford) in England, UK; and the SDSU (San Diego State University) in California, US. Nearly 78,000 students were observed, during 996 hours of observation, at 14 campuses from California and 5 campuses from England – with a total number of 56 on-campus outdoor spaces. The data is collected using both qualitative (descriptive & photographic) and quantitate (manual counts) observation methods for filling the variables of design and experience outcomes. Observation data sheets about the university characteristics, urban qualities of the campus, design features of the COS, the typologies, frequencies and durations of each COS use (design index of COS). A descriptive analysis was performed to determine the campus's quality (profiles of the campus). Both the mathematical ratings and correlation analysis were intensely testing the relationship between the variables of typologies of design, use and cost. Interviews are then used to validate this three-level approach with experts including academics, campus planners and university estates. This methodology helps to illustrate potential interactions and conflicts among the different actors who are crucial for the development of experience-based campus areas. At the end of this study, the key outcomes of implementing the integrative framework are provided with the resulting nexus to support judgment-based decisions among a variety of feasible design options in indicating the best institutional fit of student/user to space/design and university/investment.

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LIST OF ABBREVIATIONS

ABM	Activity-Based Measurement
AEx	Active Experience
ANP	Analytic Network Process
Avg	Average
AVM	Audio-Visual Material
AVO	Audio-Visual Object
CABE	Commission for Architecture and the Built Environment
CBA	Cost-benefit analyses
ES-COS	The rating Experience Score of the Campus Outdoor Space
CEA	Cost-effectiveness analysis
COS	Campus Outdoor/Open Spaces
COS-DI	COS – Design Index
CS	Case Study
Ds	Duration of stay
EBA	Enrolment Based Analysis
EIA	Economic impact analysis
FT ST	Full Time Students
Fu	Frequency of use
HE	Higher Education
HEPI–HEA	Student Academic Experience Survey
HESA	Higher Education Statistics Agency
IEx	Individual Experience
Iu	Intensity of use
GIS	Geographic Information System
Lit-1	Literature Part 1
MAVT	Multi-Attribute Value Theory
MCA	Multi-criteria analysis
NSS	National Student Survey
OMT	Options Matrix Tool
OEx	average or Overall Experience
PEx	Programmed Experience
SC#1	Sub-Case number 1
SCC	Salford City Council
SDO	Structured Direct Observations
SE	Student Experience
SEx	Social Experience
SNT	Social Network Theory
SROI	Social Returns on Investment
RS	Ranking Score
US	United States of America
LRDP	Long Range Development Plan - used commonly at University of California (UCLA, UCI, UCR).

Ch1. INTRODUCTION

"An institution's physical campus environment plays a key role in expressing - and helping to achieve - that institution's mission and strategic objectives."

(Kenney et al., 2005. Mission and place: Strengthening learning and community through campus design)

Considering the design of valuable places, still a great deal of issues to address the impacts of campus outdoor planning on students' experience (SE), achieving its outcomes as well as capturing its investment. The thesis starts with this introductory chapter that outlines the context and rational, then explains the research aim and objectives, limitations, and significance of the research, ending with a structural framework. The literature review of this study is addressed across three key disciplines: education (reviewing theories, benefits, impacts, and factors relevant to university status); space design (investigates different typologies and features of design and use); and investment (valuation methods and strategies as cost-benefit analysis) – see Appendix (01). The analysis is realized via collecting and testing data, theories, practices, costs, and design features of campus-based outdoor spaces that were established to promote positive and innovative experiences among the university students, community, and its partners. A general and detailed profile for each COS has been compared and analysed using both rating scores and statistical analysis to examine the nexus among their design, use, and value. The rating scores are based on observation and manual counts to collect the main features within each COS typology in a final Excel spreadsheet along with a strategic evaluation for each typology. Similarly, four statistical tests are used to examine the links and gaps among the three domains. These methods are finally validated by in-depth semi-structured interviews with experts from three disciplines (academia, campus design, university estates and real estate developers).

1.1 Research Context & Rationale: The Significance of Campus Outdoor Planning

Why outdoor spaces? Why re-planning? Why UK/US? Why now?

The urban location and centrality of universities to the nature and wellbeing of cities means that cities and countries can be expected to turn to their universities as part of strategies to respond to the new challenges and opportunities that global economic competition poses for urban regions'.

(Wiewel & Perry, 2015)

This section discusses a wide-ranging rational and the context arranged as with the order of this research. The three main categories of data relevant to campus design that contributes to enhancing the SE starts with an educational perspective addressing the status of universities (systems, ranks, student data sets, educational/co-curricular activities); followed by the space design and use (student-space interaction, urban and campus masterplan data sets, space features); and finally with the value-linked assessments (methods of assessments and tools, costs and benefits, costing models, ranking scores and statistical analysis). This classification is modified based on a combination of several theories that addresses the key factors likely to influence the process of SE. One key theory is by Beetham who defines the SE or the learning activity as 'a specific interaction of learner(s) with other(s) using specific tools and resources, orientated towards specific outcomes' *(Beetham, 2007).* She points the design for learning contains 'tasks' by the tutor and 'activities' performed by the learner – referring to three approaches. At the centre is activity: interaction of learner(s) with the environment feed and is fed by four planned outcomes supported by other people in specific roles, each has a relationship with another.

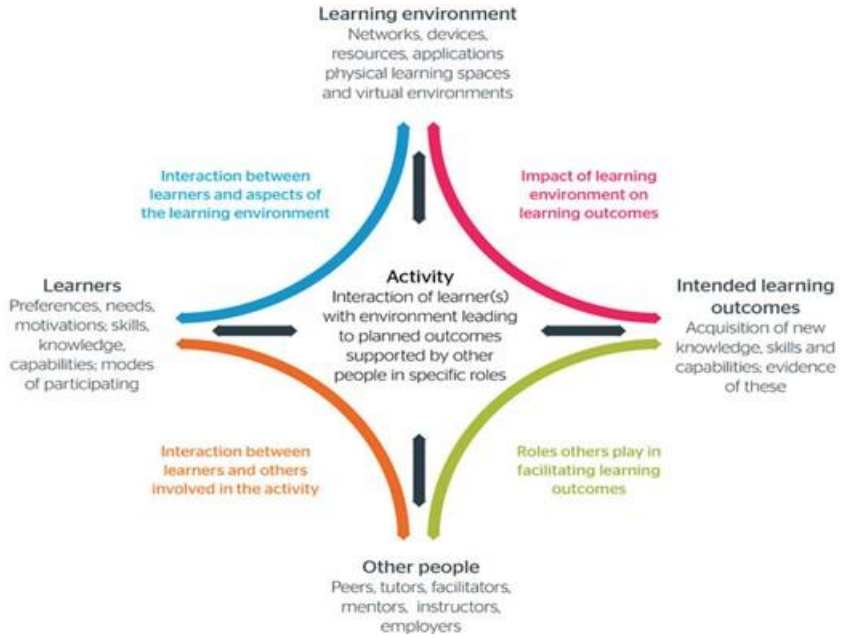

Figure 1: A model for a learning activity updated from the effective practice in a digital age and the Engestrom's activity theory (Beetham, 2007).

It must be noted here that this thesis has been established before the COVID 19 Pandemic, and hence, is not considered. Indeed, the ongoing COVID-19 crisis has underscored the critical importance of outdoor space in urban life, yet it created upheavals particularly in the social aspects *(Radanliev et al., 2020),* and might continue to transform lives and ways of living across the globe. As such, it is becoming increasingly clear that adaptations involving both physical and institutional infrastructure are warranted, and universities are at the forefront of these adaptive changes. Sasaki, Arup, ArchDaily, and other recent studies have discussed how COVID-19 might influence where and how people live, work or study, interact *(Kang et al., 2020; Megahed*

& Ghoneim, 2020; Radanliev et al., 2020; Sannigrahi, Pilla, Basu, Basu, & Molter, 2020), and move *(Zhou et al., 2020)*. They also addressed how these changing patterns might in turn shape future development routes *(Rosenkrantz, Schuurman, Bell, & Amram, 2021)*, and how they might use planning and design strategies to improve resilience in the face of future pandemics *(Bereitschaft & Scheller, 2020; E. Ellis, 2020; Franch-Pardo, Napoletano, Rosete-Verges, & Billa, 2020; Keenan, 2020; Rosenkrantz et al., 2021; Venter, Barton, Gundersen, Figari, & Nowell, 2020)*.

1.1.1 Investment in UK & US Universities

This first section of rational study shows the justification for stretching on the significance of university campuses in the UK and then US. At a time of rising student fees and tightening budgets across the university sector, an increasing emphasis is being placed on student satisfaction and the overall student experience in every and each part during the university education. Universities attract students, staff, significant business and investment to cities and all regions. Students are drawn to universities by desires thrilled and inspired by ranks and former reviews. For the students, the quality they cared about is bound to places where they live, study, play and move around from one activity to another. Besides, on-campus outdoor experiences are increasingly being recognized as an important benefit for end students. They have also added to the vitality and cultural diversity making universities much more important, interesting and exciting places. As such, universities are anchor institutions in their regions - they became major economic generators and are drivers of innovation and business development, enriching society and stimulating culture.

Universities are major contributors to the UK modern knowledge economy, transforming themselves in many ways over the past decade, including becoming more efficient and cost-effective *(Adler, 2001)*. The UK has achieved the top levels of students' satisfaction worldwide [1]. The UK government should invest in universities for more reasons such us *(Kelly, McNicoll, & White, 2014):* Universities transform people's lives through education and the wider impact of their research; Universities help students to develop the skills and knowledge employers need; UK university research is academically world-leading and more cost-effective than anywhere else in the world, providing the ideas and inventions on which future prosperity will be founded; Universities help to ensure that the UK remains competitive in the global market by supporting greater business innovation and export-led, knowledge-intensive growth as well as UK's share of global growth and influence, with a university sector that many other countries aspire to emulate.

In the absence of sustained investment, the UK's research base and the university sector will fall behind key competitors. As the 2015 spending review approaches, there remain a number of major financial challenges that must be overcome *(Decter, Bennett, & Leseure, 2007)*. Universities are scrambling to find enough classrooms, labs and offices, and demand is expected to grow in the next few decades. Over 2.3 million students are registered at UK higher education institutions, generating £73 billion of output in 2011 alone *(Yorke & Longden, 2004).* Yorke stated that these students come from all walks of life, and will experience the social, cultural, and economic benefits of HE and, in turn, translate those into benefits for society and the economy. Universities have worked strategically to make sure they spend every pound effectively and efficiently. In England, universities have consistently met efficiency targets set by the government. Between 2005 and 2011 they reported £1.38 billion of efficiencies against a cumulative target of £1.23 billion *(Yorke*

[1] *StudyPortals' Student Experience Exchange platform (www.STeXX.com)*

& Longden, 2004). There are no scholarships, but there are grants and other public funds available to applicants from less privileged backgrounds.

As for the US education system, is also taking the lead and considered the richest offering huge varieties compared to the rest of the world, according to an international ranking of OECD countries. HE in the US is also referred to as post-secondary education, third-stage, third-level, or tertiary education. It covers stages 5 to 8 on the International ISCED 2011 scale, with 5,999 postsecondary institutions that were eligible to award federal student aid[2]. These include approximately: 1,626 public universities, 1,687 private non-profit universities, 200 (private) liberal arts colleges, 1050 community colleges, and 985 for-profit colleges. Crucially there are no 'private' universities in the UK - all are public with the exceptions of 5 UK private universities. Among the US 4,360 HE institutions and 156 UK universities (see appendix-02), there are 76 British universities and 157 US universities feature in the 2020 QS global ranking, and 1,400 are regionally accredited four-year institutions eligible for inclusion in the US News ranking. Public universities are largely funded by federal Title IV funds, state governments, local taxes, tuition from students, and endowments. Private universities are usually financed from tuition fees, grants, and contributions from the providers of the private universities, third-party funds, donations/endowments, etc. In contrast to public universities, private universities may not be granted any payments in kind from the federal government.

According to a research by Georgetown University, on Education and Workforce, up to 65% of jobs will need at least some postsecondary degree, by 2020. That is a 6% rise over 2010's 59%. Average tuition is generally lower, in public universities, as compared to private universities. The US Department of Education uses different mechanisms (e.g. heightened cash monitoring) to monitor universities financial instability. In 2016, average estimated annual student costs (excluding books) were $16,757 at public institutions, $43,065 at private non-profit institutions, and $23,776 at private for-profit institutions[3].

Many research studies, ranking and study guides, as well as official government websites have compared the HE systems and institutions between US and UK *(Brock & Alexiadou, 2013; M. F. Green, 1997; Jöns & Hoyler, 2013; Mai, 2005; Marginson & Rhoades, 2002; Millot, 2015; Mowery, 2005; Pickard, 2014; Tight, 2012).* Among the differences, US systems are regulated by fewer rules than the British system (The UK system for example regulates the tuition fees). US universities/colleges also offer four-year programs with more wide-ranging courses (such as language, social sciences, etc.) culminating in a bachelor's degree, while most UK universities offer major-focused courses of only 3 years. The social scene is very different too. US has fraternities or sororities while all UK students are automatically members of the Students' Union (in some places called the Guild of Students) - which is primarily responsible for social activities - forming more loose association known as 'societies'. These all report to a national council called the National Union of Students (NUS). Another huge difference is the relative importance of sports to the US versus UK universities. The US is unique in its investment in highly competitive NCAA sports, particularly in American football and basketball, with universities owning stadiums that thousands of members of the public pay to crowd into. Sporting students are often given preferential treatment, with scholarships based on sporting prowess, and it appears that being a sportsman can compensate for poor academic performance.

Similar to the UK system, there are two major types of universities. Research (1) universities (or teaching universities in the UK) focus on undergraduate studies with more taught orientation. Research (2)

[2] *NCES 2019/20 Trend Generator*
[4] *NCES - Tuition costs of colleges and universities.*

universities (or research universities in the UK) offer both undergraduate and graduate-level education which are more research-oriented institutions.

1.1.2 Investment in Urban (Campus) Design and the Impacts on Students

The rewarding values from investment in urban design promote various qualities, civic pride, cultural activity as well as many other different economic values, which are proven in different ways worldwide. Literature also in the broad subject areas of campus planning and urban design provides background information about trends, typologies, and impacts of open spaces - see Appendix (01) for a list of key references. The campus planning literature is important for understanding and evoking serious investment ideas with practical actions for effective outdoor spaces in different university campuses. How much is too much? Have universities gone overboard in providing deluxe facilities? Or is it the case that universities are poorly providing students with what they have come to expect?

To test the value of the investment in high-quality urban design, the research published by the CABE[4] and the Office of the Deputy Prime Minister (ODPM) in 2001 have analysed three pairs of selected commercial developments in Birmingham, Nottingham, and Manchester. The research found that the better-designed schemes provided a range of economic, social and environmental benefits including high rental levels, low maintenance costs, enhanced regeneration and increased public support for the development *(Bell, Montarzino, & Travlou, 2007)*. Also, the Urban Green Nation report by CAPE found a clear disparity in quality and quantity of green open spaces in Britain relating to socioeconomic backgrounds and minor ethnic groups, with deprived areas having poorer access to green spaces and quality for facilities *(S. Cabe, 2005; Space, 2010).*

By contrast, a European survey of people's attitude towards town centres that recorded the highest incidences recorded as reasons for disliking centres within British towns. The distinguishing factors were the lack of car-free spaces to sit and relax, the low desire to participate in social activities and an unstimulating visual environment in the form of shop displays, public activity and street furniture *(Macmillan, 2006)*. Another study by the University of San Francisco in 1999 which looked at case studies across the US has reported that the preservation and improvement of open land for public use creates a net increase in municipal tax revenues by increasing land values in the surrounding neighbourhoods *(Matthew Carmona, 2001)*. A study carried out in Chicago in the early 1980s used a method known as "hedonic price estimation" to measure the impact of 'good' architecture on rental rates for commercial offices *(Matthew Carmona, 2001).* Using the receipt of architectural awards as the relevant measure of 'good' architecture it found that the rewarded buildings commanded a significant rental premium that could not be explained by other factors. A similar study was undertaken a decade later using over a hundred high-grade office buildings across the US. Again, the research found a positive correlation between design quality and market rents. In 1999 the Property Council of Australia established a scorecard for measuring the financial performance of commercial urban developments. By looking at 16 developments in detail they found evidence of a 'design dividend' which can be measured in financial terms *(Matthew Carmona, 2001)*.

A survey undertaken for the University of Nottingham of ten major companies that had invested in high-quality bespoke corporate buildings in the UK, including British Airways, Boots and Capital One, found that 'employee satisfaction' and 'functional quality' were the highest-rated drivers for investment *(Rouse, 2004).*

[4] *Commission for Architecture and the Built Environment (CABE) – the UK government's advisor on architecture, urban design, and public space*

82% of savers say it is important that managers apply the principles of responsible investment *(Hamilton, Jo, & Statman, 1993)*.

University campuses evoke the greater stage of students' education and their fascination with vision. Campus open spaces particularly are of great importance in students' lives, satisfaction and in the growth of universities and societies. It is important for students to have a space that makes it favourable for them to learn and do their best work, which may vary for different students, or at different times to address their changing needs. Similarly, physical inactivity is one pressing public health issue among universities campuses. As such, universities in particular, need to justify precisely and respond continuously investments in their spaces that are designed to support the university missions, increase satisfaction, and form better outcomes.

To understand the impact of the built environment on physical activity, the development of high-quality integration measures is essential. A key step is to better understand their functions, focusing on how SE is formed and affected by their daily on-campus life. Links should be identified between various elements of the physical/built environment and physical activity. This requires the development of high-quality integration measures: physical, institutional, social, and ecological. Whilst extensive attention had been directed to energy efficiency and ecological qualities in campus environments, student social and learning experience and their satisfaction remain central to the agenda for successful and sustainable universities, thus communities and cities. COS are just those areas in which such relationships can be formed and developed.

The links are being identified between various elements of the physical built environment and physical activity. Access to both indoor and outdoor types of learning expands the range of active learning opportunities available to stimulate imagination and creativity *(Dhanapal & Lim, 2013).* One of the many differences between such environments is that the outdoors permits for a greater range of movements for students to learn through play-based activities and via sensory learning experiences whereas the indoors are limited by the size of the classroom *(Falk & Blaylock, 2010)*. Similarly, *(Rickinson et al., 2004),* advocate that in the outdoors, 'learning objectives are achieved alongside enjoyable and challenging activities which cannot be performed in conventional settings.'

1.1.3 Incorporating Design and Assessing Investment in Experienced-Based Campus Spaces

What role does the campus urban environment play in students' experience?

The third part of rational illustrates with evidence of some critical perspectives for assessing and investing towards more student-oriented campus open spaces – as rich outdoor learning environment to support students' development (e.g. student engagement, performance, and skills). It is essential that universities assigned space with consideration for its cost, whether in terms of design, construction, extension, renovation, or maintenance and operations. But what is even more important, is to justify these costs for meeting students' expectations to develop a wide range of skills that are appropriate for future student recruitment and that students are enjoying and seeing the value in their undergraduate experience. Particularly in this revolutionizing digital world, as university campuses expand, increased site coverage can reduce open space and related outdoor values. Campus planners in order to realize the market demands need to prioritize aspects of urban development to provide the best possible creative campus environment for socializing, sharing ideas and real-life experiences. They need to know which improvements would yield

the greatest satisfaction are of the most important for attracting brighter students, communities. One way to achieve this is through enriching the campus outdoor context to maximize encounters among students, places, and practices.

While some studies of university students emphasize the importance of COS *(Bredow, 2006; Düzenli, Mumcu, Yılmaz, & Özbilen, 2012; Hami & Abdi, 2021; Peker & Ataöv, 2020; Steinberg, 2005; Y. Zhang, 2006),* some studies reveal that COS should be designed as with the university mission to enhance the students experience *(Düzenli et al., 2012; Fugazzotto, 2009; Painter et al., 2013; Peker & Ataöv, 2020; Scholl & Gulwadi, 2015).* Creating the conditions that foster student experience on campus has never been more important *(Thomas, 2012).* However, there is no scientific data about assessing and investing in experience-based design of COS. Historically, there has been little scholarly research about the physical development of student-oriented campus open spaces or the relationship of the campus to the student's outcomes. Campus space is composed of formal academic as well as informal non-academic sections (e.g. social facility zones where the social life takes place). In the past and continuing today, one of the universities biggest challenge is to develop a comprehensive approach that smooth the progress of a memorable and demanding user experience and to build critical relationships with their campuses. Key part of this approach is to invest heavily in new state-of-the-art student unions, dining halls, and other non-academic buildings to enrich the campus experience, boost enrolment, and stay competitive. These variety of designs and spaces serve the various students' needs and expectations (eat, socialize, network, study, relax, innovate, etc.). *C. C. Strange and Banning (2001a)* also proved that the diverse natural and built physical environments of the campus shape behaviour by permitting certain kinds of activities while limiting or making impossible other kinds. Additionally, some studies show that contemporary interactive student activities are often constrained by the lack of flexibility in current spaces *(Scholl & Gulwadi, 2015).* Yet these approaches will not be level-headed if not managed through cost-effective developments, as much as the desire to integrate the academic with the social.

Poor quality space is almost as bad as no space at all *(Gehl, 2011).* In the UK, the majority of university buildings have metrics in place to reduce and/or measure the energy consumption *(Gehl, 2011).* Most engineers and quality surveyors have a hard time keeping track of the quality, functionality, and usage of actual building spaces. However, serious limitations are on the types of outdoor spaces on campus and how that space is used. An institution's outdoor physical campus is rarely the object of careful assessment, and yet is an area of great expenses *(Sensbach, 1991).* Outdoor space management policies and governance are often weak, ineffective and highly political *(Keller, 1997).* At some institutions, the old model still holds space is managed at a department level, and departments cling tightly to "their" space, refusing to grant others access to space resources or even acknowledge they exist. As a result, institutions often believe they are short on space when in fact it's being poorly managed *(Gehl, 2011).*

However, the *S. Cabe (2005)* state that there is an improved student performance related to new learning spaces attributed to increased student motivation, facilitation of inspiration among students, and the provision of key facilities critical to course content. However, *Temple (2008)* argues that the empirical evidence for these claims is uncertain. In addition, he states that students give a low priority to spaces use, and that lecturer preparedness is far more important to students with respect to the quality of learning. Apart from the use of large-scale surveys, very little of the literature appears to focus upon the detailed, lived experience of students and lecturers and their reflections of working in new learning spaces.

Although this study is more focused on the design-based role, for successful campus planning, it needs to be precisely integrated and reviewed with the other professional disciplines: Owner and investor, academics, engineers, project and construction managers, financial advisors and marketing professionals, and the human capital of the collaborative team.

1.1.4 Key Terms

The key terms have been identified as central concepts of the research. There are often other key terms but the below are critically selected to represent the key concept/question. Defining the key terms works as a signal to define exactly the mentioned term, excluding other possible interpretations.

Campus design: Describes the physical campus layout and features that are observed when an individual is on a campus, which is designed by a Campus Architect or Planner *(E. L. Eckert, 2012).* In this study, campus design is very much concerned with the concept of active design and campus ecology. Active design is a dynamic approach to design with a primary focus on people, assisting students in learning to make healthy choices *(Kohl III & Cook, 2013).* Campus ecology is the conceptual framework focused on the dynamic relationship between students and the campus environment *(J. H. Banning & Bryner, 2001, p. 1).*

Community: The bond that exists between groups and individuals engaged in a common experience *(Cheng, 2004).* Communities are characterized by a shared purpose, commitment, shared responsibility, relationships, and a sense of inclusion *(Bogue, 2002).*

Experience Score of the Campus Open Spaces (ES-COS): Ranking Score (RS) is a personal estimate of value (calculated qualitative or quantitative). Value is the balance of benefits or sacrifices involved in a judgement of worth; either positive (creation) or negative (destruction) value. The best value or ranking score is the optimum mix of benefits and sacrifices in the view of the decision-maker. ES-COS is the measure of a space's ability to support student experience according to certain urban design criteria normalized to the size, scale, and value of the university. This approximate rate is a useful tool for gaining stakeholder eyes to compare the spatial and use values of each setting. The comparison can be realized in many ways, for example, to rank the setting at any point in time and assess the absolute change after development for the same setting. Another example is separately modifying one or more of the indicators of COS design features to examine what impact/s this would have on the campus experience overall ranking.

Higher Education (HE): One of the many terms - such as postsecondary education, advanced education, and post-compulsory education - used to describe education taken after the completion of compulsory education (high or secondary school). This research focusses on universities (Higher Education institutions) and on Full Time (FT) Undergraduate students (UG).

Landscaping: Landscaping may include planters (flowers, bushes, specimen trees, gardens, ornamental grasses), greenery, places for seating or congregation, artistic or architectural details, water features or other functional or decorative outdoor site fixtures *(R. P. Dober, 1992; C. C. Strange & Banning, 2001a).* Landscaping here addresses such elements of physical landscape design that positively affects the human behaviour and offer students an active and experiential education (e.g. as proved by Fredrick Law Olmstead, an influential landscape designer of early campuses).

Physical campus: The built/cultivated campus environment that include buildings, circulation/walkways, as well as the mentioned landscaping elements. *(C. Strange, 2000).*

Physical space: The physical space and its facilities, grounds, structures, and additional organizational elements together define the campus *(J. H. Banning & Bryner, 2001).* The study is focusing on the COS - also classified as green or open or external or public or urban spaces. These classifications have the same meaning, or in some cases point to different typologies/context. Green space for example, can refers to areas of campus that are reserved for grass fields or wooded areas *(R. P. Dober, 1992).*

Student Experience (SE): Ch2 covers the SE. In this study, SE is relevant to the overall student's practice; the interaction and satisfaction influenced on the student's unique journey during his/her study at the university campus. Enhancing or improving SE is the set of skills and positive practices that can be learned, developed, and utilized through the design of the campus outdoor physical environment. This include and describe the many benefits of human-nature interactions, students' awareness, involvement, creativity, etc. - as discussed in many studies *(Atchley, Strayer, & Atchley, 2012; R. Bender & Parman, 2005; Bratman, Hamilton, & Daily, 2012; Keniger, Gaston, Irvine, & Fuller, 2013).* Creativity for example is one phenomenon of SE whereby something new and somehow valuable is formed. The created item may be intangible (such as an idea or a scientific theory) or a physical object/application (e.g. invention or a painting) *(Mumford, 2003).* Student involvement: is another added SE defined as "the amount of psychological and physical energy that the student gain from his academic experience" *(Astin, 1999a).*

1.2 Problem Statement

The UK has its ancient universities Oxford, Cambridge, St Andrews, Glasgow, Aberdeen, Edinburgh all more than 400 years old, then it has its 19th and early 20th-century universities most of which are based on older colleges. The University of London, Imperial College, SOAS, London School of Economics, Durham, Manchester, Birmingham etc. In the 1960s there was an expansion again largely based on existing colleges, Strathclyde, Herriot Watt, Aston, spring to mind. With the rapidly transformed image of cities, there has been a further expansion in recent years with big metropolitan universities pulling power of their host cities. They have found it easier to attract students and to retain them after graduation. Therefore, universities campuses should be perfectly planned to both benefit from and contribute to this renewed civic energy. Unfortunately, with some notable exceptions, many university campuses do not present rise to this challenge. They neither provide a fitting setting for the University's world-class academic status nor do they integrate and enhance the life of the University with the life of the city, hence the lack or miss local or national investments *(Buxton, 2011; Coulson, Roberts, & Taylor, 2015; Gholipour, Al-Mulali, & Mohammed, 2014; Sensbach, 1991; Phil Waite, 2010).*

While universities are always finding ways to encourage students to invest more of their time in learning, research studies and observations on many campuses reveal that much of the education of students occurs outside when they are away from formal learning spaces *(Marcus & Wischemann, 1990).* As Marcus and Wischemann state, a great deal of the causal mobility, fun and study between classes takes place outdoors, when the weather permits. Students tend to benefit more effectively from alternative learning spaces rather than from formal learning areas. Hence, SE is of greater importance affecting student life and learning. Promoting and the awareness of high-quality outdoor design not only enhance the SE but also encourages higher levels of investments and vice-versa. Investing in design quality with a variety of spaces and a variety of site elements offer a range of enriching experiences, and seeking to foster real connections among societies locally and universally *(Scholl & Gulwadi, 2015).* Yet, in today's higher education environment, space is one pressing issue and is growing increasingly expensive. Growing competition and tight financial constraints mean institutions need to maximize every resource available *(Scholl & Gulwadi, 2015).* Both new construction and actions costs continue to rise and place an increasing burden on university budgets *(Scholl & Gulwadi, 2015).* Besides, in this revolutionizing digital world, as university campuses expand, increased site coverage can reduce open space and related outdoor values. Space costs even more money if it is not or miss-used, and underutilized spaces are also unsustainable. All taken together, campus planners in order to realize the market demands need to prioritize aspects of urban development to provide best possible creative campus environment for socializing, sharing ideas and real-life experiences. They need to know

which improvements would yield the greatest satisfaction are of the most important for attracting brighter students and communities, yet of greatest economic values. They not only seek the reproduction of adequate/flexible space that fulfils the major necessities of students; but for reinforcement services COS may facilitate that affect the students' moods, well-being, comfort, motivation and other psychological or physical states which all contributes to their learning progress. *(C. C. Strange & Banning, 2001a)* proved that the natural and built physical environments of the campus shape behaviour by permitting certain kinds of activities while limiting or making impossible for other kinds. Indeed, the spatial components of the outdoor spaces of campus settings can impact learning (directly and indirectly) through facilitating (or hindering) experience. COS planning also foster shared usage and connectivity from campus to the community; building to building; person to person *(Shanka & Taylor, 2005).* To ensure this planning is successful, remain flexible and adaptable over time, and provide the best value for money, new assessments is needed that gives clues to stakeholders to what might be successful on the campus to invest in *(Clemons, McKelfresh, & Banning, 2005; Hansen & Altman, 1976)*.

1.3 Aim & Objectives

This study examines the role of university campuses as instructive organizations that are having a significant impact on student life and learning experience. The main aim is to find and examine the relationship between the space design and user (learning and social) experience, considering the value or status of the university and campus development (investment potentials). In other words, it aims to measure the impacts of campus urban design to what extent of their use and suitability that inspire more and higher levels of student diverse experiences taking into account different university settings. This aim is not to provide one sort of COS, or one sort of assessment that meets the quality and quantity challenges of the next century. Rather, to identify and explore the nexuses/linkages between different space typologies and student preferences of use for the greatest potential impacts. Hence, at different stages of campus developments, assist in directing efficient investments, judge educational practices, relationships, methods, and outcomes. The study objectives are:

- To define university outdoor practices and outline models of social behaviour and informal learning.
- To describe and compare the various typologies and factors of campus design and the associated behaviour patterns.
- To capture with evidence the value (costs and benefits) of quality design.
- To grade/rate the matches/miss-matches and evaluate the links between the configurations of design, practice, and value (validated valuation and balanced correlations).
- To generate design recommendations linked with the range of stakeholders involved in the campus planning process and the value that theoretically accrues to each.

1.4 Research Questions

The main research question is:

How far does investing in campus design developments positively impacts the SE ?

Derived Sub-Questions are:
Q1 What is the highest and best outdoor use of campus-based universities today?

Q2 Which spaces - with what spatial improvements that would evoke the true experience of students?
Q3 How to ensure that the COS design developments meet the university vision, from an investment perspective (achieving best value for money) ?

1.5 Structure of the Research

The research starts with this introduction chapter, followed by three chapters of critical review of relevant literature. The three chapters define the theories and practice context that outline the design metrics for improved student experiences via three levels of integration: educational, spatial, and valuation. To some extent, the structure of literature in chapters 2, 3 & 4 blends with several studies which reported the three levels/strands as follows:

- Studies on effective teaching, instruction, learning (formal and informal), training and lecturing strategies relevant to outdoor activities *(Scheerens, 2002);*
- space effectiveness studies that examine organizational, managerial (and planning) characteristics of universities/schools; and,
- studies on investment-oriented valuation methods of university production and campus performance that look at resource input factors such as multi-criterion, expenditure per student, capital values, masterplan development costs, etc.

The three chapters of literature conclude with all-inclusive literature **(integrative theoretical framework 3/3)** to understand the nature of student outdoor experiences and their links/impacts to campus design and investment (added values). Chapter five presents the adopted methodology. The text describes the philosophical stance, the chosen methods, and techniques for methods a set of design features and closing with the **methodological outline model.** Chapter six and Chapter seven show the secondary and primary data analysis from cross-case analysis of different university campuses in the UK/England (4 cases) and US/California (17 cases) respectively. Chapter Eight comes to interpret and describe the significance of resulted ranking scores in light of the three disciplines and explaining the new insights that have emerged. The developed framework is validated through interviews of the three main stakeholders of the university campus: student (and community) as the user, the planner/designer as the developer of the space, and the university estates as the auditor, investor or main supporter. This framework is supported by the hope to support collaboration between campus planners, academy, and businesses to fine-tune an integrative framework. The resulting scores/grades can be developed for wider use - not only for university campuses but can be cultivated for the different city/urban spaces. The discussion is logically ordered to show patterns or themes among the data and alternative explanations of the results. The chapter also included research limitations as well as proposing relevant recommendations for further research or action. Figure 1 outlines the organizing model of the research structure.

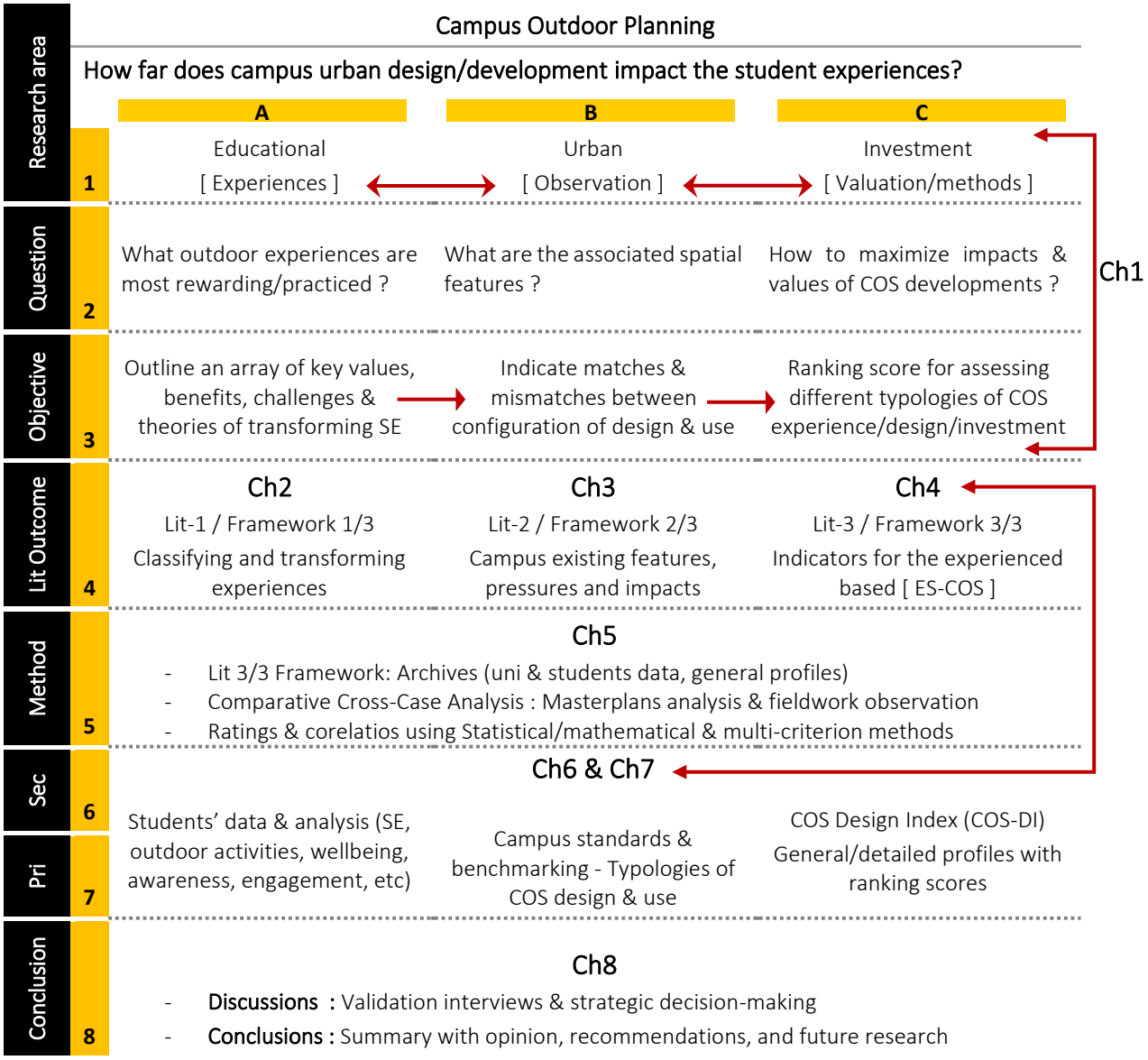

Figure 2: Research Structure / Framework (by the researcher)

Ch2. THE EDUCATIONAL PERSPECTIVE (LIT-1) : ENHANCING THE SE

"We didn't want to have a school that says; in this classroom you learn, out there you don't."

Troy D'Ambrosio, (2018) [5]

Research confirmed that the development of theoretical propositions and empirical analysis of literature and/or university documents prior to the comparative case study research process is recognized as beneficial to guiding the logic of research design, data collection and analysis techniques *(Bartlett & Vavrus, 2016; Krehl & Weck, 2020; Yin, 2013).* As such, in order to support the three multi-disciplinary nature of the conceptual framework (educational benefits, place-based, and value-assessed design), comprehensive literature is deemed and analysed searching for the added values and improved outcomes - of which student experience (learning, social and personal development) are crucial *(Beckers, Van der Voordt, & Dewulf, 2015; Fisher & Newton, 2014).*

This chapter explores the first level; reviewing contemporary theories and research that act as an enhanced paradigm shift in HE. As Pascarella concluded, "the impact of university is largely determined by individual effort and involvement in the academic, interpersonal, and extracurricular offerings on a campus" *(Pascarella & Terenzini, 2005) p. 602)*. Rethinking and involving the 'student outdoor experience' within the university database will allow more beneficial and validated student activities with evidence-based intervention. The relevant and most recently literature addressing these areas is discussed in this chapter and structured as follows:

- Defining the HE transitions in UK & US
- Defining and classifying the student outdoor experience
- Presenting the theoretical frameworks and indicators for improved SE (socio-cultural satisfaction, engagement, student success, innovation, etc.)

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2.1 Higher Education in Transition

Universities have two complementary but distinctive roles in relation to the shared body of knowledge: teaching and research *(Ringer, 1990; Robertson & Bond, 2001).* Teaching and research are generally defined in relation to theories of the discipline. Teaching involves educating (transferring knowledge), training (developing skills & methods) and should foster critical thinking (leading to innovation in both practice and theory). Research is of two kinds: exploring areas that have not previously been investigated, and documenting existing processes using current theories and discourses *(Araabi, 2016).* It is particularly important for institutions to invest in support of teaching and research facilities that are designed for the needs of diverse students *(Bailey, Badway, & Gumport, 2001).* To cover teaching and research, university is not solely about lectures and seminars. Innovations in how post-secondary education are delivered, financed, and recognized are driven by a range of actors, particularly from large public universities within the UK & the US, to elite many new and existing HE institutions worldwide.

To understand why these new approaches are emerging is by looking at what is driving them. Looking at the reasons or the barriers why formal and informal learning spaces of universities in which students learn have essentially remained static over centuries *(Jamieson, 2003).* While there are many factors influencing the direction of learning environments around the world, there are particularly noteworthy areas for influencing recent investments such as: reduced return on investments, reduced government spending, and mismatches of significant skills between graduates' abilities and jobs available *(Borgman et al., 2008).* The literature to date is underpinned by a lack of clarity and theorizing on linking those challenges with the gained benefits of SE on campus - among different institutions and regions.

A big part of the university experience is determined by the social life a student leads through joining in extracurricular activities and societies. Studies by The World Higher Education confirmed that universities are currently experiencing continued, revolutionary changes bringing into focus: curriculum and learning attitudes, student population and diversity, academic freedom, and student life. These are eventually improving and improved by the learning climate in and outside the classroom. Indeed, the campus climate is having greater impacts on SE. The next sections present some key information to understand how SE is defined and supported particularly within universities in the UK & US. This covers matters areas relevant to the student experience from the university perspective (e.g. university missions, standards, policies, fees and expenses, students completion and enrolments, new trends and approaches, outdoor learning, etc).

2.1.1 UK Perspective: University Systems and Rankings

Earning a baccalaureate degree is the most important rung in the economic ladder *(H. Bowen, 2018; W. G. Bowen & Shapiro, 2016; Boyer & Hechinger, 1981; Nunez, 1998; Pascarella & Terenzini, 2005; Trow, 1999).* Undergraduates need some form of higher levels of education to prepare them to live an economically self-sufficient life and to deal with the increasingly complex social, political, and cultural issues they will face *(Riley, Glasgow, Etheredge, & Abernethy, 2013)*. Enhancing students' experience has been explored to varying degrees in the literature, and there is wide agreement on their importance. This section considered many blogs from the Higher Education Academy website (recently called advance HE) as related to SE.

In the UK, an institution can only use the title "University" or "University College" if it has been granted by the Privy Council, under the terms of the Further and Higher Education Act 1992 *(Commission, 2002).* There are only five fully private universities: The University of Buckingham, BPP University, Regent's University

London, the University of Law and Arden University[6]. All other British universities are public which are partly publicly funded and regulated - i.e. the government regulates their tuition fees, student funding and student loans and commissions and regulates research assessments and teaching reviews. However, unlike in Continental European countries, the British government does not own universities' assets, and university staff are not civil servants. Government regulation arises as a condition of accepting funding from bodies such as HEFCE and any university can in principle choose to leave the HEFCE regulated system at any time *(Farrington & Palfreyman, 2012).* Since September 2012, government annual funding for teaching and research funding has been substantially reduced, and then in 2015 reduced again to around 15% of universities' income *(UK, 2016).*

Universities in the UK are regarded as the best and leading in the world, where many young ones learn from those centuries of experience, adhering to the quality mark of British HE. To maintain high standards, UK universities are regularly evaluated by The Quality Assurance Agency for Higher Education (QAA). Such a reputation makes British graduates in high demand in the international labour market[7]. The UK also enrols the second largest number of international students in the OECD area after the US. As a destination country, the UK accounts for 10% of the total international education market share in OECD and partner countries. It came with 71% of the country's students completing their undergraduate courses, in contrast with 49% in the US and just 31% in Australia. In 2011, Capital Expenditure on universities estates was £3.58 billion compared to around £1billion in 1997. Over the same period, the total number of UK students in Higher Education had risen by around 43% from 1.76 million in 1996/7 to just over 2.5 million in 2010/11.

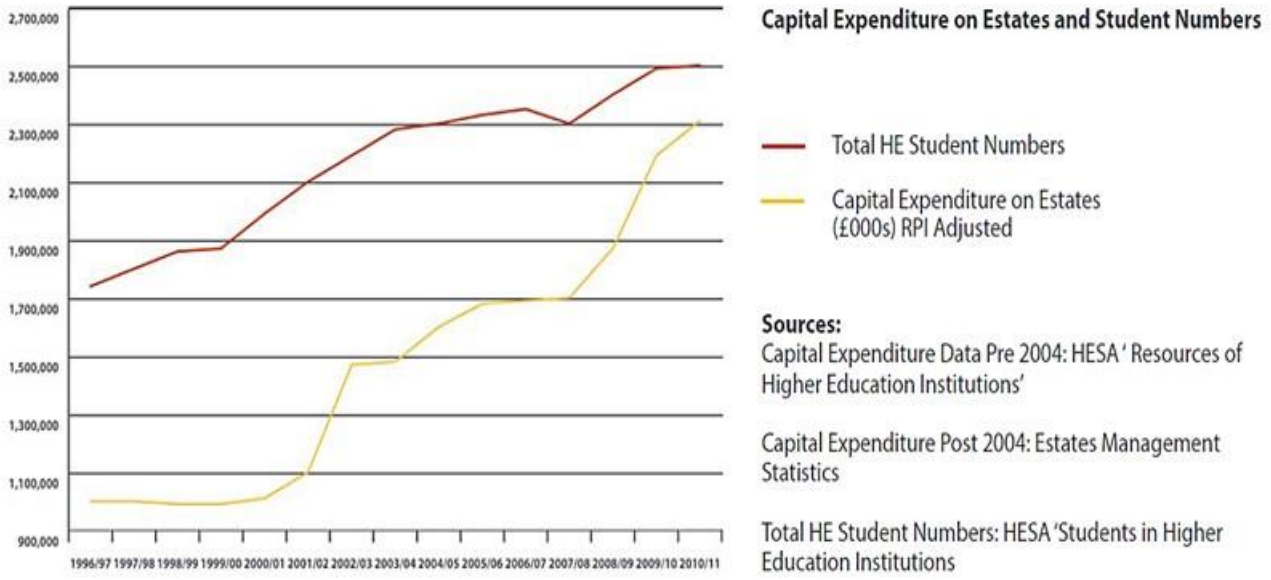


Figure 3: UK Capital Expenditure on Estates and Student Numbers *(Gholipour et al., 2014).*

As potential applicants increasingly use and sometimes rely on university rankings (especially international students), several ranking systems have been developed at national and global levels. Ranking systems compare performance analysis and benchmarking of universities to develop league tables collected from internationally accessible bibliometric/webometric databases and reputation surveys. The comparison is based on a range of criteria such as the student satisfaction, staff/student ratio, academic services and facilities expenditure per student, research quality, student destinations, etc. Several studies and weblinks have explained and compared the methodologies and criteria of the university ranking – locally and globally *(Aguillo, Bar-Ilan, Levene, & Ortega, 2010; Bains & Rani, 2021)*. On the UK, three reliable university rankings are

[6] *State -wise List of Private Universities as on 19.09.2017.*

[7] Top student *retention* in the 2019 OECD data.

published annually: 1) The Complete University Guide *(Jobbins, Kingston, Nunes, & Polding, 2008),* uses ten Z-scores criteria then weighted and summed to give a total score then transformed to a scale where top score is set at 1,000), 2) The Guardian (uses nine criteria each weighted between 5-15% based upon a sophisticated indexing methodology that tracks students from enrolment to graduation), and jointly by 3) The Times and The Sunday Times (in past The Daily Telegraph and Financial Times, now The Good University Guide) rank using eight criteria.

Much is made of these academic rankings, and increasingly students are judging institutions by the overall university experience. Additionally, for improving, measuring and reporting the SE indicators, instruments such as CCSSE and NSSE is one relatively inexpensive approach that can serve multiple purposes (assessment, accountability, improvement). Another two mostly used and reliable surveys: NSS which collects data in undergraduate student's satisfaction final year; and the UK Engagement Survey (UKES) typically takes place in a student's first or second year. UKES defines students' experience in the key areas of critical thinking; learning with others; interacting with staff; reflecting and connecting; course challenge; engagement with research; staff-student partnership; skills development (hard-soft skills); how students spend time[8]. The NSS scores were also improved to increasingly seek the links and gaps between SE and the universities' physical spaces. The Student Experience Survey (SES) is another key instrument in reporting the relative quality of student life in UK universities, highlighting those institutions who recognize the importance of the overall quality of student experience and the considerable impact it has on the university's performance[9] *(Bhardwa, 2017).*

Different methods and assessments used to identify areas of strength and to address areas for development are widely seen as an important way in making a difference in learning outcomes *(Tang & Logonnathan, 2016)*. Paul Black, one of the most influential proponents of assessment for learning in the UK, has stated that it has become 'a free brand name to attach to any practice' *(P. Black, Harrison, & Lee, 2003), p. 11).* Some institutions, such as the University of Sheffield are heavily investing in their students' unions to provide students with more to do in between studying. These include time-out workshops for students to practice mindfulness and manage their stress and anxiety and the building of a study hub.

Also organized by Advance HE, a one-day symposium hosted at York (Mar, 2018) seeks to better understand and evidence the complex interplay between three core features of learning space design, namely: Space, Technology and Pedagogy. Considering the range of learning activities and the variety of environments necessary for students to realize a richer educational experience, leads to the development of learning spaces that supports innovative (formal and informal) pedagogical approaches. To this end, the HEA's Flexible Learning symposium aims to bring together cutting-edge examples of effective and innovative efforts at learning space design.

Duncan Peberdy (consultant on learning spaces from Droitwich.net) indicated that many universities have been steadily transforming their campuses to make collaborative work easier, introducing new, diverse

[8] *The results of both surveys (NSS & UKES) offer a completely different perspective on questions of quality and true diagnostic potential and can provide feedback about how students are challenged and encouraged during their studies. They allow time to reflect on student responses and implement changes that will benefit students while they remain at the university.*

[9] *The on-going project, conducted by the Times Higher Education (THE), in its 11th year quizzed students' experience and ranked universities accordingly against 21 key attributes. More than 15,000 full-time undergraduates were asked how strongly they agreed that their university offered 21 different provisions about their student experience (e.g. good support and welfare, good social life) as well as the quality of their courses (e.g. good extracurricular activities), staff and facilities (e.g. good environment on campus / around university). The results - issued by THE Student Content Editor Seeta Bhardwa - were then combined to give an overall rating of a university's "societal experience"*

kinds of spaces, furniture, and technology. Peberdy has been working with Jisc, which supports universities' use of technology, to encourage institutions to rethink their use of space. He has been promoting the idea of the "sticky campus" – a place where students will want to stick around even if they have no lecture to go to. The idea was recommended by the Higher Education Policy Institute in this year's student academic experience report. This does not just involve making changes to academic spaces, he says [10] *(Støckert, VAN DER ZANDEN, & PEBERDY, 2019).* Similar to this symposium and published series, is another important preview in UK published by CABE 'Design with distinction, The value of good building design in HE' *(Britain, 2005).*

The Higher Education Design Forum (HEDQF) also commissioned research - supported by the Association of University Directors of Estates (AUDE) - to investigate students' views on the quality of the buildings, places and spaces that make up a university campus *(Neary et al., 2010).* One of the UK companies, OpinionPanel (now called YouthSight) was selected to provide a quantitative survey of 1,000 students' views on the quality of their estates [11]. OpinionPanel provided and processed online survey data and assisted HEDQF in the development of seven survey questions. The sample size had to be carefully calibrated to ensure that there was coverage of all universities across the UK and that there was no bias in favour of gender, year group, region, and type of university (119 Higher Education institutions representative of the UK from Russell Group, pre-1992/post 1992 universities, and other specialist institutions). Weighting is based on data supplied by the Higher Education Statistics Agency (HESA). Students were asked to select the top three priorities, from a pre-formed list of nine building and facilities related items, which would improve their university experience. As the figure shows, if funds could only be spent on university buildings and campus came at the top of the list (77%), improved sustainability (65%), and better outdoor spaces (59%) of respondents putting this in their top three choices.

Figure 4: Student priorities for spending on university buildings and facilities [12].

Despite all, although the UK historically played a major role in international student mobility, recently it appears to be losing ground increasingly. This is due to several reasons such as the unfavourable visa policy, its withdrawal from the EU, and the relatively high tuition fees. In 2017, the UK hosted only 2% more foreign students than it did in 2012. Its numbers have grown more slowly than those of any other of the top twenty host countries (see table below). Its long-held position as the leading destination after the US is threatened by Australia, which has experienced spectacular growth (up 53% between 2012 and 2017). The UK has the distinction of receiving eight times more internationally mobile students than it sends abroad [13].

[10] *Sticky Campus Roadshow Duncan Peberdy Supported by: Creating Learning Spaces*
[11] *Conducted 5-7 March 2012 by YouthSight*
[12] *Data obtained from EMS, HESA student return, HESA finance return and the websites of the respective universities.*
[13] UNESCO Institute for Statistics; Foreign / international students enrolled by OECD Stat

Table 1: Top 10 host countries for student mobility *(data from the UNESCO Institute for Statistics, 2020)*

Host country	International students hosted 2017	Change 2016-2017	Change 2012-2017
United States	984,898	+1%	+33%
United Kingdom	435,734	+1%	+2%
Australia	381,202	+14%	+53%
Germany	258,873	+6%	-
France	258,380	+5%	+15%
Russia	250,658	+3%	+44%
Canada	209,979	+11%	+55%
Japan	164,338	+15%	+9%
China	162,957	+14%	+76%
Turkey	108,076	+23%	+180%

2.1.2 US Perspective: University Systems and Rankings

Although there is much debate about rankings' interpretation, accuracy, and usefulness, rankings increase the university's visibility. For the international students, rankings and league tables often weigh into their decision-making process when considering return on investment. College and university rankings are rankings of US colleges and universities based on factors that vary depending on the ranking (e.g. measures of wealth, research excellence, selectivity, alumni success, etc.). Rankings are developed and published by a range of entities, including magazines, newspapers, websites, academics, and governments. Some ranking organizations specialize in global rankings, others in national or regional, and a few do both. In addition to ranking entire institutions, specific programs, departments, and schools are ranked. Quacquarelli Symonds (QS), Times Higher Education (THE) and Shanghai Ranking (the Academic Ranking of World Universities; ARWU) are considered the three most established and prominent global ranking bodies. The US most popular and influential set of rankings is published by is the US News and World Report. Other US most reliable sources and used in this study are the National Centre for Education Statistics (NCES) and the National Student Clearinghouse. Private universities out-perform public universities in ranking tables and enjoy a much stronger reputation academically. They usually exercise strict, very low acceptance rates to control the quality and quantity of students admitted to their programs. Their campuses and classes are smaller, and their programs are critically picked by the school administration as compared to their public-school counterparts. Public universities offer large enrolment opportunities and lower tuition fees while often still maintaining an excellent standard of education.

The universities aim to increase student satisfaction by making the campus a place where learners want to spend time. If students feel compelled to stay, they can contribute positively to campus culture and have a fulfilling experience that prepares them for professional success. Meeting the student's satisfaction leads to a healthy state of mind, higher academic performance, and more positive outcomes after graduation. Current students and alumni provide annually their feedback about how they think of their institution, their life on- and off-campus, and their satisfaction on several things such as the campus facilities, extracurricular activities, financial provision, etc. Similar to UK, an essential part of US rankings is about expressing students' opinions and meeting their satisfaction and expectations. These are seen in many national surveys and studies such as the National Survey of Student Engagement (NSSE) data and the College Student Report (CSR) Survey, which assess and compares the student satisfaction, engagement, and experience *(Korobova & Starobin, 2015).*

Table 2: Classification of US and California universities

Classifications by Location (Wiewel, W. 2005)

Over 3,900 university campuses in the United States

- urban core 51%
- Rural 25%
- Suburban areas 24%

Classifications by type (Roger L. Geiger)

7 Colonial (before American Rev.)

Harvard, MA (sv#16)
Yale, CO; Pennsylvania, PH; Princeton, NJ; Columbia, NY; Brown, RI; Dartmouth, NH

5 State universities

Michigan, Wisconsin, Minnesota, Illinois, **California**

University of California system

UC Berkeley (sv#1)
UC LA (sv#2)
UC SD (sv#5)
UC San Francisco
UC Santa Barbara
UC Irvine
UC Davis
UC Santa Cruz
UC Riverside
UC Merced
UC, Hastings College of the Law

California State University system

CSUB / CSUCI / Chico State / SUDH / CSUEB / Fresno State CSUF / HSU / Long Beach State / CSULA / Cal Maritime, The Academy / CSUMB / CSUN / Cal Poly Pomona / Sacramento State / CSUSB / **SDSU (cs#1)** / SFSU / SJSU **(sv#13)** Cal Poly San Luis Obispo / CSUSM / SSU / Stan State

5 Private Research

MIT & **Stanford (sv#4)** & Cornell & Johns Hopkins & Chicago

University Southern California (sv#3)
University of San Diego (sv#6)
Pomona College (sv#7)
University of San Francisco (sv#8)
Santa Clara University (sv#12)
Caltech (sv#14)
Northeastern University (sv#15)
Chapman University
And 100+ private universities and colleges in California

Classifications by type (Carnegie and US news)

Carnegie category	US News category	Total no. of universities
A) Doctoral Universities (highest research activity / R1-115), B) Doctoral Universities (higher research activity / R2-107), C) Doctoral Universities (moderate research activity / R3-113)	National Universities	311 (114 private; 190 public; 7 for profit)
A) Master's Colleges and Universities (larger programs / M1-393), B) Master's Colleges and Universities (medium programs / M2-207), C) Master's Colleges and Universities (smaller programs / M3-141)	Regional Universities: North, South, Midwest and West	659 (388 private; 259 public; 12 for profit)
A) Baccalaureate Colleges - Arts and Sciences Focus (259)	National Liberal Arts Colleges	233 (213 private; 20 public)
B) Baccalaureate Colleges - Diverse Fields (324); C) Baccalaureate/Associate's Colleges: Associate's Dominant (149); D) Baccalaureate/Associate's Colleges: Mixed Baccalaureate/Associate's (259)	Regional Colleges: North, South, Midwest and West	324 (193 private; 116 public; 15 for profit)

2.2 Defining Student Outdoor Experiences

The Student Experience may sound like a vague concept to define and develop. In fact, the best predictor of university grades is the combination of an individual student's academic preparation, high grades, aspirations, and motivation. Once students start university, however, another key factor in their success - broadly defined - is SE or the extent to which they take part in campus effective practices *(Kur, DePorres, & Westrup, 2008).* The idea of the SE as an identifiable set of interconnected activities to be institutionally managed is a relatively new concept *(Temple, Callender, Grove, & Kersh, 2014).* User experience is a term used to describe the overall student's interaction and satisfaction a user has when using a space *(Temple et al., 2014).* It is the characterization of what a user feels while using any space.

"Faculty who show regards for their students' unique interests and talents are likely to facilitate student growth and development in every sphere - academic, social, personal, and vocational" *(Sorcinelli, 1991, p. 21).* Also Boud and others indicated that: experience is the central consideration of all learning, and that learning can only occur if the experience of the learner is engaged, at least at some level" *(Boud, Cohen, & Walker, 1993).* Journal articles on the role of students in campus planning tend to be tagged with keywords other than SE (such as participation, interaction, collaboration, engagement, involvement, succuss, etc.) suggesting part of or sometimes a different orientation *(Lizzio & Wilson, 2009).* The study is, however, focusing on what the literature offers in terms of the relationships between experience and space particularly within the university campus.

Several studies confirmed that first-generation students' expectations about the campus environment were less matching with what they actually experienced *(J. M. Braxton, Vesper, & Hossler, 1995; G. Kuh, Gonyea, & Williams, 2005).* They also proved that most first-year students say they will engage in more academic and other educationally purposeful activities more frequently than they reported doing later. They might also underestimate what the campus environment will be like. Institutions that foster student success provide stimulating experiences that encourage them to devote more time and effort to their learning and help them develop good study habits *(G. D. Kuh, 2005; Volkwein, Valle, Parmley, Blose, & Zhou, 2000).* Supporting and enhancing the SE throughout the student lifecycle (from the first contact through to becoming alumni) rises the success in HE today for both the student and the institution.

2.3 Theories and Classifications of Outdoor Experiences

On the whole, the student experience represents two key areas:

- The amount of time and effort students spent in their campus to acquire social practices and other educationally purposeful activities, as specified "Learning is strongly influenced by the degree to which an individual is invested in the learning process" *(Alexander and Murphy 1994, p. 12).*
- The way the university arranges its facilities/resources, organizes the curriculum and learning opportunities, and support services to provoke students to participate in activities that lead to the SE (desired outcomes as persistence, satisfaction, learning & graduation) *(G. D. Kuh, Kinzie, Schuh, & Whitt, 2011).*

Within both areas, the study appraises three main dimensions:

- Students' (end users') needs, perception, and attitude towards the COS.
- Nature of activities which occur in these COS.

- The associated spatial structure of the COS and its relation to the occurring activities (next chapter).

2.3.1 Meeting Students Needs/Expectations and Transforming Experiences

Universities develop and implement strategies to maintain and enhance their competitiveness based on a set of unique characteristics. These characteristics are linked and developed together with the relevant students' needs/experiences. An appreciation of student's needs, as a principle of responsive campus, is part of the social dimension which raises important issues concerned with people's values and choices, and interventions of urban development *(Matthew Carmona, 2010b)*. According to Maslow's pyramid of human needs *(McLeod, 2007)* include: 1) Physiological needs (food, warmth & survival); 2) Safety & security needs; 3) Affiliation needs (belonging & acceptance); 4) Esteem need (by feeling valued by others through a person's status); 5) Self-actualization needs (through artistic expression and fulfilment). Designers & planners should cater for those basic needs "human factors" - the social, cultural & ideological dimensions.

Maintaining a persistent focus on SE reveals high expectations from and for all students and is a central feature of institutions with a student success-oriented educational philosophy. A key element of this approach is adopting a **Talent Development Philosophy**[14] throughout the institution. In addition to recognizing that every student can learn under the right conditions, the talent development view requires that the institution organize its resources and create conditions for teaching and learning based on educationally effective practices. The talent development view also recognizes the need to embrace and address students' diverse talents and needs *(Chickering & Gamson, 1987; Subotnik & Arnold, 1995).* It is especially efficient when pedagogical practices acknowledge and honour the experiences of adult learners and view the talents and skills students bring to the university as "assets" versus deficiencies. Such a view holds that because each student has a unique perspective on the world, and all students enrich the learning of others as well as their own through sharing their knowledge and experience *(P. A. Alexander & Murphy, 1998).* Because faculty members often misunderstand, ignore, or devalue the talents of students from diverse backgrounds, these learning style differences can be viewed as academic deficiencies in need of remediation *(Pounds, 1987).* For example, *Treisman (1992)* discovered that environmental disorientation and problem-solving talents were a problem for students who failed a course not the lack of motivation as was assumed initially by their instructors.

The way the human reacts with the spatial elements is linked to his behaviour (natural, psychological & sociological composition). Understanding user's needs is a cornerstone for any well-designed open space. A design that attracts people, facilitates their activities, and encourages them to spend more time when undertaking these activities *(Francis, 2003).* Appealing campus design provides key prompts to visiting students and community members *(Phil Waite, 2010),* and has implications for establishing an inclusive environment *(C. C. Strange & Banning, 2001b).* After aiming to meet the basic needs, talents, and expectations *(T. E. Miller, Bender, & Schuh, 2005)*, comes the typologies/patterns of outdoor space use.

2.3.2 The Nature and Classifications of Activities : New Perspectives of the SE

In addition to attending lectures, working in labs, and participating in other formal educational activities, experience outside of the classroom should enhance personal development and helps facilitate meaningful connections with faculty, peers, and the university. Many references revealed that 'group discussion'

[14] *TDP can be defined as the most effective way to manage talent to achieve the university strategy. By definition, it says that the more students are managed in this way, the more successful the university will be.*

particularly has made a significant contribution to SE on campus open spaces. Varied involvement opportunities and motivating factors stimulate students for example to form relationships within the external space and contribute to the quality of student life as well as creating a connection to the campus. Such gained experiences involves all various interaction with the human and environment, leading to a strong campus community. SE, however, face many challenges while trying to respond to the varying needs of different individuals in a community. They require feelings and sense-making as well as activity *(see (Harper & Quaye, 2009)).*

This section list and classifies the wide ranges of out-of-class environments that are utilized to foster different experiences. As with the findings of the *Peker (2010)* content analysis in his PhD research showed that the most frequently mentioned typologies of use within campus open spaces are in order of: 1) group discussion, 2) individual studying, 3) tutoring/consulting each other, 4) relaxing, 5) coincidental meetings, 6) chatting, 7) sharing current daily issues, 8) observing surrounding areas. In practice, although it is difficult to respond appropriately to students' motivational experiences and preferred modes of interaction *(Hofstein & Rosenfeld, 1996),* the use of patterns may be applied in combination to create different kinds of space with different effects on behaviour. The nature of these relationships and the extent to which they support students in their campus-based activities or present obstacles to academic progress can vary along multiple dimensions. *Berger and Milem (1999)* and *Skahill (2002)* found that the students most likely to persist are those whose norms and behaviour are already matching with dominant patterns on campus.

As mentioned in the key terms section, the study focus on the campus experience in terms of the student journey, which is derived from the following classification *(Temple, Callender, Grove, & Kersh, 2016):*

- Application experience: covering the interactions between potential students and the institution, up to the point of arrival.
- Academic experience: students' interactions with the institution associated with their studies.
- Campus experience: student life not directly connected with the study, which may include activities away from the actual campus.
- Graduate experience: institution's role in assisting student transition to employment/further study.

Drawing on *Bloom (1956),* there is another classification stating three basic dimensions to SE:

- Behavioural experiences: students typically comply with behavioural norms, such as attendance and involvement. They would demonstrate their absence or any negative behaviour *(Ghorbanzadeh, 2019).*
- Emotional experiences: students would experience negative or positive reactions such as interest, enjoyment, or a sense of belonging.
- Cognitive experiences: invested in students learning would value the challenge. Student cognitive growth seems to be influenced by a variety of experiences and conditions on a campus, particularly when out-of-class climates and experiences complement and encourage students to integrate what they learn in class with their lives outside (G. D. Kuh, 1995).

Each of these dimensions can have both a 'positive' and a 'negative' pole, each of which represents a form of experience, separated from inexperience (lack of involvement, withdrawal, or apathy). The terms 'positive' and 'negative' are used here to denote value or reflect if there is productivity (e.g. behaviour that challenges, confronts or rejects can be disruptive, delaying, or obstructive, thus seen to be counterproductive). Thus, students can experience either positively or negatively along the behavioural, emotional, or cognitive dimensions.

Similarly, *G. D. Kuh (1993)* has listed a broader classification with four outcome domains of student experiences associated with university attendance *(Ghorbanzadeh, 2019)*:

- Cognitive complexity. Cognitive skills including reflective thought, critical thinking (e.g., ability to summarize information accurately and perceiving logical coherence and visible themes and patterns across different sources of information), quantitative reasoning, and intellectual flexibility (i.e., openness to new ideas and different points of view).
- Knowledge acquisition and application. Understanding knowledge from a range of disciplines and physical, geographic, economic, political, religious, and cultural realities, and the ability to relate knowledge to daily life including using information presented in one class in other classes or other areas of life.
- Humanitarianism. An understanding and appreciation of human differences including increased sensitivity to the needs of others. Interpersonal and intrapersonal competence: a coherent, integrated constellation of personal attributes (e.g., identity, self-esteem, confidence, integrity, appreciation for the aesthetic and spiritual qualities of life and the natural world, sense of civic responsibility) and skills (e.g., how to work with people different from oneself).
- Practical competence. Skills reflecting an enhanced capacity to manage one's personal affairs (e.g., time management, decision making), economically self-sufficient, vocationally competent).

Classifications according to Beneficiaries: This classification is supported by several studies with minor differences. The broadest classification of the campus environment - according to *(Conyne & Clack, 1981)* - includes the physical component, a social component, an institutional component and an "ecological-climate dimension" derived from the interaction of the other three. As such, in terms of the beneficiaries, the value of actively involving students on university grounds is generally described as:

- Functional. How does it benefit the university?
- Developmental. How does it benefit the student?
- Social. How does it benefit society?
- Ecological. Integration of all benefiting the environment.

2.4 Indicators for Improved SE: Measuring Expectations & Outcomes

The indicators for attracting and retaining the SE must be defined. Below are grouped set of indicators with descriptions of improved experiences (e.g. social interaction, awareness, creativity, enterprise, a sense of belonging, student success, enrich experiences of planned and chance innovations, etc.). These can be generally categorized within: Learning Experience (from studying and other co-curricular activities); Social Experience (from social gatherings/interactions); Cultural Experience (e.g. participation in student clubs and organizations); Environmental Experience (for the benefits of the natural environment). These indicators are important to show how significant and successful COS in being appealing and multifunctional, distinguished by a concentration of stimulating and promoting a combination of diverse skills.

2.4.1 Sense of Campus/Belonging

sense of campus in this study is defined as - adapted from *(Scholl & Gulwadi, 2015)* - the student perception of the surrounding campus landscape and the opportunities it offers for intentional and unintentional learning or recreational activity. It indicates the degree to which a student feels comfortable in the university environment. *Chapman (2006)* calls 'sense of place' as a personal phenomenon, having as much to do with the individual's own perceptions & practices as with the physical environment. A handful of elements of SE have emerged recently representing new dimensions (variations on common indicators, an

appreciation for human diversity, beliefs and values, a well-developed sense of identity *(Colleges, 2002; B. Magolda, 2007; M. B. B. Magolda, 2004).* This factor may affect the students' notions of institutional quality, their willingness to attend the institution again, and overall satisfaction; which are all precursors of educational attainment and other dimensions of student success *(Hossler, Schmit, & Vesper, 1999; Strauss & Volkwein, 2002)*. *Astin (1997)* proposed that satisfaction should be thought of as an intermediate outcome of university. Sense of campus can be approached along with both environments: physical/living and virtual environment. This study focusses on the living aspects. Thus, developing a sense of campus consider different aspects of students' college life, articulate/express their perceptions of campus and individuality is respected, and fosters positive relationships through on-campus activities (e.g. celebrates traditions or heritage of the university, provides events to students when they feel lonely or depressed) *(Cheng, 2004)*.

2.4.2 Educational: Multiple Learning Experiences

Multiple experiences are what brings about important new ideas. Creating and improving the learning environment should enable and encourage students to perform the 'multiple learning experience': know each other and engage, work on group projects, interact in a variety of ways, and present their work to each other and take feedbacks *(D. G. Oblinger, 2005).* Students succuss for example can be very affected by positive social experience such as the interaction and collaboration among students, staff and community *(G. D. Kuh, 2005; Meeuwisse, Severiens, & Born, 2010)*. There is always a strong nexus between the learning and the social experiences, yet each are discussed separately. *Chickering and Gamson (1987),* in their landmark publication Principles of Good Practice for Undergraduate Education, underscored seven categories of effective educational practices that directly influence student learning and the quality of *their* educational experiences: Encourage Student-faculty contact; Encourage cooperation among students; Encourage active learning; Give prompt feedback; Emphasize time on task; Respect diverse talents and ways of learning; Communicate high expectations. They proved that the more students engage in such activities, the more they learn and the more likely they are to persist and graduate from university. *Beetham (2007)* has defined the different approaches to learning experience as summarized in the table below.

Table 3: Defining approaches to learning (Beetham, 2007).

Perspective	Assumptions / Tasks	Associated pedagogy / Activities
Associative Perspective	Learning as acquiring competence Learners acquire knowledge & skill by relating complex concepts & actions	- Environments for Individualised performance (competence, structured activities, progressive difficulty, feedback) Activities as rule-based.
Simulative Perspective (individual focus)	Learning as achieving understanding Learners actively construct new ideas by building and testing hypotheses and through collaborative activities.	- Interactive spaces for knowledge-building. - Activities encouraging discovery of principles. - Activities for shared expression of ideas. Activities as incident- or strategy-based.
Constructive Perspective (Social focus)	Learning as social practice Develop learners' identities, participation in specific communities of practice	- Participation in social practices of enquiry and learning. Activities as role-based (role as in work not role-play)

Student learning is encouraged and supported through the cultivation of human-scale settings and an ethos of learning that pervades all aspects of the institution *(G. Kuh, Douglas, Lund, & Ramin-Gyurnek, 1994).* For example, student usually mark high levels of satisfaction with the logical progressive accessibility to the outdoor physical campus. *Jamieson (2003)* states that the campus environment should provide learning spaces that contain the possibility for multiple and constructing experiences - see informal science-learning environments such as science museums, zoos and outdoor settings, science youth programs, science media

(Hofstein & Rosenfeld, 1996). Yet *JH Banning and Cunard (1996)* confirms that the most obvious gap is the paucity of knowledge as to how the campus outdoor planning contributes to student success. One way to achieve this complex relation is by allowing more diversity: different people, working on different things, and meetings together purposefully or unexpectedly *(J. Braxton, 2003)*.

2.4.3 Cognitive: Interpersonal and Intrapersonal Competence

Student interpersonal and intrapersonal directs the personal development that confer benefits on individuals and society. These include becoming proficient in critical thinking and more highly developed levels of personal functioning represented by five main attributes considered vital to living a meaningful, self-regulating, and fulfilling life. They are self-awareness, independence/self-worth, confidence, social competence, and sense of purpose *(G. D. Kuh, 2005; Pascarella & Terenzini, 2005).* These outcomes would be more effective via purposeful out-of-class experiences. Those skills and relationships on campus play a role in mediating student innovation. The NRC Report deemed the cognitive (reasoning & memory), intrapersonal (executive functioning, metacognition) and interpersonal (expressing ideas and interpreting and responding to messages) as the three broad domains of competence. *(N. R. Council, 2012)*. Thus, the different sets of values and norms represented by campus life need to be considered when studying various aspects of the students' experience. This leads to the designated innovative quality places that retain and attract clever/talented students who in turn retain and generate communities. Therefore, the structurally diverse campus tends to help students clarify and define their identities and strengthen their interpersonal skills. Diverse and vibrant spaces are crucial to the continued ability to innovate and compete *(Delgado, Galvez, Hassan, Palominos, & Morel, 2020; Moultrie et al., 2007).* Spaces that are also 'softer, less rigid, more open to the everlasting of experience and where the character of the space is formed by the shape and identity of the relationships created within it *(Jamieson, 2003).*

2.4.4 Employment Skills: Practical Competence

Represents students' capacity to perform effectively after school or out of class in a variety of areas. Employers and policymakers are increasingly interested in this arena, saying that while students are well-prepared in their major field, many lack the skills and abilities needed to be successful in the workplace *(Cappelli, 1992; Ewell, 1989; Immerwahr, 1999).* Although practical competencies can be obtained in classrooms, laboratories, and studios, the nature of many out-of-class activities often requires that students become competent in these areas *(G. D. Kuh, 1995).* Thus, the practical competence domain includes the acquisition of time management skills and other attitudes and competencies, such as interpersonal communication, group process, teamwork, decision making, and understanding and demonstrating sensitivity to workplace culture, needed to manage one's own affairs and perform well in post-university employment settings. That is why some universities are trying to respond to students' increased preoccupation with life after university by improving careers service support and bringing work-related activities into campus. Several studies *(J. M. Braxton, Brier, Herzog, & Pascarella, 1990; Pascarella, Ethington, & Smart, 1988)* suggest that extracurricular activities may positively affect career mobility.

2.4.5 Sociability or Livability : Interaction, Engagement & Collaboration

As *D. G. Oblinger (2006)* states, learning is a social issue which requires interaction and feedback among students. The social component represents students' demographic characteristics as well as dominant personality orientations that can be represented by the proportions of students' practicing various majors. That is, institutions with large numbers of engineering and science majors differ in their environmental press from schools that have large numbers of business and performing arts students, as the personalities of the former tend to be realistic and conventional while the latter are enterprising & artistic *(Holland, 1973).*

Pace (1984) found that the largest differences in self-reported gains in personal and social development were between on-campus and off-campus students. This view is consistent with social networks perspective that students' relationships with faculty, staff, family, friends, and mentors contribute to student satisfaction, persistence, and what students gain from university *(Astin, 1977, 1997; G. Kuh et al., 1991; G. D. Kuh, 2005; Pascarella & Terenzini, 1991; Tinto, 1975, 1987, 1993).* Additionally, the existence of shared public spaces like student union/commons, cafeterias, dining halls, and other hospitality areas on campus increases the interaction between students *(Halsband, 2005; Jamieson, 2003)*. This assist in the transformation of learning experiences from formal spaces to informal spaces.

Social interactions such as debate, discussion and group working have an influential role in students' success, as they have some different knowledge, idea, view, perception on particular topic or subjects. Group conversations can turn into a beneficial interaction in which students share knowledge or gain new information. *Katzell and Thompson (1990)* state that group working with diverse members make someone observe and absorb new attitudes, behaviours, or knowledge from other group members. Group working has also a triggering effect on motivation which is one of the encouraging conditions for learning. Another special type of interaction is the 'student-faculty contact' beyond the classroom, which has a statistically significant influence on perceived career preparation growth, particularly for students in trade and industry fields *(Astin, 1977; Karman, 1973; Lamport, 1993; Nadler & Nadler, 2001).* Such interactions include the hours per week spent talking with faculty outside of class, between first-year and upper-class students, assisting faculty in teaching, working on a professor's research project, and being a guest in a professor's home.

According to *(Fredricks & McColskey, 2012; Land & Jonassen, 2012),* one of the most factors to enhance SE is through engagement and collaborative learning and spaces. Five facets form the basis of the National Survey of Student Engagement (NSSE), and the annual survey have conducted among public and private HE institutions in US and Canada. They have been modified into sixth aspects from the Australasian Survey of Student Engagement (AUSSE). They define SE as "student involvement" with activities and conditions which likely to generate high-quality learning, measured along six engagement scales *(Coates, 2010)*:

- Academic challenge. The extent to which expectations & assessments challenge students to learn.
- Active learning. Students' efforts to actively construct their knowledge.
- Student and staff interactions. Level and nature of students' contact with teaching staff.
- Enriching educational experiences. Participation in broadening educational activities.
- Supportive learning environment. Feelings of legitimation within the university community.
- Work-integrated learning. Integration of employment-focused experience into study (not in NSSE).

2.5 Lit-1/3 Theoretical Framework: Assessing On-campus Experience

At the end, this chapter concludes with the first level of framework (Lit-1/3). Although the academic imperative is at the heart of SE, it encompasses aspects of application and graduate experiences, as well as the campus experience (functional, personal development, ecological, and student social life). Indeed, the effectiveness of SE is difficult to measure like the degree to which students are satisfied and feel comfortable and sustained in their campus environment. The below table, however, summarizes and relates the above-mentioned theories and approaches along with the selected indicators in a cause-method-effect process of improved student experiences. It looks to things that cause or encourage an

improved experience, in which form or typology, to achieve the best outcomes as with importance and relevance to education. The indicators were selected based on two main assumptions: (1) objectivity (clear, easy to understand, precise, and definite among all references); (2) relevance and measurability (quantitative, systematic observable).

Table 4: Cause-Through-Effect of SE with exemplar references (diagram by researcher)

Student Experience

Application experience	Academic experience	**Campus experience**	Graduate experience
Functional : University	**Developmental : Student**	Social : Society	Ecological : Environment

A. Behavioural experiences | **B. Emotional experiences** | **C. Cognitive experiences**

Improved Experience

Influencers	Method Assessing Practice	Outcomes	Description & Evidence Increasing **satisfaction-success-persistence**
Friendly atmosphere Educational requirements (outdoor projects) Environmental settings & weather conditions Personal attitudes Cultural or community traditions Health & outdoor practices Security & safety *(Astin, 1997; G. D. Kuh, 2005; McCabe, 2000; Scheerens, 2002)*	**Academic** Formative communication, tutoring, consulting, organizing or attending events, projects **Social** Coincidental meetings, chatting/group discussion, sharing current daily issues **Individual** studying, using mobile, observing surroundings **Active** walking, relaxing, recreation, playing, fitness. *(Coates, 2007; Hopkinson, Hughes, & Layer, 2008; Paula Jones, Trier, & Richards, 2008; Krehl & Weck, 2020; Locke, Verbik, Richardson, & King, 2008; Pike, Kuh, & Gonyea, 2003; K. J. Watson, 2017; Yıldız & Sener, 2003)*	**1. Interaction (A)**	Student-faculty interaction, group discussion, and many other positive impacts
		2. Collaboration & Engagement (A)	Interactivity, social interactions - feedback, discussion, group projects, motivate, observe and absorb new behaviours or knowledge *(Malcolm Brown & Long, 2006; Coates, 2010; Katzell & Thompson, 1990; G. D. Kuh, 2005; Lamport, 1993; McClenney, Marti, & Adkins, 2012; Meeuwisse et al., 2010; Thomas, 2012).*
		3. Sense of Campus (B)	Student own experience & cognition with the physical environments *(Chapman, 2006).*
		4. Interpersonal-Intrapersonal Competence (C)	Independence (self-directed learners, fully responsible, execute own activities); Self-management (individualized learning goals, control/plan own time and effort); competence; curiosity; enthusiasm *(Allen, 1985; Brockett & Hiemstra, 2018).*
		5. Practical Competence (C)	Students' capacity to perform effectively after or out of school/classroom
		6. Multiple Experiences (A, B & C)	Diverse & best learning experience/outcomes, identity; desire for learning; Problem solving, use resources & avoid challenges *(Knowles, 1975; Pace, 1984; Pascarella et al., 2014)*

Cause	**Through**	**Effect**
Addressing needs & expectations	**Create conditions and organize resources**	**Measure outcomes to addressed expectations**

Ch3. THE URBAN PERSPECTIVE (LIT-2) : ACTIVATING THE CAMPUS OPEN SPACES

Successful Masterplanning is the key to creating great places. A clear, considered masterplan developed by professionals and local people together can lead to the physical, social, and economic revival of places.

(Al Waer, 2014)

As this study reviews the process and the proposals that are needed to plan for major change (improved experience) in a defined physical area (university campus), it is therefore concerned with 'spatial masterplans' - definition provided in Towards an urban renaissance (Mulliner & Maliene, 2011) - which set out and integrates proposals for learning environments, urban and economic-oriented strategies and match to an investment strategy. After comprehensively understanding the status of todays' universities and substantial students experiences, the study proceeds to the second level reviewing the associated on-campus design features. It discusses the factors that determine their effectiveness in creating satisfactory and student-oriented learning environment. *Khan, Moulaert, Schreurs, and Miciukiewicz (2014)* and many others, discussed and proved how design – by its nature - is innovative, collaborative, and well placed to find new solutions to some of the most challenging and complicated problems. Accordingly, the design of outdoor spaces and the physical environment in campuses are proved to be very influential factors to contribute to enhancing levels of SE – such as well-being, cognitive abilities and mental health, attention restoration, pleasant educational and emotional experience to relieve the stress of the studying routine and exams, and improve academic outcomes, etc. *(Ahmadi Afusi, Zarghami, & Mahdinejad, 2014; Bratman et al., 2012; S. S. Y. Lau, Gou, & Liu, 2014; McFarland, Waliczek, & Zajicek, 2008; Scholl & Gulwadi, 2015).* Additionally, d**esigning a successful COS can also stimulate students to spend more time outdoors, feeling better while achieving more outcomes** *(Amedeo, Golledge, & Stimson, 2009; D. A. Black & Smith, 2006).* As design-led research, this chapter identifies the attributes of COS that constitute more use for gaining and improving such experiences. This chapter looks into the design of campus environments associated with previously discussed student characteristics, expectations and activities. It summarizes the historical overview of campus planning, a discussion of current campus planning trends, and overviews of several important topics related to master plans and campus plans; and university-community planning relationships - via theoretical-documentary and archives. It concludes with key outdoor design variables that potentiate such innovative experiences as supported by some studies *(e.g. (Araabi, 2016; Curvelo Magdaniel, 2016; Ewing & Clemente, 2013; Pace, 1984; Perry & Wiewel, 2005; Wiewel & Perry, 2015; Yıldız & Sener, 2003).*

3.1 The Recognition & Implication of Campus Planning & Design

The word "campus" comes from the Italian word campo, which means country or field *(Paul Venable Turner, 1984)*. It was first associated with college grounds to describe Princeton University in the 1770s and now refers to the overall physical quality of HE institutions *(E. L. Eckert, 2012).* As well as being the face of a university and the base for education and research activities, a university campus is a forum for learning for students, and a place that holds caring and unforgettable memories. Moreover, it is important for a campus to be attractive to those who are thinking of studying there in the future *(Gorgati & Savid-Buteler, 2016)*. As such. the university campus is an important asset with financial, reputational, educational, social and environmental benefits to the university and the wider city. Its design can support the link between its green infrastructure and the outdoor practice in the direction of extending its values or outcomes particularly for its students and staff. This section defines and shows the important rule of the campus planning and design.

In order to lay the foundation for the continuous growth of the university campus and to provide the foundation for a caring development of the university, the campus planning must be considered from the overall level of the campus structure, and to seek continuity in time and space. Campus planning is a unique endeavour, combining many design and planning disciplines. Like urban planning, campus planning integrates many diverse disciplines: interiors and interior design, architecture, landscape architecture, transportation planning, engineering, infrastructure and utility planning, politics, economics, sociology, ecology, and psychology, just to name a few. Therefore, *Huang (2007)* believes that the university campus planning is a dynamic planning process and should be considered as an urban design paradigm. In a certain period of development, the overall campus-related land use, spatial layout and various facilities are planned and managed in an integrated manner, aiming at setting and formulating guidelines for the goals of campus development and construction.

The concept of the overall campus planning concept was not really taken seriously until the end of the 1940s after World War II. Among them, Richard P. Dober's four series of campus planning series have systematically and comprehensively discussed three aspects of planning, architecture and landscape and successively proposed "Planning Modules" and "Building Standardization System". The acknowledged classic is Richard Dober's Campus Planning which launched the genre with its publication in 1963. Planning a campus with a strong sense of place is a consistent theme throughout *R. Dober (1997); R. P. Dober (1996)* extensive body of work as a practitioner as well as an acclaimed author. Based on this principle, the interrelated activities of place-making and place-marking now characterize the field *(MacKenzie, 2015; Painter et al., 2013; Poplin, Yamu, & Rico-Gutierrez, 2017; Rissola, HervÃ, Slavcheva, & Jonkers, 2017).* Place-making, "the structuring of the overall design, the broader skeleton, the articulated pattern, that is the campus plan," is combined with place-marking, "the definition, conceptualization, and orchestration of certain physical attributes which give a campus a visual uniqueness appropriately its own" *(Dober 2003, 4).* It is understood that campuses achieve their distinct senses of place through these two practices. Concepts such as "campus image structure" have become an important reference for many campus planners.

The main projects of the "design stage" of the campus's overall planning and design structure can be summarized into the land use, site plan, road system, campus landscape and open space. In recent years, the qualitative improvements in campuses are being pursued by nearly all universities in different ways. Dober in his book "Campus Design" discusses the main planning and design elements that constitute the image of the university campus and puts forward two viewpoints such as "Place-making" and "Place-marking" and then developed the basic indicators for the "place creation" of campus hardware. The

“landmarks”, “landscapes”, “materials”, “styles” and so forth are the basic elements of the “software-level” campus software to perform “Place-marking”. It believes that it is necessary to try to construct and shape the image of the campus and give it the meaning of the place to create a high-quality campus environment. After the 1970s, the campus planning, due to the influence of urban design and other related reflections, began to abandon the one-time overall design and the pursuit of static external forms and paradigm shift direct planning and design evolved into a “dynamic progressive planning” that respects and emphasizes indirect norms. Christopher Alexander and his colleagues at the Centre for Environmental Structure laid the basis for an entirely new approach to architecture, building, and planning through their three popular books: The Timeless Way of Building, A Pattern Language, and The Oregon Experiment. Through their urban design concept - where it is directly applied to the interpretation of campus planning in a simulated empirical way - it believes that the most important aspect is the integrity of the process and the three concepts of “Organic Order”, “Piecemeal Growth” and “Patterns” which have made the campus master plan more reasonable *(C. Alexander, 1977).*

Many terms can be used to describe strategies for the physical regeneration of an area. Some of the most commonly used are masterplan, development framework, regeneration strategy, urban design framework, or vision. They are used interchangeably and can mean different things to different people. As such, for a masterplan to be complete, it must be supported by functional, financial, and social policy documents and delivery mechanisms, without which the spatial plan has little meaning or likelihood of effective implementation *(D. CABE, 2000).* Masterplans are only required where the urban scale of change is significant. According to *D. CABE (2000); Cowan (2002); Kriken (2004),* spatial masterplan can be described as a sophisticated ‘model’ that:

- Shows how the streets, squares and open spaces of a neighbourhood are to be connected.
- Defines the heights, massing and bulk of buildings.
- Sets out suggested relationships between buildings and public spaces.
- Determines the distribution of activities/uses that will be allowed.
- Identifies the network of movement patterns for people moving by foot, cycle, car or public transport, service and refuse vehicles.
- Sets out the basis for the provision of other infrastructure elements such as utilities.
- Relates physical form to the socio-economic and cultural context and stakeholder interests.
- Allows an understanding of how well a new, urban neighbourhood is integrated with the surrounding urban context and natural environment.
- Other strategies for physical regeneration at a different scale or to a different level of detail may also be prepared. Some of these will form part of the background or strategic context for a masterplan – for example, a design brief for a site or cluster of buildings.

A masterplan sets out principles that can be applied with a degree of flexibility. A good masterplan has a ‘vision’ that helps shape what happens on the site, giving it coherence and a real sense of identity and place. Some sites might call for visionary design quality, and some masterplans might achieve it, but this is not true of the majority. Rather, a vision is likely to derive from an understanding of the characteristics of a site, its history and geography, to suggest how a sense of place can be created and related to what is there already *(N. R. Council, 2002).* Some aspects of the vision may go beyond the physical and change people’s perceptions of a place or alter aspirations and expectations of local people and investors. A vision

need not arise from a design objective: it may be generated by other aspects of master planning, such as the business plan or innovative funding arrangements. *Coulson et al. (2015)* described the field in the following way: "campus planning is understood to encompass a wide range of physical planning activities, from specific space placement and design that implements a capital plan to a framework of principles that guides future development". A few key texts authored by a handful of experts guide current practice.

In recent decades, many studies have discussed the involvement of different stakeholders in the campus planning process which adds new qualities, both physical and spiritual, to the overall vision of the campus. Initiatives from the public participation, campus stakeholders and the local community working together to gain a deeper understanding of the needs of stakeholders' and commit to effectively achieve the goal of sustainable campus development. There is a common understanding in the literature, that is, stakeholders' participation in campus planning is indeed helpful to understand and meet their actual needs and is effective and positive for promoting sustainable campus development *(Leal Filho & Brandli, 2016).*

There are two explicit assumptions guiding campus design and planning practice – first, that campuses are predominantly physical places and, second, that a campus' sense of place is an outcome of its material, particularly visual, form *(Coulson et al., 2015; Edwards, 2014; Stanton, 2005; Temple, 2009).* As such, it is commonly accepted that a sense of place arises from a well-planned and designed built and landscaped environment which gives a campus its unique "experience" *(M. Watson et al., 2014).* A sense of place is understood to be a product of a specific urban design and a representation of time in the built form that together create a visually identifiable character *(Malpas, 2008).* Other studies provided guidance and reference for the campus planning and design process. For example, *Sun and Chiou (2019)* developed five planning principles for promoting sustainable campus development: 1. Social learning campus: creation of a sustainable network of open spaces 2. Integral campus: combination of new university uses 3. Accessible campus: Campus of sustainable mobility 4. Didactic environmental campus: Biodiversity and consolidation of botanic routes 5. Campus morphology: Creation of a campus landscape into its surroundings.

3.2 UK Universities : The Campus Context

This part summarizes the history and classification of university and campus planning in UK and England particularly derived from various studies *(Melhuish, 2015).* A campus university is a British term typically used for a university situated on one site, with student teaching and research facilities, accommodation, and leisure activities all together. It is derived from the Latin term campus, meaning "a flat expanse of land, plain, field" *(Oxford Latin Dictionary, ed. P. G. W. Glare, Oxford University Press, Oxford (1982), p. 263).* In the UK, there are two main types of university campuses: Campus universities and collegiate universities [15]. A campus university means that all (or most) of the university-owned buildings and spaces e.g. lecture theatres, halls of residence, open spaces etc. are situated in one place. Confusingly, multi-site universities often call each separate site "a campus" and many original campus universities now have expanded to more than one site (or campus), for example, the University of Nottingham. A collegiate university is a university in which functions are divided between a central administration and a number of constituent colleges (e.g. Oxford & Cambridge, Durham and Kent universities), or a university consisting of a number of sites, or even individual buildings, spread throughout a town (such as University of Edinburgh or University of Sheffield).

Appendices (2 & 3) include the list of 'recognized' (above 2000 students) or significant universities in the UK and US respectively with key data including: The current name of university, its campus type, foundation

[15] *Adapted from Types of UK universities by ukuni articles*

year, Average student experience score (NSS), and size by area and by population. Data collected from the HESA data from 2013 to 2016.

The main types of after school education, included in the list of UK recognized bodies, are classified to:

- General Further Education (FE) College: FE colleges offer students National Vocational Qualifications (NVQs) at levels 1-7 of the RQF, as well as HNC, HND, PGCE, Foundation degree, and Apprenticeships. These are designed for students wishing to gain practical skills and move on to employment, although they can also progress to undergraduate studies.
- University. Large educational institutions awarding all types of degrees (bachelor's, master's and PhD). Unlike vocational colleges, universities are more research focused.
- University College (not tertiary education). A small educational institution, which is usually part of a larger university. University colleges hold taught degree awarding powers.
- All UK universities are Public universities (formally independent bodies) which means that they receive part of the funds (30-90%) from the government. At the same time, they are largely autonomous and independently decide on the additional ways of generating income. Unlike US and other European countries, there are no government-owned universities. There are only 5 private universities in the UK, which are not subsidized by the government: the charitable University of Buckingham; Regent's University London; the profit-making University of Law; BPP University; Arden University.

The UK universities can be divided by age to [16]:

- Ancient universities (founded before 1800): Oxford 1167; Cambridge 1209; St Andrews 1413; Glasgow 1451; Aberdeen 1495; Edinburgh 1583; University of Dublin in Ireland 1592.
- Nineteenth-century universities: Durham University 1832; University of London 1836; Queen's University of Ireland 1850; Royal University of Ireland 1880; Victoria University 1880; University of Wales 1893.
- Civic universities - First wave (Referred to as Red brick university): University of Birmingham 1900; Victoria University of Manchester 1903; University of Liverpool 1903; University of Leeds 1904; University of Sheffield 1905; Queen's University Belfast 1908; University of Bristol 1909. The large civic "red brick" universities all gained official university status before the First World War. The term was first coined by a professor at the University of Liverpool to describe these universities, inspired by the university's Victoria Building which is built from a distinctive red pressed brick. All the red brick institutions in Great Britain have origins dating back to older medical or engineering colleges which prepared students for the University of London external examination.
- Civic universities - Second wave: evolved from local university colleges founded before the Second World War including: University of Reading 1926; University of Nottingham 1948; University of Southampton 1952; University of Hull 1954; University of Exeter 1955; University of Leicester 1957.
- Plate glass universities: Pioneered by the University of Keele, which was established in 1949 as the University College of North Staffordshire with its own degree award powers, under the oversight of Oxford, Manchester and Birmingham.

[16] *Adapted from Types of UK universities by ukuni articles.*

- Colleges of Advanced Technology (CAT): Created in the 1950s and entered the university sector following the Robbins Report in the 1960. All previous classifications which granted the University status prior to 1992 are known as 'Old universities'.
- New universities (Post-1992 universities): Polytechnics, colleges and institutes of HE endowed with University status by the government under the Further and Higher Education Act of 1992 or later. The Open University is also unusual, being the UK's only public distance learning university.

The UK universities can be divided by structure to [17]:

- Unitary: a central university supervises all teaching and services provided by its educational units. The majority of UK universities adhere to this system. The first unitary university in England was the University of Birmingham.
- Collegiate: functions are distributed between a central university and a number of constituent colleges (such as the University of Oxford, University of Cambridge, Lancaster University, Roehampton University, University of London).

3.3 US Universities : The Campus Context

Reviewing history to various types of campus planning and design, aid in understanding their lessons, impacts and influences at students, societies, cities and other urban settings. This part addresses the history and significance of university planning and campus design in the US and particularly California collected from several references *(Chapman, 2006; Kriken, 2004; Madanipour, Miciukiewicz, & Vigar, 2018; Rork, 1962; Stanford, 2003; Paul Venable Turner, 1987; Paul V Turner, 2018; Welker, 1965; Whitton, 2018)* - see appendix (03) for a list of significant universities across US. The origins of colleges in the US can be traced from the 17th century *(Paul Venable Turner, 1987).* Harvard College and the College of William and Mary were built in 1636 and 1699, respectively, and were considered the first colleges in the US. The design of these campuses initiated the tradition of a quadrangle, which is an inward-looking courtyard with a single building on each of three sides around an open space. Some of the best university campuses in the US were almost fully developed in the 19th century and early 20th century. Before World War II, campus designers would follow certain formal typologies such as quadrangle campus (e.g., University of Washington in Seattle), picturesque campus (e.g., University of Vermont), or Beaux-Arts campus (e.g., Columbia University). After World War II, with the vast expansion of university campuses, the emphasis was more on the design of freestanding buildings than on campus masterplans *(Muthesius, 2000)*. In the 19th century, Thomas Jefferson proposed a different approach to education at the University of Virginia, called academic village. Its design focused on reaching out to students and professors in an appropriate landscape setting [18]. Jefferson's design principles have played a major role in shaping the American campus landscape and his ideas continue to be emulated in the planning of modern university campuses *(Chapman, 2006; Paul V Turner, 2018; Zemsky, 2013).*

In US, the original use of the word campus referred to the grounds of a school or university. This stems from the fact that the first colleges and universities were simply a building or group of buildings around a central grassy field. Over time, the term campus came to include not just the grounds, but also the buildings and all the interconnected voids and interstitial spaces of the landscape between the buildings *(Polyzoides,*

[17] *Adapted from Types of UK universities by ukuni articles*

[18] *Thomas Jefferson, a founding father and third President of the US, is featured on the 5-cent coin and the 2-dollar bill. Besides being a national leader, he was a very creative inventor, designer, and planner. He built the Virginia State Capitol and the University of Virginia (the campus and buildings he designed).*

1996). Current usage of the campus has further expanded beyond the combination of the grounds and buildings of a school, college, or university. It now includes a variety of settings such as corporate campuses, business "parks," office complexes, medical complexes, civic centers, recreational and entertainment parks, and even Olympic sports villages *(LANG, 1987).* Preliminary campus designs followed the British tradition consisting of three components: classrooms, residence halls, and recreational facilities *(Shattock, 2012; Paul Venable Turner, 1984).* It continues to be impacted by the patterns of European campuses, including architectural forms and spatial organization *(Chapman, 2006).* In 1850, Fredrick Law Olmsted introduced park-like campus design principles, especially prominent in the land-grant institutions, which embodied the new air of a more democratic education versus the previously portrayed elitism of institutions of HE *(Paul Venable Turner, 1987).* Olmsted designed several campuses in America including Cornell University, Stanford University at California, Yale University, the University of California at Berkeley, and others *(Pelfrey & Cheney, 2004).* His aim in designing these campuses was to improve students' overall learning experience. With the increase in the US population in the nineteenth and early twentieth centuries, university campuses began to evolve and expand. During this period, the construction of new buildings and facilities was based on realigning the spaces with existing topography *(Chapman, 2006).* From the 17th century until today, American campuses have evolved in both campus planning and landscape designing. In recent years, most universities re-embraced the idea of campus master plans to address their institutional objectives, such as attracting more prospective students, increasing the quality of life of current students and faculty, promoting a learning and research environment, creating a sustainable environment, and benefiting the surrounding communities. The most ambitious and comprehensive plan for a campus up to that time, the Union design became a model for collegiate planning" *(Turner, 1996, p: 62).*

A good number of the lawns, open courtyards and quads are due to another trend called the Beaux-Arts movement of the 1900's with its emphasis on city planning *(Griffith, 1994).* As looking at the modem era, a fresh approach towards campus planning was established to accommodate the impact of automobiles, computers and digital communications *(R. P. Dober, 1992).* Low maintenance planting, use of native plants and low water use are new modem campus planning principles *(Calvo-Sotelo, 2014).*

3.4 Campus Open Spaces (COS): Experience-Based Design

The COS has been studied widely in the literature from different perspectives such as their visual characteristics *(Lynch & Lynch, 1960);* their visual description and aesthetics *(Cullen, 2007; Gordon, 1961);* the design characteristics and crime prevention *(Newman, 1972);* patterns of people behaviour and space quality *(Cao & Kang, 2019; Gehl, 2011);* and evaluation of the quality of open spaces *(Marcus & Francis, 1998);* the restorative component of green spaces such as urban pocket parks *(Hartig, Mitchell, De Vries, & Frumkin, 2014; Hipp, Gulwadi, Alves, & Sequeira, 2016; S. Kaplan, 1995; Nordh, Hartig, Hagerhall, & Fry, 2009; Skärbäck, 2013; Zhao, Xu, & Ye, 2018).* In this study, three main factors are related to the effective use of COS namely, meeting users' needs and expectations; quality of activities; and the impacts of both on user experiences through both the spatial structure of the space and the quality of design of the physical features. Careful implementation of these COS factors will have an important impact on the characteristics of a future, student-based campus *(Coulson et al., 2015; Gorgati & Savid-Buteler, 2016; Long & Ehrmann, 2005; Matloob, Sulaiman, Ali, Shamsuddin, & Mardyya, 2014; Nikolopoulou & Lykoudis, 2007; I. Taylor, 2019; Whitton, 2018)*. As the two first factors where addressed in the chapter two, this chapter addresses the third factor. The spatial structure of urban open spaces (typologies of its design and use) has shown to be associated with how people response to the various design (how they move, gather and socialize) as evident, for example, in space syntax theory *(Calvo-Sotelo, 2014; Czerkauer-Yamu & Voigt, 2011; ElMorshedy, Ibrahim, & Kamel, 2018; Garau, Annunziata, & Yamu, 2020;*

Greene & Penn, 1997; Lievonen & Vesisenaho, 2013; Penn, 2003; van Nes & Yamu, 2017; Yaylali-Yildiz, Czerkauer-Yamu, & Cil, 2014; Yaylali-Yildiz, Spierings, & Çil, 2020). The quality of the physical features of the open space has been seen as an important aspect that improves people's satisfaction and quality of life *(Beck, 2009; Douglas, McClelland, & Davies, 2008; McFarland et al., 2008; Tiyarattanachai & Hollmann, 2016),* promotes better use of public spaces *(Gehl, 2011)* and enhances the social, environmental and economic values of cities *(Beck, 2009).* These studies and more have shown a thriving interest in both policy and practice on the physical, social, psychological and economic benefits/impacts of open spaces in university campuses.

3.4.1 Meaningful Campus Design : The Sense of Place or the Placemaking

Virtually, many studies agreed that student-space interaction is an important factor in student success *(Astin, 1997; G. Kuh et al., 1991; Pascarella & Terenzini, 1991; Tinto, 1993).* Yet universities vary considerably as to the degree to which their physical and social environments foster to or oppose student success (Berger, 2002; Pascarella & Terenzini, 2005). For example, some can encourage student-faculty interaction and peer interaction before and after class by placing benches and comfortable seating areas near buildings, while others support student-faculty interaction by creating well-equipped group study courts proximal to school offices, thereby increasing the likelihood of spontaneous interactions between students and staff (G. Kuh et al., 1991; G. D. Kuh, 2005). On the opposite, unplanned spaces in terms of safety and security or difficult constraints as limited footprint or a poor surrounding context, for example, can pose a challenging environment for students to live, study, or meet on campus.

Architecturally speaking, the campus experience is a sense of place – a phenomenon where the built and landscaped environment embodies the idealism of HE wrapped in the distinct character of the university - considering that people are an integral part of the making of place *(Coulson et al., 2015; Edwards, 2014; Stanton, 2005).* Yet the presumption that the built and landscaped environment creates a sense of place is incomplete, failing to consider that people are an integral part of the making of place *(Cresswell, 2004).* Students' commitment in terms of persistence and loyalty to the institution can be strengthened by intentionally creating a strong "sense of place" through connecting campus architecture and design to meaningful experiences and memories of activities *(G. D. Kuh, 2005).* For example, the proximity of academic buildings to student residences can promote or inhibit interactions between students from different majors *(Pike et al., 2003).* Thus, "the actual features of the physical environment can encourage or discourage the processes of learning and development" *(Strange and Banning 2001, p. 12).* Given its power to achieve multiple outcomes effectively, place-improving – putting "place" at the centre of policy and planning frameworks such as place-making, place-meaning and place-based approaches – are fundamental theories in the campus planning agenda. They are multi-faceted approaches that merge the interconnection between people and places by involving people in how their public spaces look, feel and operate to discover what they want and expect from a space *(Whyte, 1980).* As the results of many factors (mixed-used developments, arts and sociocultural opportunities, etc.), they help create inclusive, community-driven design in the built environment to create places of meaning, and neutral areas for people to meet, socialize and observe *(Brunnberg & Frigo, 2012).* For example, COS can provide values for health (via green, environmental and health benefits), wellbeing (via physical activity and social interaction), inspired (supporting diverse, innovative, and extra-curricular initiatives).

There are different design methods for pursuing and practising the "good university campus form" as an attempt to shape the ideal appearance of the campus as well as the ideal experience for its students. The observation of campus design features that can help mentally fatigued individuals has been empirically demonstrated in a body of research – using for example the Attention Restoration Theory *(R. Kaplan & Kaplan,*

1989) – in order to understand and describe the many benefits of human-nature interactions *(Atchley et al., 2012; M. G. Berman, Jonides, & Kaplan, 2008; Bratman et al., 2012; Hartig et al., 2014; Keniger et al., 2013; Tennessen & Cimprich, 1995).* A key theory 'Attention Restoration Theory (ART)' focuses on the internal and external influences affecting one's cognitive ability and suggests that interaction with nature has specific recovery effects on the human attentional system. Indoor design studies are coordinated with outdoor landscape for visually pleasing and integrated learning connections *(Marcus & Francis, 1997b).*

Placecheck is another common method defined as a tool and developed by the Urban Design Alliance. It is used for assessing the qualities of a place, showing what improvements are needed, and focusing people on working together to achieve them. A Placecheck [19]can cover one or part of: street, neighbourhood, town centre, district or city. The crossed design values are examined in order to both capture the key characteristics of a 21st-century learning space and also highlights its impacts on the previously mentioned student experiences, the COS typologies need to consider the following set of satisfaction variables [20].

3.4.2 Types & Typologies of Design & Use

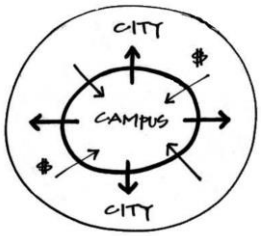
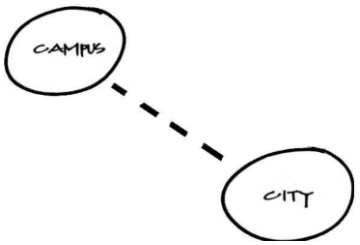
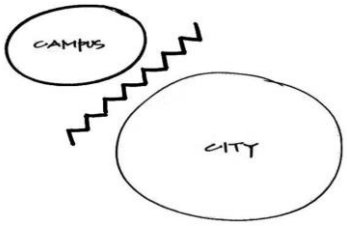
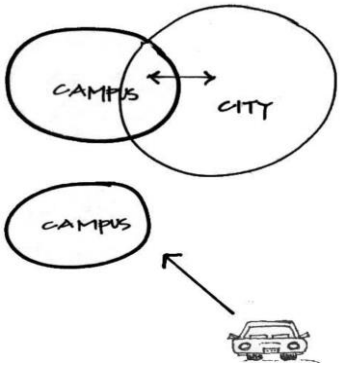
The goal for the campus open spaces is to create a rich, supportive environment that enhance the academic life components of the university. As such, continuously improving the existing COS and adding new spaces serving different purposes over time will revive the university image, provide programmable and informal usable space, and contribute to a sustainable campus. The open space is the spatial context of the users' experience; therefore, it is essential to understand the physical, cognitive, and emotional experience as occurring within that context *(Boud et al., 1993; N. Council, 2000; G. Kuh et al., 1991; Peker & Ataöv, 2020; Temple et al., 2014; Tuan, 1977).* Understanding how various groups of students perceive and react to the particular design and function should be an essential step in any effort to enhance student satisfaction and success *(JH Banning & Cunard, 1996).* The benefits of effective planning of COS contributes to - and is assessed by satisfaction, loyalty/identity, advertising and marketing intelligence, awareness and effeteness of well-connected campus *(Brodie, Ilic, Juric, & Hollebeek, 2013).* As such, planners realize the COS as 'outdoor rooms' *(Gu, 1992),* considering their type, frequency, duration, and arrangements of activities through the physical characteristics of these rooms, which may serve to encourage or hinder the SE. Although the importance of COS is far greater than simply their aesthetic appeal, many campus designs are defined to express the visual expression of campus landscape rather than other aspects affecting for example, the human comfort needs *(Jamieson, Fisher, Gilding, Taylor, & Trevitt, 2000)*. The campus master plan, therefore, should offer positive and diverse designs, with clear definition and enclosure, supplementing spaces of all scales and purposes. There should be no ambiguity, miss-used or left-over space. Therefore, the campus should have a clear pattern of open space with a clear vision of typology of use.

In this context, the space design give rise to both behaviour setting (composed of human or social aspect of the setting) and the physical aspect (nonhuman component). Students interact each other in different ways (behaviour setting) within different typologies of the physical space (walkways, greens, plazas, marketplace, courtyards, playfields, etc.) *(Hanan, 2013)*. Reviewing the existing and anticipated uses of COS and identifying the presence of outdoor activities will illustrate the COS physical aspects for learning environment and reflect places that are meaningful for students. The result will inform typologies that may provide pleasing, comfortable, accessible, supportive, and meaningful place for supporting formal learning activities. The success of COS in its use, its frequency and popularity depend greatly on the location

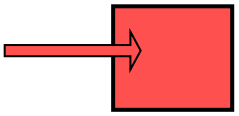
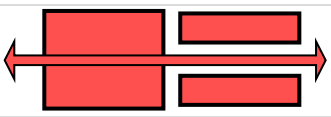
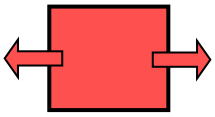
[19] The Placecheck User's Guide is found at www.placecheck.com.
[20] Adapted from DEEP learning spaces & (Abu-Ghazzeh, 1999).

and the details of its design *(Marcus & Francis, 1998).* Studies on urban spaces *(Askarizad & Safari, 2020; Francis, 2003; Mehta, 2014; Ujang, 2017; Yıldız & Sener, 2003)* suggest that systematic attempt to compile of what seems to have functioned and not functioned, what appears to be appreciated and not appreciated by the users of existing spaces are essential for the design of new open spaces. Designers are often weighed down by not having the time to search out appropriate user-based needs and performance related solution *(Hanan, 2013)*. As such, the table below is developed to summarize all relevant classifications considered in the design and planning of campus space - after a systematic review of over 100 research papers. For example, some studies value the different importance of COS experience at campus-based university as: 1) most done (frequency), 2) most favoured (chosen/socially), and most valued (healthy & academically rewarding) *(Siu, Xiao, & Wong, 2021).* In this kind of classification, it is important to be clear about how each development contributes to this hierarchy, and treat spaces according to their typology, size and shape from broad to narrow, complex to simple, openness to closeness, their location in relation to buildings and the whole campus, the designated space functions/activities (for informal recreation or formal learning), and the activities of the surrounding spaces.

Table 5: A list with references of COS classifications & typologies (gathered by researcher)

Typology	Definition, description, components and characteristics	
Classifications of campus layouts and relationship with the city *(T. Bender, 1988; Calvo-Sotelo, 2014; Alexandra C den Heijer & Magdaniel, 2018; Kireeva, 2012)*		
Campus City (College Town)	Traditional - followed Jefferson's Academical Village concept.	
Rural Campus	Wood's and ravines or pastoral rural – followed Mollowed Olmstead's irregular, park-like, natural landscape concept.	
Suburban (commuter) Campus	The campus had a lack of continuity and an unclear relationship to the landscape	
Urban Campus (modern urban-city concept)	- Integration: The University premises are embedded with the city fabric (Peripheral - As urban fabric - Isolated within the urban interior - Diffuse within the urban interior). - Segregation: isolated from city (Dissociated – Polarized - Super-peripheral). - An intermediate relationship is also possible, where the University grounds adjoin the city. - Urban gridiron: buildings formed block-by-block with pedestrian movement on the inside and vehicular traffic on the perimeter.	
Quadrangles campus	Followed the Oxford & Cambridge, ideal of seclusion and separation.	

Spatial and Institutional classification (Distribution model): the way in which a university is distributed in a territory *(Calvo-Sotelo, 2014; Cortes, 2005; Coulson et al., 2015)*	
Territorial	The University is distributed on a large scale on the basis of a polycentric and evenly spread structure, with no designated central seat (e.g. University of Castilla-La Mancha - four seats are Ciudad Real, Cuenca, Albacete, Toledo; University of Extremadura - Cáceres, Badajoz, Mérida, Plasencia). Mono-site (only one distinct site) or Multi-site (more than one distinct site)
Local	The University's central seat is polarized with respect to a specific city that is both large in size and important in territorial importance, and this city and its administrative district have special ties to the university, even where the university also operates branches elsewhere (and, as an exceptional case, a university may have a distance-learning sub-structure consisting of small centres in other localities scattered across the territory). Examples: University of Barcelona (Barcelona); University of La Rioja (Logroño).
Associated	This is the model instantiated when a University is individually linked to an urban centre of moderate size, but the existence and educational scale of the university are better explained by the proximity of another urban centre which is larger and more important. Examples: University of La Laguna (Tenerife); University Alfonso X El Sabio (Villanueva de la Cañada).
The physical arrangement of the University in terms of planning *(Abd Razak, Abdullah, Nor, Usman, & Che-Ani, 2011; Calvo-Sotelo, 2014; Dalton, Hajrasouliha, & Riggs, 2018; Orenstein, Troupin, Segal, Holzer, & Hakima-Koniak, 2019)*	
Symmetrical	Configured on axial symmetry (a side or an access) or central symmetry (pivoting on a point).
Balanced	Configured with a view to balancing the volumes and voids of a given spatial whole.
Unbalanced	The compositional arrangement takes no account of any criterion of balance of mass or space.
The internal (compositional) structure *(Calvo-Sotelo, 2001, 2012, 2014)*	
Mesh	The composition is based on a linear weave, comprising the intersection of two families of parallel lines. Classified to: Reticulate in general (parallelograms spaces); Right-angled or perpendicular reticulate (rectangles spaces); Grid right-angled and uniform intervals (squares)
Linear	The internal structure is arranged along a linear axis.
Central	The composition is arranged around one or more central points. Classified to: Concentric (centre upon the same point); Eccentric (centre upon different points internal to an outermost boundary); Multi-central (A range of different central arrangements is developed across a larger area, giving rise to distant centres).
Radial	The design is arranged as a series of radii converging on a central point.
Organic	The structure is analogous to an organic form or compositional system, inspired by a shape arising in nature.
Irregular geometries	The composition adopts an irregular arrangement that defies geometric modelling. Classified to: General (arrangement emerges from unplanned processes); Adaptation to context (whether context is natural or urban, the irregular shapes result from typographical, urban planning or natural adaptation).
Functional classification categorizes COS by function *(Dumont & Istance, 2010; Gibbons, 1998)*	
Natural resource areas	Protection areas like animal & vegetative habitat, stream belt corridors, trap rock ridges.
Outdoor recreation	Parks, playgrounds, beaches, trails, plazas, sitting areas, arboretums.
Resource management	Forests, fisheries, farmland.
Public health & safety	Health protection areas such as floodplains, wetlands, unbuildable areas or areas for development including steep slopes, high water table, shallow depth to bedrock.
Community areas	Areas that shape community character/design such as: buffer strips, front, back and side yards, urban plazas, greenways, open space dedications related to development.
Historic/archaeological sites	Battleground, historic structures and grounds, historic districts, town greens.
Four COS categories that accommodates the transformation of students experiences from indoor/formal spaces into outdoor/informal spaces associated with their anticipated outcomes *(Astin, 1999b; C. C. Strange & Banning, 2001a, 2001b)*	
Physical / Spatial (applying)	Benefits: Personal adaptation space-use; Fit between indoor and outdoor; Spatial perception; Creativity and critical thinking; Legibility & wayfinding.

Ecological & Therapeutic / Environment (engaging)	Benefits: Environmental awareness; Student comfort and wellbeing; Student ownership & given choices; Sustaining health Build competency; Personality & identity.
Social & Recreational (Reflecting)	Benefits: Social interaction (creating social bonds, group experience); Engagement (feel connected, peer mentoring-counselling, community); Social and behaviour activities (variety, independence, confidence, self-esteem, personal effectiveness, social effectiveness, communication skills, group cohesion, teamwork).
Educational / Academic (Sharing)	Benefits: Contribution (enrichment of the learning experience); Involvement (desire to be involved or amount of time and energy spent; Curiosity (find their interests); Challenge (figuring out complexity); Compliance (to meet another's expectation, to do what one is told); Recognition & Competition (to be publicly acknowledged)
Campus plan classifications as potentially significant places for shared-usage and informal learning *(Hansen & Altman, 1976; Ibrahim & Fadzil, 2013; Shanka & Taylor, 2005)*	
Central core of campus	Dynamic campus centre is a primary component that a campus can contain in its body, which can entirely provide all necessities of students in terms of catering, cleaning, health etc.
Students' living spaces	Becomes a formative tool on what students do in their extracurricular time.
Formation of faculty buildings	The design of COS between faculties used as reflective spaces sustaining open air study areas or for students to exercise or gather for an all-hands meeting.
Amplify well-designed campus into 3 key realms of work (components & recommended characteristics) *(Schmertz, 1972)*	
The urban vibe	The energy and urgency of working in an urban setting in close proximity to collages. The highest impact realm of work for researchers and companies with long-term goals in mind.
The collegiate atmosphere	A walkable, pedestrian-friendly campus. One typical example of achieving the collegiate atmosphere using scale: 90 feet across from building to building, with buildings six and seven stories tall so that employees can identify the person they see across the way.
The walk in the woods	Soccer field, swimming pool & outdoor spaces nurture the authentic roots of a university.
Classifications of learning spaces *(R. P. Dober, 1992)*	
Formal learning spaces	More private areas such as outdoor portion of a central plaza, transportation hub, outdoor amphitheatres, learning commons including nature trails and ecological study areas.
Informal meeting spaces	Seating walls, picnic tables, overhangs, small greens, cafes, and/or other (semi-public) spaces.
Other Learning spaces	Semi-public areas and outdoor commons lending more opportunities for community and social encounters that foster a sense of belonging. Planners do not suggest the separation of formal from informal meeting spaces. The Scottish Funding Council argued 7 types of learning spaces could be identified in HE for: group learning; simulated spaces; immersive environments; peer-to-peer spaces; clusters; individual/quiet areas & external work areas.
Classifications of COS according to the functions & activities *(Rached & Elsharkawy, 2012; Schmertz, 1972)*	
Common turfs	Include the university entrance space and main courtyard spaces.
Academic spaces	Adjacent to educational buildings: front entry space/yard, backyard, secondary/service, etc.
Sports spaces	Spaces for sports activities include open courts and sports facilities provided on campus.
Circulation – Movement	Spaces for vehicle roads, pedestrian pathways & parking areas.
COS character according to their location, context and enclosure *(Compendium, 2007).*	
Go to places	Destinations for staying, eating, meeting or events such as parks, fields, outdoor living labs, etc. Mostly best durations of stay but intemediate or low rates of frequency. 
Go through spaces	Past spaces or corridors of movements. Typically, high frequency rates but low or no durations of stay. 
Stop in places	Similar to past spaces but users sit and watch the world go by such as transit spaces or engage in and interact in favoured courts/quads and central squares. 
Mixture of all	Providing multi-functional spaces where people live, work and are entertained.

*In addition to the typical campus spatial typologies, and a*mong many different theories and classifications, the study classifies and define 8 typologies of COS *(Amsden, 2005; Calvo-Sotelo, 2001, 2014; Coulson, Roberts, & Taylor, 2017; R. P. Dober, 1992; Francis, 2003; Polyzoides, 1996). Similar space typologies are defined within the Restorative Landscape Design research by Marcus and Barnes (1999). They are known to have a great impact on the people they serve and will be an important guideline in the design framework.*	
COS1: Quadrangles Gardens / Secondary Plazas	Campus quads are the prominent natural/green COS considered as secondary plazas that serve as passive recreation and as access connecting campus through multi-functional greeneries. With dramatic elements such as seasonally flowering trees can make it even more iconic, mostly native and natural landscapes contributing to the beauty and unique character of the campus and provide habitat. Quads usually secure an important pedestrian walkway around through a lawn/garden linking buildings as well as providing important landscaped outdoor. Most of campus quads in UK & US built 15 years ago or more are formal geometric lawns providing a variety of usable space, seating and other furnishings, suitable for studying and socialization. The oldest examples are the medieval colleges at Oxford and Cambridge (Mob Quad), plain and unadorned with arcades. Modern quads resemble cloister gardens of medieval monasteries, called garths, enclosed by covered arcades or cloisters.
COS2: Courtyards / building yards (front & backyards)	Courts adjacent to buildings: front yard (main entry) & side/backyard (secondary entry/services). They are areas of flat ground outside and partly or completely surrounded by usually one building (more like internal COS). The design of courtyards focusses on providing a comfortable environment in virtually all seasons, with plenty of seating and a variety of opportunities for personal/shaded activities. Greenery and courtyards around classrooms play also significant role in stimulating outdoor activities and informal social gathering between classes. While not strictly defined as having a paved ground plane, most images of courtyards show primarily hard ground surfaces. The study also distinguishes the courtyards from quads that they are usually circulated by and serves one building while quads are usually more green area circulated by two buildings or more and can be completely open from one or more of its sides.
COS3: Circulation Routes / Corridors / Paths / Pedestrian Malls	Used to facilitate a safe and enjoyable walking experience (accessibility) providing practical links to buildings, public spaces and parking lots (connectivity). Visitors, students and staff are clearly accessing/walking to destinations throughout campus are enormously important. The concept of pedestrian mall is developed (from just a corridor) with seating, shade, and aesthetic features to improve the aesthetic attractiveness of the campus and create a unique atmosphere for social interaction. Major corridors should terminate at the campus limits with well-defined gateways. Design of pedestrian and vehicle circulations include factors like: friendly walkable pathways, safety and stability of walkways; ease of movement, effective circulation, best accessibility and connectivity, ring roads and parking on boundaries to separate campus from outside *(Afsar, Mohd Yazid, & Mohd Johari, 2015; Chesters & Watson, 2016; Ewing & Handy, 2009; Koska & Rudolph, 2017; Matan, 2011)*. By manipulating the hierarchy of paths, the space will regulate the direction of student's movement. The long walk along the main axis where social activities are interconnected with physical space is imbued with symbolism and rich with memories of a meaningful place. The main axis exemplifies the dominant spine – a long, landscaped promenade limited to traffic access, which functions as a visible orientation to all students.
COS4: Campus Square / Main or Central or Core Plaza	Usually the largest and most vital open space located at the heart or at focal point of the campus - usually hard paved and providing passive recreation. It may contain some or all the other COS typologies and thus considered to be the most active. It is also typically fronted by the most important academic and student life building and campus spaces (e.g. library, student union, food courts, main campus axis and landmark) which add the highest value to its significance. Campus plaza also accommodates the university events and serves as a shared space for the surrounding dense academic and social buildings. The scale of these spaces varies to provide more successful, inviting places for students, faculty and staff. Big size campuses usually have more than one central plaza.

COS5: Parks / Natural Reserves / Recreational Areas	This typology designates the healthful element of campus that promote the safety and physical wellbeing of students and faculties and support activities and people change. This can be parks, woodlands, natural reserves, recreational areas like playing field or playground - usually located around the campus edges or closer to accommodations. Parks are large natural areas for the display, cultivation and enjoyment by plants and other forms of nature. They may integrate natural, manmade materials, and may exhibit enrichments as ponds and water features. Parks usually have large and high canopy trees at edges to provide shade for spectators and to help screen prevailing winds. Play or relaxation area formally laid out for active recreation such as football, basketball courts, golf, etc. Playgrounds or playscapes often also designed to provide a safe environment for play informal (or sometimes formal) games in a natural setting.
COS6: Special or Private Spaces / Learning or Inspired Spaces	May include many sub-types which do not belong to the other typologies. It mainly includes special spaces and those unique academic spaces such as outdoor living labs, learning or inspired or innovation spaces, faith-centre spaces, private spaces with permitted access for students with a particular major or for staff only, etc. It is typically a small space or a variety of spaces that allow a student to be as secluded or engaged. To provide experienced, yet iconic units, those spaces are usually composed of distinctive architecture, landscape and signage such as: Technology-enabled, ecosystems (e.g. birds, fishes, etc.), flexible zonings/settings of form, barriers from noise, winds and severe weather conditions, etc.
COS7: Gateways / Entry Plazas / Reception / Campus Frontiers or Edges	Campus entries and gateways serve as a first impression of campus for visitors. Gateways provide access, but they can also physically form common areas and view corridors into and out of departmental buildings, and therefore, they serve social purposes. The “entrance and arrival” theme also adds unique identity to the campus experience (sense of campus). The visual progression from the formal entry to a pleasant walk and nearing prominent buildings in the distance become an experiential spatial sequence. The immediate view of surrounds, the glimpses of views and vistas along the way, the appreciation of spatial sequence in moving from one place to another affect the student’s sense of being in a vivid learning environment. Attractive entry plazas or gateways should include site elements such as strong boundaries with monument signs, integrated system of security kiosks, landmarks or unique architectural features, further clearer ornamental landscapes and more appealing campus art, wayfinding and directional signage (campus maps/information). The incorporation of these elements endorses a pleasant and welcoming experience, orients visitors and marks a notable transition to the university environment. The campus entries are usually accessed from streets and transit facilities, parking areas, and residential neighbourhoods.
COS8: Vehicles routes & parking	Due to the high volumes of pedestrian movement, the academic core of campuses is free of vehicle traffic, except for limited service and drop-off access. Bollards and signage are used where needed to limit access to approved vehicles. This typology is excluded from this study.

3.4.3 Theories, Practices and Design Factors

This section aims to review significant studies about campus as a place and space that made meaningful through student experience *(Tuan, 1977).* Designing such a space necessitates many factors such as giving each outdoor space a clear function *(R. P. Dober, 2000);* character and shape *(Matloob et al., 2014);* clarifying boundaries through the positioning of adjacent buildings, walls, fences, trees and hedges *(Poplin et al., 2017; C.-l. Zhang & Ru, 2013; T. ZHANG & CHU, 2006);* carefully curating urban forms *(Leyden, Goldberg, & Michelbach, 2011; Marrone, Orsini, Asdrubali, & Guattari, 2018; Scheer, 2017)*; making amenities available *(BRAVO, 2010);* choosing a good location *(Bansal, 2014; Jöns & Hoyler, 2013; Poplin et al., 2017)*; maintaining cleanness and providing seating, benches, and tables for studying, eating and conversation for students *(Marcus & Francis, 1998; Yeh & Huang, 2015)*; carvings, statues, paintings and other aspects value or privilege some groups over others *(Al-Kodmany, 1999; J Banning & Bartels, 1993; Campos Calvo-Sotelo, 2014; Gaines, 1991)*; environmental conditions – such as

climate and sustainability practices (proposing productive and rain gardens, welcoming paths/links to surrounding structures, green infrastructure, biodiversity corridors, etc.) *(Alshuwaikhat & Abubakar, 2008; Deus, Battistelle, & da Silva, 2016; Marrone et al., 2018; Orenstein et al., 2019; Pascarella, 1985; Ragazzi & Ghidini, 2017; Washington-Ottombre, Washington, & Newman, 2018; White, 2003).* Such never-ending factors of campus qualities are drawn from a broad range of literature in urban, landscape, environmental and sustainable design *(e.g. (D. CABE, 2000; S. S. Lau & Yang, 2009; S. S. Y. Lau et al., 2014; Marrone et al., 2018))* which are proven to yield motivative and innovative impacts - linking the academic, social and environmental aspects. As such, A successful open space considering those factors will have a significant impact on human feelings and user behaviours, and directly affects what students with physical or visual limitations can do *(Ahmadi Afusi et al., 2014; Farag, Badawi, & Doheim, 2019)*. Therefore, over 800 published studies have been comprehensively examined to extract and prioritize factors and qualities that support the association between the built environment and physical activity behaviour in order to think differently about the way students create, plan, and experience the campus. Below are the key common indicators from these studies including a combination of educational, social, environmental, and spatial features and policy influences of the physical (built) environment.

A. Educational 'the Learning Environment' - Realising the University Mission

This part was comprehensively covered in the previous chapter. Considering elements of the university profile and its mission, a supportive learning environment in a physical sense can enrich students' college experience, create a sense of belonging, and respond to their social and emotional needs. Learning environments with these characteristics are intentionally designed and do not happen by accident *(G. D. Kuh, 2005; C. C. Schroeder & Hurst, 1996)*. Campus urban design is a key criteria that determines a university's educational quality. It affects student perception, cognition, behavior, arousal, and performance *(Moghaddam & Bagheri, 2012).*

Despite the extensive literature on the pedagogic principles of and the design vision for learning spaces and the design and pedagogic principles which underlie them, there is very little evidence to measure the impacts of learning spaces - that are changing - on learning outcomes and student performance. Indeed the use of large-scale surveys is a big step towards assessing the learning outcomes, yet very little of the literature appears to focus upon the detailed, lived experience of students and their reflections of working in new learning spaces. A few studies proofed that a successful campus open space contributes positively to the quality of student life, increases student interaction with the urban environment, promotes psychological comfort and safety, creates memorable places and strengthens the university's life experience *(Davis, 2012; Pace, 1984; Ramsden, 2008).* Additionally, open spaces produce a relaxing atmosphere that encourages students to meet, discuss, and enrich their university's social life *(S. S. Y. Lau et al., 2014).* This section discusses the different COS design factors that assist to generate the discussed outcomes (interaction, collaboration, physical movement, social engagement, etc.) as primary elements of the students learning experiences *(Dugdale, 2009; Halsband, 2005; Jamieson, 2003).*

It is being observed with increasing frequency that the role the physical campus plays in contributing to HE's goals is insufficiently understood *(Greene and Penn 1997, Strange and Banning 2001, Painter et al. 2013, Marmot 2014, Temple 2014, Boys 2015).* In a review covering the learning spaces literature in HE, *Temple (2008)* cites two studies which link learning spaces with performance. First, as with *Cappelli (1992); Volkwein et al. (2000); Wilkins, Balakrishnan, and Huisman (2012)*, an improved student performance related to a new learning space attributes to increased student motivation, facilitation of inspiration among students, and the provision of key facilities critical to course content, etc. However, Temple argues that the empirical evidence for these claims is uncertain. The second relation suggests that more and better use of learning spaces contributes

to the learning quality. However, *Thomas and Galambos (2004, cited in Temple 2008)* state that students give a low priority to spaces use, and that lecturer preparedness is far more important to students with respect to the quality of learning.

Due to its rewarding and increasing importance, some of the most significant groups, placed their concerns on exploring and assessing the factors and qualities of space design to support learning environments such as JISC, EDUCASE, and more recently the OECD-CELE project (Centre for Effective Learning Environments). Additionally, several author's works complement the discussion of the relation between student learning and environment *(Acker & Miller, 2005; Adedokun, Parker, Henke, & Burgess, 2017; Baepler, Brooks, & Walker, 2014; S. Bennett, 2007; N. Berman, 2020; Blackmore, Bateman, Loughlin, O'Mara, & Aranda, 2011; Boys, 2010; M Brown, 2005; S. F. Council, 2006; Delgado et al., 2020; Dudek, 2000; Fisher & Newton, 2014; Granito & Santana, 2016; Grummon, 2009; Heitor & Pinto, 2012; Heitor & Tomé, 2009; Heitor, Tomé, Dimas, & Silva, 2007; Hertzberger, 2008; Hunley & Schaller, 2009; C. Johnson & Lomas, 2005; Lippman, 2002; Long & Ehrmann, 2005; Malcohn & Lippincott, 2003; Monahan, 2002; Reushle, 2012; Schneider, 2002; Scholl & Gulwadi, 2015; Scott-Webber, 2004; Støckert et al., 2019; A. Taylor, 2009).* The Learning Landscapes project, based in the UK, and led by the University of Lincoln, is an exemplar project which has aimed to consider the development of learning spaces across several universities in a holistic way. As with Oblinger's work, several case studies are presented from universities across the US and beyond, to demonstrate innovative design principles in relation to learning spaces with an emphasis on informal and independent small group learning *(D. Oblinger & Lippincott, 2006).* Considering these studies, the following factors are counted to support learning spaces:

- Promote diverse and inclusive design to accommodate a variety of pedagogical approaches and different learning styles.
- Allow dynamic use of learning resources and pedagogic design that open the way for deeper, continuously changing experiences.
- Include and balance between formal and informal meeting spaces. Formal meeting spaces are formal outdoor spaces for interaction including the outdoor portion of a student centre plaza, transportation hub, outdoor amphitheatres, or campus commons *(Amsden, 2005; Gaines, 1991; Paul Venable Turner, 1984).* Informal meeting spaces include seating walls, picnic tables, small greens, overhangs, or other spaces not specifically built for masses to gather separation of formal from informal meeting spaces, upon consultation with campus *(R. P. Dober, 1992; Harrop & Turpin, 2013; Ibrahim & Fadzil, 2013).*

B. Interactive & Personality 'Participatory Spaces' - Meeting Needs & Identities

Participatory spaces are those where individual and group relationships among students and with the environment are negotiated by the lecturers and students, both personally/ separately and expansively/jointly. This closely aligns design with the notion of dynamism in time and space. A design process that is consultative allowing for a sense of ownership and tailoring to the needs and expectations. In their creation, both staff and students need to be consulted in order to facilitate a sense of ownership and belonging, as well as the development of their own practice. *Gaines (1991)* described campus efforts to develop a personality or clear identity as critical for recruitment and the development of a dedicated alumni base – as approved with many studies *(Ferrari, McCarthy, & Milner, 2009; Greenberg, 2007; Reynolds, 2007; Phil Waite, 2010; Whitton, 2018).* This part includes factors such as:

- Sustaining meaningful and appealing spaces. *Gumprecht (2007)* reports that attractive and lively campuses create memories and build loyalty among students.

- Promoting character by responding to and reinforcing locally distinctive patterns of development and culture *(D. CABE, 2000)*. Part of the site character and the space ability to raise curiosity in a new onlooker is referred to as Mystery *(Balling & Falk, 1982; JH Banning, 1993; Zhao et al., 2018).*
- Providing control or shelter from discomfort and overstimulation *(Nikolopoulou & Lykoudis, 2007; Ragazzi & Ghidini, 2017; Roman et al., 2017)*.

C. Engaging 'Collaborative Spaces' - Meeting Socio-Cultural Aspects

Through its problem-solving capability, campus design can play a big role in tackling the grand challenges facing society. In recent years, some research on the more mature urban forms of university campuses tried to explore the general campus morphology from the surrounding context and society *(Boys, 2014).* According to *((Askarizad & Safari, 2020; JH Banning, 1993; J. H. Banning & Bartels, 1997; H. Bowen, 2018; Cope et al., 2021; Izadi & Mohammadi, 2016; Malpas, 2008; Peatross & Peponis, 1995; Pope, Reynolds, & Mueller, 2014; Rapoport, 1980; Sailer, 2011; Shouyun, 2012; Trainor, 2008; M. Watson et al., 2014; Yaylali-Yildiz et al., 2014)*, successful campus outdoor planning increases socio-cultural benefits (direct and indirect) by:

- Creating well connected, inclusive and accessible space;
- Delivering mixed-use environments with a broad range of facilities and amenities available to all
- Delivering development sensitive to its context (e.g. more energy-efficient and less polluting)
- Enhancing the sense of safety and security
- Beneficial public use
- Boosting civic pride/image

As such, the general university campus environment includes the physical and spiritual environments of the campus. This is also a two inseparable/interact component of a good campus, and together constitute the so-called university culture. The former includes the school sites, school buildings, campus, playgrounds and ancillary facilities.

D. Layout 'Functional/Interactive Spaces' – Accommodate Spatial Needs

Campus planners and researches highly consider the layout - the organization of the campus spaces or the way of arrangement - by grouping such spaces together, buildings together, residential areas together, and recreation facilities together - or intertwining the zones completely *(R. P. Dober, 1992; Gaines, 1991; C. C. Strange & Banning, 2001b).* Improving the designs of these areas will encourage greater utilization of this type of space *(Amsden, 2005).* The layout should respond to spatial features making open spaces significant features of the campus by relating them to each other and to buildings as complementary elements. A successful layout will also respond to the composition of students needs and the individual qualities and characteristics of the students, surrounding context and community, as well as university practices. The layout should meet several factors explained below.

Figure 5: The New Corporate Campus, by Draw Patton, PDR, Expert Insights (May 24, 2016)

D1. Permeability, Continuity and Enclosure

Permeability is about promoting the continuity of street frontages and the enclosure of space by development which clearly defines private and public areas *(D. CABE, 2000)*. A sense of urbanism or human scale is fostered when the buildings and/or trees fronting onto them are appropriately scaled (height to width enclosure ratios). Open spaces must be also coherent. Coherence refers to the clarity or comprehensibility. Ambiguity, disorder, and disorientation are major impediments to coherence.

D2. Legibility, Connectivity & Accessibility

The functional factors that make the best use of legibility, node connectivity, ease of movement, achieving well connected and accessible spaces. Promoting accessibility and local permeability factors is through the ease of movement by making places that connect with each other and are easy to move through, putting people before traffic and integrating land uses and transport *(D. CABE, 2000)*. These factors are very much concerned with circulation, which many studies consider a key part in the campus design *(R. P. Dober, 1992; C. C. Strange & Banning, 2001a; Phil Waite, 2010).* Legibility or way finding is another key, relevant factor to achieve connectivity. It is the ability of a new member to scan the environment and be able to perceive (from past experiences) how to navigate the environment *(R. Kaplan & Kaplan, 1989; C. Strange, 2000).* Wayfinding design with signage clarity help users read and discover their ways simply and interestingly *(R. P. Dober, 1992; C. Strange, 2000; Zimring, 1982).* Promoting legibility is through development that provides recognizable routes, intersections and landmarks to help people find their way around. This can be one of the biggest planning worries between experiencing interesting and surprising patterns of movement while also offering international or new students to find their way around a large campus area.

D3. Flexibility and Adaptability

Including key factors that provide the type of 'dynamic' spaces, having the flexibility to change (or facilitate change) in both space and time in order to accommodate different and changing SE *(C. C. Strange, 2003). Kronenburg (2007)* defines flexibility as a design process that is ongoing allowing for a flow of modification and personalization. As such, master plan should always promote flexibility and adaptability through development that can respond to changing social, technological and economic conditions *(D. CABE, 2000)*. However, this can only happen if considered in relation to time. Flexibility will be determined by timeframes: short term i.e. day to day and semester to semester, and longer term, both year-by-year and generation-upon-generation. Such flexibility will ensure that the space can easily be adapted not only to meet new demands but also cost effectively. As a strategic and high-cost resource, the COS should be inherently flexible and dynamic as the relationships, activities and personal histories of both students and lecturers change and evolve. In this case, COS will be used effectively as it is functional and flexible *(Greden & Glicksman, 2005)*.

While *Massey and Massey (2005)* makes the case for seeing space as being socially constructed and, therefore, constantly changing. The space must be flexible to embrace individual needs and social interactions. The use of robust spatial strategies, such as activity-based hubs will support this. Such flexibility should be considered in line with adapting the level of infrastructure and resilience with the context. In a world where access to information takes place anytime and anywhere, flexibility should also reflect a knowledge-rich environment and a technology-enabled campus.

D4. Diversity and Variety

Whilst some differences exist between the design principles supported by different studies, there is a large degree of consistency in defining the diversity and variety of space. Diversity is recognized by developing a mix of compatible designs and activities that work together to create viable places that respond to local needs *(D. CABE, 2000; Harder & Christensen, 2015; Meeuwisse et al., 2010; M. Watson et al., 2014)*. This enables a number of different approaches to learning and students as active individuals. As core quality, diversity is very much combined with the previous factor flexibility and adaptability *(Coelho & Heitor, 2017; Willems, 2005).*

E. Aesthetic / Attractiveness – Visual and Emotional experience

Refers to the overall visual appeal of the outdoor campus landscape *(Balling & Falk, 1982; JH Banning, 1993; De Botton, 2008; L. Johnson & Castleden, 2011; Siu et al., 2021; Paul V Turner, 2018; Van Yahres & Knight, 1995; Zhao et al., 2018).* In some studies, is referred to the 'quality of the public realm', which is to promote public spaces and routes that are attractive, safe, uncluttered and work effectively for all in society *(Matthew Carmona, 2001)*. Part of the attractiveness relies also on the Building style cohesiveness. Several studies have indicated three common types of campus styles: a) monoform - one unifying style per full campus or sector of campus, such as Collegiate Gothic, or Georgian; b) metamorphic - disparate styles united by one or more unifying characteristic, and c) mosaic, no unifying characteristics *(R. P. Dober, 1992; Elfland, Kanter, Kenney, & Kroloff, 2006; Greenberg, 2007; Petroski, 2013).*

Maintenance and Cleanliness is another factor affecting the quality and visual experience. It is crucial to forming positive impressions of the campus environment with clean, well-maintained spaces; discourage vandalism and encourage people to spend time in an environment *(R. P. Dober, 1992; Phil Waite, 2010).* Durable urban furniture (discussed in a separate section) with a thoroughly tested feasibility will have a longer lifespan, which will make a disorderly urban image impossible. On the other side, the visual quality is negatively affected by the lack of care and attrition.

Promoting campus as an aesthetic showpiece imparts a sense of place with artistic identity. For example, the gateways to campus entrances can also impart a sense of welcome *(C. Strange, 2000)* and serve as an important demarcation from the surrounding environment *(R. P. Dober, 1992)*. Such meaningful qualities go beyond advertising the aesthetic value of the COS for student recruitment purposes to recognizing the entire campus landscape as a learning space and advertising its educational value – that is more than just its visual appearance. Recognizing college campus landscapes as vital learning spaces will harness the holistic potential of college campuses as attentional resources. Hence, well-designed and connected networks of indoor and open spaces on campus can be key with a strong influence on students' experiences that promote a sense of awareness and attraction to the environment and community.

F. Landscaping & Urban Furniture

Landscape means many things; it is the green spaces, parks, squares, and streets; it is their designs and their furniture; it is hard and soft. A key design principle is to treat everything as landscape; if buildings define the edge of space, landscape occupies the space. The designs should, in a holistic manner, interrogate the relations of all campus design, contributing to the tangible and intangible needs of the students, and meeting all their working, resting, entertainment and play needs including man and women, the young and the old, the healthy and the ill and the disabled; from all years and all schools of the university. From observing over 40 universities and 100 COS, the elements of urban and landscape design that are compatible with the COS and enrich its impacts to form the foundation of its spatial identity are:

- Soft landscaping or the flora covers the design of greens and vegetations. Greenery examines the percentages and designs of green ground coverings or lawns. Vegetation is more concerned with dense plantations which has no access (tree lawns, shrubs, flowers group, etc.). Form and texture of varying plants, and trees lining and embracing the walks - with their shades and tints of green - raise the campus landscape along the pedestrian routes to a meaningful place.
- Urban or site furniture covers a considerably large section of the campus space and is a key part of its designs. Besides the direct functionality it offers to students, it plays important roles in the formation and development of all other aspects of campus design - the educational, social, environmental and aesthetic environments.
- All water features natural and built (water dispensers, fountains, free drinking water, lakes, ponds, rivers, canals and streams, pools, waterworks, etc.), which provide rich wildlife habitats, offer recreational value and sometimes used as movement corridors.
- Ground flooring or paving (stones, tiles, cast on-site, etc.)
- Levelling (slopes, ramps, steps, stages, etc.)
- Lighting and signs (square lamps, lighting projectors, special lighting devices, direction and traffic signs, campus plans and maps, information boards, billboards etc.)
- Landmarks & artworks (observation or clock or water towers, monuments, historical walls or statues, sculptures, corners with symbolic meaning, etc.)
- Cleansing tools and garbage cans/bins
- Vehicles barriers or restricted access
- Recreational items (Toy units or children's playgrounds, chessboard, outing and fitness, etc.)
- Infrastructure (fireplugs, electrical and communication fittings, telephone booths, ATMs, etc.)
- Special and technology-enabled fittings (sounding devices for urban acoustics, digital interactive walls and displays, and other smart sensors and advanced technologies).
- There are two other items that are separately discussed. Areas that provide a place for sitting and meeting needs (all kinds of seating units, benches, chairs, tables, etc.), and shades/shelters or stops (pergolas, light structures Kiosks or food cabins, open markets, toilet cabins, etc.).

G. Environmental - Meeting Ecological Factors (Excluded)

A learning space that gives attention to environmental aspects. A design process gives attention to aspects such as sustainable procurement and ecological architectural design. The results from several research studies shows the various benefits of implementing such factors which are explicitly linked with the flexibility and enrichment of deeper learning *(J. H. Banning & Bryner, 2001; Beatley, Timothy, & Manning, 1997; Chou, Lee, & Chang, 2016; Day, 2002; Hartig et al., 2014; Orenstein et al., 2019; Rapoport, 1980).* All the above – educational, interactive, functional, collaborative, aesthetics, landscaping, and environmental factors - have significant impacts on the student experience. However, the research focus - and for the limitations of this study - is more on the social experience and the physical design factors rather than the wide influences by the green and ecological features (e.g. bioswales, rain gardens, permeable materials, green roofs/walls, etc). Also excluding the environmental factors as the overlaps with the health and psychological literature produced a lot of nonrelevant studies. Rather, there is limited literature and research on how campus urban design spaces fit student needs and how to use those needs to develop campus urban design *(Yang, 2007).*

3.5 Lit-2/3 Theoretical Framework : Space-Student Integration

This section concludes the chapter with the below table – as the second level of the framework. In campus morphology and design, there are various trends and factors to achieve the space-student integration (for example mixed-use) each focus on certain factors. It is widely accepted that the lack of or inappropriate student-space integration threaten not only the use/function of the space but also the experience of their users as discussed in the previous chapter. Contradictory, the open and informal atmosphere of COS, if good-naturedly integrated, can stimulate creative expression, increase the student satisfaction and achievement with the university. As such, the measures of each factor of this integration, determines and compares design in various areas. For example, in the campus life, a well-designed open space shall create an integral blend of private space for concentrated study or public space for collaborative exchanges. The table briefly list the factors deemed to be important in designing useful and responsive COS. Each factor is associated with its main and sub indicators, as well as the quantitative and qualitative measures.

Table 6: Lit-2/3 Framework – valuation of space-student integration with methods of assessment

URBAN QUALITIES	ATTRIBUTES		
Domain Key indicators - Definition - References		**Quantitative Measures**	**Qualitative Measures**
1. Physical Space – DESIGN **Functional to Accommodate Student & Academic/Educational Needs**			
Adequate layout/ Spatial planning *Relevant studies: (JH Banning & Cunard, 1996; Bansal, 2014; Beckers et al., 2015; Calvo-Sotelo, 2001, 2014; Matthew Carmona, 2001, 2010a, 2014, 2017, 2019, 2021; R. A. Ellis & Goodyear, 2016; Ewing & Clemente, 2013; Ewing & Handy, 2009; Jamieson et al., 2000; C. Johnson & Lomas, 2005; Katzschner, Bosch, & Röttgen, 2003; Marcus & Francis, 1997a, 1997b; Matthew, Tim, Taner, & Steven, 2010; D. G. Oblinger, 2006; Pasalar, 2004; Sensbach, 1991; Thilagam, 2015; Van Yahres &*	**1.1** - Morphology - Configuration - Fabric	- Buildings : open spaces (ratio %) *(Franz, Tausz, & Thiel, 2015; Wu et al., 2017; Yaylali-Yildiz et al., 2020)* - Number of students by total open space area : St per 1m²	- Promote COS and routes that are attractive, safe, uncluttered and work effectively for all in society. - Handles adjacency, approach routes, centralism, etc. - Create coherent and viable urban form.
	- Scale - Compactness - Contextual		- How the scale of buildings and spaces suits the site (human scale). - Adequate proportions.
	- Density - Utilization		Observation (gate counts); Masterplan, Google Earth, Open-Street-Map.
	1.2 - Diversity & Unity - Spatial variety & adaptability	- The variety of activities and the diversity of the students (different age-fields-cultures) - indicate how responsive the space is for different users and purposes *(Garcia et al., 2001).*	- The way of arrangement and layout looking at inside and outside unity. - Unity of spatial composition and its internal conformity. - To promote choice through a mix of compatible developments and uses.
	1.3 - Legibility - Wayfinding - Readability	- Number of guiding signs & lightings, hierarchy of layout routes *(Gärling, Säisä, Book, & Lindberg, 1986)*	- Easily understood by newcomers - Easy orientation & direction finding. - Recognisable routes, intersections and landmarks to help find way around.
	1.4 Flexible - Adaptability - Future-proofed - Robust - Inclusionary	- Provision of space technologies. *(Ardeshiri, Esteghlal, & Etesam, 2016; Greden & Glicksman, 2005; Kronenburg, 2007; Monahan, 2002; Willems, 2005)*	- Dynamic in time & space (adaptable and distinct in the face of change). - Sufficient typologies & multiple use responding to various changing functionality, economic & social needs.

Knight, 1995; Phillip Waite, 2014; P. S. Waite, 2007; Wu, Law, Heath, & Borsi, 2017; Yaylali-Yildiz et al., 2020; T. ZHANG & CHU, 2006)	- Convertibility - Versatility		- Changing nature of technology (Net Generation - Accommodate ICT). - Students ability to manipulate and create the type of space they need, from being alone to being in a large group.
	1.5 Continuity & Enclosure - Privacy - Communal - Shared - Ownership - Openness - Expansibility	- Private - public space (ratio%). - Classify into public, semi-public or private urban spaces *(Madanipour, 2003).*	- Well-designed public & Personality - Promote the continuity of street frontages and the enclosure of space by development which clearly defines private and public areas. - Indicate openness/closeness, coverage, and definitiveness of space. - Different hierarchy levels and diverse qualities to meet community needs. - Integrated design approaches to maximize function, amenity and beauty. - Physical spatial arrangement of elements to facilitate & inspire a heavy use (sit, read, climb, jump, flirt, social contact, converse and meditate, etc.). - Community involvement/participation that precede & inform the COS design.
	1.6 Integration - Interaction - Compatibility	- Number of intersection points (rates of interaction among users and with the space which allows for the social, cultural & learning experience) *(Pasalar, 2004; Peker, 2010; Poom, Ahas, Silm, Aasa, & Post, 2018; Thilagam, 2015; Yaylali-Yildiz et al., 2014)*	
1.7 Connectivity & Accessibility - Well connected - Inclusive - Accessible - Permeability - Ease of Movement		- Depthmap % - Open to extension (Total area Site boundaries : total areas of opened to surrounding) - Circulation routes : campus area *(Cadena, de Andrade, & de Freitas Dourado, 2017; Cadena, de Andrade, Meira, & de Freitas Dourado, 2020; Heitor & Tomé, 2009; Jud, 2003)*	- Delivering mixed-use environments with range of facilities available to all. - Enhancing the sense of safety/security. - Easy access to public transit. - Places that connect w/ each other and are easy to move through. - Putting people before traffic and integrating land uses and transport. - Interconnected bike and pedestrian-friendly streets. - Quick access to services, greeneries and to recreation and leisure areas.
1.8 Meaningful	- Expressive - Comfortable	- Amounts of protection from weather, sunlight & air/noise control). - Amounts of site furniture (comfy seating) & shades. *(Cheng, 2004; Greenberg, 2007; Hanan, 2013)*	- Incorporating notable living conditions. - Feeling safe and relaxing. - Respond to psychological & personal needs (e.g. interesting landscapes). - Convenient environmwent & env-friendly design.
Aesthetic / Visual and Emotional experience	- Interface & visual appearance Character - Esteem - Identity - Style & Attractiveness (vernacular, modern, etc.) - Rhythm - Harmony	- Availability of decorations, aesthetics elements, screened parking, etc. - Student satisfaction analysis. - Record materials quality & lifecycle. *(Al-Kodmany, 1999; Balling & Falk, 1982; JH Banning, 1993; Forsyth & Crewe, 2010; Hernández, Hidalgo, Salazar-Laplace, & Hess, 2007; L. Johnson & Castleden, 2011; Polat & Akay, 2015; Siu et al., 2021; Ulrich, 1983; Zhao, Wang, Cai, & Luo, 2013; Zhao et al., 2018).*	- To impart a sense of place, an artistic identity, and an aesthetic showpiece. - Sensitive/responsive to its context. - Boosting university pride/image. - Respect local history/character. - Respect the urban fabric. - Respond to and reinforce locally distinctive patterns of dev. and culture. - Adaptation of vernacular elements.
	- Maintenance and cleanliness		- Observe cleanliness at different spaces/times. - Consider potential for increased requirements for the management,

			maintenance and asset renewal of facilities, landscapes and materials.
Landscaping *(Amirbeiki & Khaki Ghasr, 2020; Atchley et al., 2012; Balling & Falk, 1982; M. G. Berman et al., 2008; Bratman et al., 2012; Campos Calvo-Sotelo, 2014; Creswell, 2010; R. P. Dober, 2000; Dugdale, 2009; Engler, 2015; Francis, 2001; Gabr, Elkadi, & Trillo, 2019; Gaines, 1991; Ghorbanzadeh, 2019; Graham, 2006; Gutierrez, 2013; S. Jasim & Kamel, 2017; S. N. Jasim, Abdulrazzaq, & Khaleefa, 2018; L. Johnson & Castleden, 2011; S. Kaplan, 1995; Keniger et al., 2013; Kwon & Silva, 2020; S. S. Lau & Yang, 2009; Lin & Dong, 2018; Lombard, Cowling, Vlok, & Fabricius, 2010; Matloob et al., 2014; Polat & Akay, 2015; Scholl & Gulwadi, 2015; H. W. Schroeder, 1991; Shouyun, 2012; Steiner, 2011; Tennessen & Cimprich, 1995; Vallés-Planells, Galiana, & Van Eetvelde, 2014; Van Yahres & Knight, 1995; Velarde, Fry, & Tveit, 2007; Phillip Waite, 2014; Yang, 2007; Y. Zhang, 2006; Zhao et al., 2013)*	A. Seating Gathering places *(Bredow, 2006)*	- Furnished/seating area: total open space - Numbers of seats : numbers of students	- Provide seating at regular intervals along trails, walking tracks and dual-use paths, as rest stations for recuperation or observation. - To capitalize on views and areas of community activation. - Ergonomics of seating elements. - Integrate wheelchair stopping points as part of seating areas to ensure all accessible points of congregation.
	B. Greenness (lawns) C. Vegetation (Planting, trees, shrubs, flower box, etc.)	- Paved space : Green space (ratio%) - Numbers of trees canopies, plant boxes, etc. - compare data on footfall for mixed use cases to average for locality (vitality). - layouts + Google Earth + Open-Street-Map + Depthmap	- Locate productive gardens where they are visual and accessible. - Use of various forms, colours, types, and density of planting. - Select for their longevity (50-60 years). - Habitat value to ensure the connection to nature is maintained. - Trees should not impose visibility and should be clear stemmed to a minimum of 2.5m above ground level where shadowing is required. - Selection of trees & shrubs should avoid impact on infrastructure and does not lead to potential public liability issues.
	D. Shading	- shaded (natural/ build): total area - Avg % of tree canopy.	- Provide various sufficient shelters.
	E. Site furniture	- Water: Water areas : total open space	- Incorporate porous surfaces to allow water to permeate and increase stormwater inundation. - Water features, fountains.
		- Bins, bike racks, etc.: - Furnished area: total COS area	- Should encourage gathering and provides meeting points that respond to and provides for social interaction based on context/typology. - Ideal location, also should be readily accessible by the maintenance staff. - Avoid excessive physical and visual clutter and potential conflicts with users.
		Public arts	- Statues and artwork, manipulation of the ground as sculpture to create activation, animation and destinations. - Foci or landmark to mark a place of cultural significance. - Can be designated for recreational activities, a gathering spot or destiny.
		Lighting and signs Provision of: - Access, public spaces & pedestrian lighting. - Landscape lighting. - Decorative and feature lighting.	- Consider using lighting to increase evening activation whilst increase comfort and safety. - Effective and correct lighting. - Systems of symbols and legible information signs (way finding).
	F. Materials Durability		- Select durable materials with 20-30 years asset lifespan. - Less maintenance required.

2. Sociability/Livability – USER Experience Meeting Participatory and the Diverse, Socio-Cultural Aspects		
2.1 Quality of Public Realm Interacting - Engaging - Social Livable - Active - Dynamic - Walkable Comfort - Relaxing Sense of place - Place attachment Sensitivity	*(Abbasi, Alalouch, & Bramley, 2016; Abu-Ghazzeh, 1999; Amarathunge & Madhuwanthi, 2020; Askarizad & Safari, 2020; Backhouse & Drew, 1992; J Banning & Bartels, 1993; Cao & Kang, 2019; Cope et al., 2021; Crook & Mitchell, 2012; da Silva & Heitor, 2017; Düzenli et al., 2012; Fisher, 2005; Greene & Penn, 1997; Hiller & Hanson, 1984; Jamieson et al., 2000; C. Johnson & Lomas, 2005; Kazmierczak & James, 2006; Leander, Phillips, & Taylor, 2010; Lupton, 2005; Marsden, Oakley, & Pratt, 1990; Peatross & Peponis, 1995; Sailer, 2011; Salter, Junco, & Irvin, 2004; Whyte, 1980; Wu et al., 2017; Yaylali-Yildiz et al., 2014).*	- If available, compare data for individual developments on enrolments, student satisfaction, events, etc. - Interviews (university estates & users/local community) to mark positive impressions, feelings of space & society. - Map behaviour & trace how meaningful & purposeful (issues of place-identity, vitality & inclusiveness). - Levels of personal development, active uses, group meetings & social engagement.
2.2 Learning Environment Creative - Inspiring - Enterprising Instructive - Multicultural Supportive - Collaborative Sense of belonging - participation		- Maximise alignment of different curricula activities & support several types of activities. - Reflect university mission & rules/values. - Maximize teacher and student control. - Maximize student access.

Ch4. THE INVESTMENT PERSPECTIVE LIT-3: MEASURING LINKS & IMPACTS

"Design thinking is a human cantered approach to innovation that draws from the designer's toolkit to integrate the needs of people, the possibilities of technology, and the requirements for business success."

Tim Brown, President and CEO of IDEO

Universities as long established, self-sufficient public bodies could play key role in shaping and participating in investment and planning. Considering university as an investment - both of time and money - owners, governments, and consultants need to develop thoughtful informed decisions they need for wise investments. For them to prioritize projects, massive future investment must be assessed to efficiently value which improvements are of the most significance to SE and would yield the "best value for money". *Rymarzak and Marmot (2020),* confirmed that the increased spending by the HE sectors is likely to be driven by the need to provide an outstanding environment to ensure continued recruitment of students. Besides, some research believe that urban design assessment is one of the best professions in problem-solving *(E. Eckert, 2012; E. L. Eckert, 2012; Moghaddam & Bagheri, 2012).* As such, chapter 4 - the third and last part of the literature - aims to develop the basis for assessing and methods for comparing developments with the basic financial information to set the stage for an informed, integrated and justifiable decisions – in regards to the impacts of clearly articulated COS typologies that capture the range of student experiences. It also discusses different, efficient ways of using financial aid to invest in encouraging and improving the student experience on campus and support more activities - considering the position/status of the university and the value of its campus spaces. This also may support the investment decisions to achieve higher returns on investments and more added values from improving the SE. The chapter responds to questions like: does the investment actually translate into an experienced-based COS? How can we support or prioritize between the alternatives of COS development/renovations?

4.1 Economics and Benefits of Enhancing the Student Experience

Theis section explains some social and economic benefits from enhancing the SE. First, education itself is no longer countered by only in-class learning but more linked with the associated experiences. Indeed, HE has entered into an era of transition with changing student demographics, rapidly evolving stakeholder demands and new technologies. Long-standing models of HE that prefer tradition and stability will be supplemented, if not displaced, by new models that embrace logistic innovation, responsivity, and adaptation *(Gilbert, Crow, & Anderson, 2018).* Universities, therefore, seek continuous growth for responding to market and student demand for courses in a particular discipline, utilizing expertise and leadership, and competing with other institutions to draw high-quality new students and faculty.

Second, this required universities to reconsider also abiding assumptions about the campus layout, time, and quality. All development projects exist within a context of finance, time, and resources and these are high on the agenda of all building commissioners, financiers and developers. Furthermore, via blending experiences and campus environments, universities are keen to re-integrate scientists, researchers, academics and students with local communities, and to participate in the wider dialogue and practice of urban regeneration. As universities get bigger and more anonymous, the need to plan for greater connectivity in student life and provision for social contact is articulated by students, while the pressure on available appropriate teaching space, and lack of dedicated individual workspace, is often a frustration for staff *(Boys, 2014).* Drawing upon this belief, the importance of informal social learning spaces for self-directed learning grow, when the student-staff contact time reduced as student numbers grow. These factors are another motive leading to the growing reliance on the design of larger, more generic and more flexible COS, often shared by different disciplines, and supported by state-of-the-art landscape features. They are intended to promote collaborative work and may include a multimedia venue, social learning cafés and forum or central plazas (for displays, events promoting interaction & university-community interface).

Third, the most common private return is the increased income resulting from going to university. Others are non-quantifiable entities such as a greater appreciation for culture, social connections, etc. *(Marsden et al., 1990).* Going to university is encouraged and supported by several experiences such as students' enthusiasm and the social and wellbeing benefits of attending. Analysing four categories of college-related outcomes and benefits (public and private economic benefits, public and private social benefits), the Institute for Higher Education Policy (IHEP) concluded that individuals and society at large benefits from each person who attends college *((1998); see also (Williams & Swail, 2005)). Pascarella and Terenzini (2005)* concluded that attending college clearly influences occupations and earnings and various indices of quality of life, in part because college graduates tend to choose environments with similarly educated people, including spouses, close friends, and colleagues who share their social and political points of view. These quality-of-life benefits are transmitted to their children, favourably shaping their academic preparation, college choices, and college performance. This explains the universities efforts for organizational change to embody and tackle deliberate choices from both legacy and emerging markets that purposefully shapes the object and direction of enhancing the SE, exceptionally, fulfilling their social mission. "Socially Optimizing HE" should lead to an effective way not only to increase enrolments and attendance but to bring improvements in the social structure and relationship, and bringing empowerment in the community in university and around *(Moulaert, Mehmood, MacCallum, & Leubolt, 2017).*

Forth, attracting investments and funds is of growing importance on their effect on brand attachment, commitment, satisfaction, trust, visibility and emotional connection with alumni *(Dennis, Papagiannidis,*

Alamanos, & Bourlakis, 2016)[21]. There is also increased reliance on private fundraising to support existing services and campus growth. Universities also strive for investors and planners to seek new approaches to the briefing and design of university campus. Even with private donations and the best efforts of many institutions, the cost of attendance per student is climbing at a rate that far outpaces the Consumer Price Index (CPI)[22]. In fact, collective student debt now exceeds total consumer debt in the US, and, as a result, is a subject of current political debate about the cost/financing of HE[23]. The financial setting for academic institutions has also changed. British universities have ramped up their spending on new buildings by 43% from the previous year, in the race to expand campuses and draw worthwhile foreign students *(Morris, Adams, & Ratcliffe, 2016).* As such, to meet the challenges of limited budged planning, universities should redesign their core functions while also creating capacities to reach emerging and underserved markets.

Fifth, the nature of the institution, growth is very linked with the students' needs, expectations and with the most needed typologies of experiences. The specific needs of the campus environment will also vary - depending for example on whether students live on-campus or commute, whether it is publicly- or privately funded, the scale and size of campus, etc. Hence this study reviewed the types and typologies of design and use starting from the scale of university campus till the campus open spaces. This will help draw decisions for selecting the best design choices to accomplish and how it is organized to achieve those ends. Best choices that not only reflects changes in and responds to models of pedagogy within the academy (multi-disciplinary, cross-disciplinary and collaborative teaching and research), but also with the least costs.

4.2 Theories and Methods of Student-Space Investment Evaluation

Despite all mentioned benefits, very few studies have been conducted to uncover possible links between institutional expenditure and SE, and those few have produced conflicting results *(Alexandra Cornelia Den Heijer, 2011).* New theories and methods of cost-based and experience-based assessments are arising as attempting to measure the links between investments/expenses of space development and the enhanced SE. This mainly help decisions about whether universities can use the allotted spending amount (e.g. standard income, hiring professors, funding more scholarships, etc) in order to extend, upgrade and/or repairing spaces and facilities. This is however complicated mission with lots of ingredients and therefore, out of the scope of this research. This section offers very brief preview of assessments methods, theories and practices to understand how investments in campus developments are assessed in line with the needs and values of students and university planning. It considers new evaluation methods and strategies to space-student investment approach for improved SE. The following sections shows the typical/common methods for general urban valuation as well as a detailed assessment of the campus experience.

4.2.1 Assessing the Outcomes/Values

One way to assess the outcomes is by calculating the gross value of all the elements (in accordance with the RICS red book valuation[24] on what is termed an 'open market value'). The advantage of measuring the

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[21] *"Since the change in the tuition fee regime universities have focused on improving campus facilities in the increasingly competitive market of attracting prospective students. This has involved using increased student fees and debt markets to invest heavily in construction projects," said Michael Dall, lead economist at Barbour ABI.*

[22] *https://www.bls.gov/cpi/factsheets/college-tuition.htm*

[23] *https://educationdata.org/student-loan-debt-statistics*

[14] *Red Book Valuations are those that meet the criteria set out by the Royal Institution of Chartered Surveyors (RICS). RICS Valuation - 'Red Book Global Standards' contains mandatory rules, ethical standards & best practice guidance, to promote high standards in valuation delivery worldwide. It also offers a useful reference resource for valuation users/stakeholders.*

value of design using this standard practice in the real estate world that in the event of dispute can be the subject of third-party verification. It is a much cleaner approach than trying to determine profit or added value as these concepts can be subject of too much argument over what is or is not included whereas 'open market value' is the most used methodology. The 'value' debate has been central to CABE's work since publishing *'The Value of Good Design' in 2001.* This provided evidence of the economic and social benefits of good design for several different sectors including healthcare, education, housing, civic projects, and the commercial sector. 'Be Valuable' updates this evidence gathering, but more radically explores how different sectors of the built environment profession and academia have developed concepts, methodologies and tools for valuing design, and the roles of different stakeholders in creating value. The Value Mapping project was commissioned by CABE in late 2005 and was managed by the Young Foundation, drawing on a team with experience of research and practice.

In case of universities, the value is determined based on customers' (students) expectations of the service and the costs in comparison to the competitors. Understanding the value and creating customer value are a means to attain competitive advantage and constitute the basis of price setting. Because universities depend on investment returns for supplementary income, there could be trouble if the investments do not yield a suitable amount of returns. As an initial step towards value-based pricing method, the possible value factors are suggested for calculating university price/value.

Pike et al. (2006, 868) found "very complex" relationships between expenditure and student engagement, contingent on a number of factors including institutional control (public vs. private institutions), students' seniority, and type of engagement measure. Measuring the social benefits can be extremely difficult, but essentially. As *Rizzo (2004)* suggests, it involves adding the private returns to education (personal benefits) and the public benefits (such as the improved livability of a community since educated individuals commit fewer crimes and need fewer social services) and then subtracting the private and public costs. The private returns in HE is the ones captured by the principal investor - the student. Studies of students outcomes focus primarily on the economic benefits associated with degree attainment. *Kuh (2009a, 695)* calls for studies to examine the cost/benefit ratios of "high-impact" practices, considering the probability of enhanced persistence and success of students who participate in these activities. Knowing the costs of high-impact practices and student success interventions such as mentoring behaviours and outdoor integrative systems could help institutional decision-makers to decide whether to reallocate resources and invest in them.

4.2.2 Assessing the Design : Benchmarking via the Urban Quality Indicator

To continuously meet the user needs and expectations, institutions need to benchmark their spaces, inventions, and processes by analysing their leading competitors in the same industry or other industries using similar processes. Benchmarking Organizations can compare their services/practices against peers in order to enhance performance through benchmarking *(Goetsch & Davis, 2003; Qayoumi, 2012; Salhieh & Singh, 2003; Tasopoulou & Tsiotras, 2017).* The rapid changes in the market environment (in organizations) such as the changing nature of people intelligence, increased competition, specific improvement initiatives, national and international quality awards, changing internal and external demands (stakeholders), accelerated technological advancement, changing institution roles and the acceleration of globalization has led to changes in benchmarking of products/processes *(Moffett, Anderson-Gillespie, & McAdam, 2008).*

The case for investment in the built environment, and for the qualities it should have to deliver the best urban benefit sacrifice ratio (best value), requires systematic research and feedback on what works and

what it costs to run. The first cost of everything is easily known, but the value of nothing, particularly with the absence of customer, academic and practitioner investment in this knowledge. Good design quality enables the better deployment of the physical resources and can add value. Added value (Asset value) starts to indicate that the space will add value to the activities for which it is intended. 'Excellence' is achieved when the design sparkles as a whole meets the fundamental factors and added values.

The study developed a comprehensive intellectual framework that constitute high design qualities with greatest impacts adapted from the Design Quality Indicator (DQI). *Saxon (2005)* has developed the DQI based on the ideas of Vitruvius. The Construction Industry Council (CIC) identified the three quality fields of 'functionality - use value benefits' 'build quality - use value sacrifices' and 'impact - social, cultural, image and environmental value areas'. Each topic under these three main indicator sections is separately rated against a group of about ten questions. The more overlap there is between these three quality fields the higher the overall design quality. Functionality is concerned with the way in which the place is designed to be useful and is split into use, access, and space. Build quality relates to the performance of a space fabric and is split into performance, engineering, and construction. Impact refers to the space's ability to create a sense of place, and to have a positive effect on the local community and environment. It is split into character and innovation, form and materials, internal environment and urban and social integration.

4.2.3 Assessing the Assets : University Budget & Costing Models

Calculating the cost or value of a university or a place is a very complex process with many variables. Three common methods/classifications of analysing costs at university campuses: direct and indirect costs (overhead); educational & general costs vs auxiliary costs; and fixed & variable costs. Another way to indicate the value of a university is by calculating its surplus which total income subtract total expenditure. Below are different ways of calculating costs and their corresponding percentages of the total costs commonly used in UK and US universities.

Table 7: Breakdown with average percentages of costs and expenses of a public university in UK & US

	Ownerships & Cash in/Revenue	UK	US	Cash outs / Cost drivers	UK	US
1	Net tuition and fees revenue	49%	25%	Salaries & benefits & academic staff	60%	50%
2	Fund-raising donations; government/state grands; education/research grants	27%	35%	**Institutional & instructional expenses:** student support (Bursaries & outreach, student experience); Program supplies (academic/research support)	2-8%	20%
3	Endowment, private donor/grant & investment incomes; sponsored projects (project Income from external institutions)	1-3%	15%	**Managerial costs:** Administration, central services, training costs, marketing & advertising	1-5%	15%
4	Student Accommodation, Catering & student services	5-15%	10%	**General/Operating expenses (Lifetime costs):** Campus premises (library & IT, computing), maintenance & improvements (infrastructure, repairs & preservation), utilities & public services (security, safeguarding, communication), taxes & occupation costs (rents, equipment leases, etc.)	29%	15%
5	**Land values:** How much a campus site & buildings are likely to be worth with planning permission (land acquisition costs).	-	-	**Design Development & Construction:** consultants, design fees, materials/equipment, labouring, supply/deliver, landscaping, etc.	-	-
6	**Auxiliary & activities:** Hospital, independent operations, enterprises, consultancy, conference, catering, hire of rooms, car parking & permits.	5-15%	20-30%	**Auxiliary costs:** Residences/dormitory and cafeteria costs, interest & other finance costs	3%	5%
UK resources: *HESA (2019) Data & Analysis - Higher Education Provider Data; UniversitiesUK (2019) facts & stats/data & analysis; statista.com (2018) Higher Education institutions income; IFS.ORG.UK (2019).*						
US resources: *US Department of Education, National Centre for Education Statistics (2020); Delta Cost Project (2016); Educationdata.org (2018/20) Average costs of college; Statista.com (2018) Expenditure of public & private universities.*						

Nearly every university uses a prescribed viability framework as part of a routine audit of every department or degree program offered *(Tremblay, Lalancette, & Roseveare, 2012).* The Hanover Research Council for example explores the financial models used by US colleges and universities to determine net revenues and profits generated by specific academic departments and athletic teams with the goal of assessing program viability. However, at many institutions, university administrators require that each program be examined for academic and financial viability on a regular schedule, typically every 5 or 7 years *(Hemsley-Brown & Oplatka, 2006; Research, 2014).* Routine audits are performed so that the institutions understand the viability of all academic offerings. This structure allows for data from thriving programs to be used to create benchmarks for future audits within or between programs[25].

Hard or inflexible standards for financial (or academic) metrics appear to be very rare, except in reference to student enrolment levels *(Berry, 2014; Hamilton et al., 1993).* Viability auditors are much more likely to ask whether a department brings in "substantial funds" from external sources rather than designating a specific amount, and terms like "adequate" and "sufficient" are more prevalent. Most mentions of financial viability follow a long list of academic- and performance-related requirements, indicating that high-quality academic performance is the most important factor at most of the institutions studied. Even regarding issues related to generating revenue, many institutional audits appear to be more concerned with program popularity than with viability. This is not to say that financial factors are unimportant, rather, economic concerns are simply understood as part of a grander scheme of a fully functional and efficient institution with an established mission statement. "Is demand for program X high enough to justify its costs?" appears to be a more important question than "Is X program losing money?" That being said, this research will not discuss program quality issues even though many viability frameworks make explicit mention of these metrics alongside economic concerns *(Research, 2014; Tasopoulou & Tsiotras, 2017).*

The difference between Value-based vs cost-based developments/projects can be seen in an example of a journey *(Rouse, 2004; Thomson, Austin, Devine-Wright, & Mills, 2003).* A value-based journey sets out with an ambition but no clear destination (a waste of time), while the cost-based has the destination as the aim without any interest in the journey (a waste of opportunity). It is proven that value fee basis has more influence on the project than those charging on cost fee or time basis. However, both types of experience need to be accessed.

A university budget is a statement of an organization's plans, priorities, goals, and objectives, expressed in financial terms, for a specific period of time *(Gibson, 2009; Szatmary, 2011).* The most common period of time that an operating budget for university covers is one year. Capital budgets are generally for a longer period of time. The primary purpose of the budget is to assist in planning and control for the organization, department, or program. The control function of the budget kicks in after the activity has occurred. Its purpose is to determine if what was anticipated is what actually happened. To begin preparation of a budget for a university, must know the budgeting process to put into action: Identify what need to be accomplished (the mission), how to accomplish (goals), seek the necessary resources and funding the university priorities and purposes financial manager, and evaluate the alternative strategies and select one. The strategy specifies the activity, what is needed, when it is needed, and what resources will be required to accomplish the goals (How much will the activity cost?). The goal and its strategy become the justification for the budget. Appendix (09) offers a brief description of the most common budget models used in HE. All models are developed from basic towards more assessing the factors that influence practices and decisions for improved SE as summarized in the table below *(Gibson, 2009; Lasher & Sullivan, 2004).*

[25] *Example of viability audits at www.roosevelt.edu/provost/programReview/schedule.htm.*

Table 8: Summary of relevant business-based models and methods for assessments (Cordes, 2017; Decter et al., 2007; Gibson, 2009; Lenington, 1996; Smart, 2008; Szatmary, 2011)

Enrolment-Based Measurements	The number of students in a program multiplied by total tuition.
Multi-criteria analysis – MCA	Undertaken to make a comparative assessment between projects or heterogeneous measures. Applied weights consistent with the relative importance of the effects on society. Algorithms used to select alternatives according to a set of different criteria and their relative 'weights'. In contrast to CEA, which focuses on a unique criterion (the maximization of social welfare), MCA is a tool for dealing with a set of different objectives that cannot be aggregated through shadow prices and welfare weights.
Economic impact analysis – EIA	An exercise to determine how a project/policy affects the amount and type of economic activity. At mega-projects (very large projects relative to the economy i.e. have a significant macroeconomic impact. The social, economic and environmental impacts of an intervention are all interlinked. The various types of impact assessment may therefore need to be combined in an integrated impact assessment. Total economic impact = duration of economic benefit (average life expectancy by years) x total people (population size) x total costs prevented I.e. Economic profit = total revenues/sales - total costs (explicit & implicit)
Activity-Based Measurement / Costing – ABM / ABC	A method of identifying and evaluating activities as the fundamental cost object of the organization, by utilizing the cost of these activities as the basis for assigning costs to other cost objects *(Dean Hubbard, Northwest Missouri State University)*[26]. ABC establishes relationships between overhead costs and activities while ABM focuses on managing activities to reduce costs and improve customer value. The ABC model[27] is generally comprised of four key steps *(Ibid)*: Identify all activities used to achieve outcomes; Determine the cost of each activity; Assign costs to outcomes on the basis of the amount of each activity used by the outcome; Re-assign resources to those activities that result in benefits to institutional outcomes and conduct internal benchmarking against other institutions. Allocated overhead = Number of activities x Overhead cost per activity
Cost-effectiveness analysis - CEA	A technique that relates the costs of a project to its key outcomes or benefits, applied when only a single dimension of outcome matters. It focuses on a given outcome and see how much spending is needed to bring about that outcome (CEA can only measure technical efficiency rather than allocative efficiency). Cost-effectiveness = Costs (£) / Outcome
Cost-Benefit Analysis - CBA	Attempting to compare costs with the pound value of all (or most) of a project's many benefits. It is the cost and return on investment of becoming involved in a certain activity - such as an outdoor project, a first-year campus tour, or study outdoor *(J. Braxton, 2003).* Costs are thought to include tuition and fees as well as lost income; while benefits represent future earnings and other less tangible outcomes such as obtaining additional knowledge and skills and enjoying a higher overall quality of life *(Morris et al., 2016).* CBAs assist policymakers in understanding the wider impacts of a project, including its external costs. A drawback of the method is its limited ability to reflect difficult

[26] *Quality, Cost, and Value-Added in Comprehensive Institutions of Higher Education: Toward New, Testable Approaches*

[27] *As noted by Northwest Missouri State University, integrating an ABC model into the University's planning process, and at higher education institutions in general, is associated with numerous strategic benefits, such as greater profitability and additional value-added. Other benefits that may accrue as a result of using the model may include more precise cost information for costing and pricing; improved cost control and management; improved insight into cost causation; improved performance measures; and more accurate "customer profitability analysis" (Ibid). A key challenge in applying the ABC model to the realm of higher education exists in identifying reliable measures or key quality indicators for programs and activities.*

	to monetize impacts (e.g. improved comfort or improved quality of life). Common process is: Identification of benefits and costs; Quantification of costs and benefits with monetary values; Calculation of net present values; Decision criteria for establishing benefit; Variable analysis. Research indicates that cost-benefit analysis is an effective choice for determining whether a specific program or investment should be initiated. Cost-benefit = Benefits (£) - Costs (£) (AKA "net benefits") OR Cost-benefit = Benefits (£) / Costs (£) (AKA "benefit ratio")
Social Returns on Investment – SROI	SROI is a framework for measuring and accounting for a concept of value that incorporates social, environmental and economic costs and benefits. It is a method to calculate a wider concept of value of an intervention from each £1 invested (costs), across the bottom line of economic, social, and environmental value (benefits). SROI Ratio assigns a monetary value to inputs and outcomes, using that assignation to calculate a ratio. If that SROI Ratio is 5:1, it means that every pound allocated will generate (or has generated) social value worth £5. A primary purpose of the SROI analysis is to support the case for the development of an experienced-based COS design and to help universities to justify future investment. *(Arvidson, Lyon, McKay, & Moro, 2013; Martinez & Hayes, 2013; Millar & Hall, 2013).* SROI ratio = Benefit or profit (return)/value or costs of inputs (investment)

4.2.4 Assessing the Impacts of Design on the Social Experience

Extensive research has studied the assessments methods for tracking and measuring the impacts of public spaces on users life and experience *(Westlund, 2018).* These are briefly explained within the following main categories: A) Visual/mapping, B) observational, C) computational/simulation, D) mathematical methods.

A. Kevin Lynch's Mental Mapping & Gordon Cullen's Serial Vision

Among the pioneers of mapping patterns of movements were Kevin Lynch and Gordon Cullen. Lynch was one of the first to study the impact of space on people, being active between the 1950s and 60s. His most famous work "The image of the city" theorizes that people orient themselves through, what he called, "mental maps" which he proposed consists of five elements: Paths, edges, districts, nodes and landmarks. These elements need to create a coherent pattern in order to be "legible" for the people using the space. Because of people's dependence on their surroundings to orient themselves, a relationship forms between the people and the space. "The city is thus a powerful symbol of a complex society" *(Lynch & Lynch, 1960).*

Cullen also was an early pioneer in the study of spaces and their impacts on life. His book "The Concise Townscape" written in 1961, consists of his own drawings of several case studies, which formed the method "serial vision". The purpose of these drawings was to show how users relate to their surroundings by noticing the contrasts between everything. He proposed three "gateways": Motion (Serial Vision), Position (Here and There), and Content (This and That). "You cannot have a here without a there, a this without a that. Some of the greatest townscape effects are created by skilful relationship between the two". Because of Cullen's approach to drawings, the method "serial vision" is primarily visual *(Engler, 2015).*

B. Jane Jacops & Yen Gehl Observational Methods

Based on systematic reviews of over 100 studies, mapping activities was found to be derived from two urban methods: observational qualitative methods developed mainly by Jane Jacobs and Jen Gehl, and computational quantitative methods applied via tools like Space Syntax, Depth map, space 3d, etc. While assessing the different activities, associated spatial measures and costs are assessed through one or mix of

methods such as: balanced cost-benefit analysis, multi-criterion evaluation, statistical (correlation) analysis, and ranking methods (scoring and weighting).

Two of the pioneers of for developing and implementing the observational methods were Jane Jacops and Yen Ghel. Gehl was influenced by Jane Jacobs who spent her life studying cities and urban spaces. The Death and Life of Great American Cities is her single-most influential book and possibly, the most influential book on urban planning. Published in 1961, this book was widely read by both planning professionals and the general public; the book is a strong critique of the urban renewal policies of the 1950s, which, she claimed, destroyed communities and created isolated, unnatural urban spaces. In the book she shows the advantages of diversity and complexity of old-mixed use neighbourhoods, while discussing the disadvantages and problems of modern planning and the new prototype urban spaces. Beyond the practical lessons in city design and planning that Death and Life offers, the theoretical underpinnings of the work challenge the modern development mindset *(Fuller & Moore, 2017).*

Since 1980s, Gehl's[28] work is considered one of the biggest milestones to the importance of people experience within public spaces. His research has consistently shown that wherever public spaces of good quality are provided an increase in public life also takes place. Gehl proposes the method of observation with systematic measurement. "Anyone who decides to observe life in the city will quickly realize that you have to be systematic in order to get useful knowledge from the complex fusion of life in public spaces" *(Gehl & Svarre, 2013).* His method of observation for the squares shows that people tend to follow the same pattern (Amount, speed, type of activities etc.) if nothing else is offered in the space. However, when something is offered to the pedestrians, as a market during the weekends, the square itself becomes a destination, the speed slows down, more people spend more time there and the activities become more diverse. This, therefore, supports Jan Gehl's theory "the positive effect": "Something happens because something happens because something happens" *(Gehl, 2011).*

C. Space Syntax Methods

The term space syntax encompasses a set of theories and techniques for the analysis of spatial configurations. It was developed by Bill Hillier and Julienne Hanson during the 1970s but only get global recognition in the 1980s with their famous work "The logic of space, 1984" *(M Carmona, Tiesdell, & Heath).* According to most researchers, space syntax helps urban planners to better understand the built environment and its effect on people (or relation between society and space) by analysing the relation between possible parameters to correlate with human spatial behavior. From there, planners can understand and therefore map out complex behaviours that occur in a city, some examples where space syntax has been used for analysis are pedestrian movement, criminal mapping and way-finding process *("Space syntax Network", retrieved 2018).* This method also consists of calculating configurative spatial relationships in built environments. According to Hillier, based on the empirical results arising from analysing urban spaces, space syntax makes it possible to develop a set of theories about how urban space networks relate in general to the social, economic and cognitive factors which shape them, and how they are affected by them *(Hillier, 2007).* These techniques are developed into the computer programs such as Depthmap; Spatial positioning tool (SPOT); Syntax2D; and recently, the Space Syntax toolkit which is integrated into the open source geographic information system known as QuantumGIS *(Axwoman developed by Dr Bin Jiang).*

[28] *Jan Gehl at University of Copenhagen has conducted research on the contribution of public spaces to civic life, with his famous books like (Life between buildings, 1971/translated 1987) and (Public Spaces & Public Life, 1996/2004).*

It can be described as space syntax using the perspective of space and Jan Gehl the perspective of life. This leads to space syntax being concerned about how much the space encourages usage of it while Jan Gehl's method of observation is focusing on the behaviour of the people using the space, for example who they are and what they do. When discussing what each method can provide to the study of public spaces, space syntax usefulness for comparing spaces to each other and making prognosis makes it adapted to choose an appropriate location for a new project. It is also good for testing and comparing the likely success of new suggestions. Jan Gehl method with its lots of details can show the success of a space in practice. This can also be useful for identifying needed improvements in the existing space. The efficiency of space syntax can be integrated into the quality measurements of Jan Gehl's method. By using computer programs to measure people's behaviours, the time spend to observe, and catalogue can decrease. One suggestion is through surveillance devices: counting stations, speed detection and cameras overviewing the space *(Garau et al., 2020; May, 2011; Mehta, 2014).*

D. Mathematical Methods : The Design ROI tool & Ranking Models

Also applied in the case of outdoor spaces, fractal geometry which studies the structures characterized by the repetition of the same principles of element distribution on multiple levels of observation - 'urban pattern design'. The fractality in urban environment is important for human well-being through the consideration of all relevant factors that can influence the choice of urban pattern solutions.

A tool that lets businesses measure and predicts the financial outcomes of investing in design *(Phillips & Phillips, 2007).* The research team is a collaboration between 15 design agencies and a team of academics at Aalto University in Helsinki, Finland. "What we've set out to do is to create a methodology and metrics to measure the economic impact of design ... designers should talk numbers rather than aesthetics to appeal to prospective clients" project leader *Antti Pitkänen* told Dezeen. The team analysed more than 40 internationally published academic papers to find out what design strategies businesses are investing in, whether they are benefiting from that investment and how to quantify those benefits. The researchers also identified four areas of design in which businesses might invest: products; brands; spaces; and services, which covers how well a business responds to customers' needs. The first prototype of the tool is a complex spreadsheet that calculates the multiple variables affecting the return on investment (ROI) [29]that the design can deliver. "So, if I invest £100,000, do I get £100,000 back or do I get twice that, or ten times that?" Although it is impossible to predict the exact return on an investment, said *Pitkänen*, the Design ROI tool can indicate a positive or negative result and suggest approximate figures. While good design brings benefits that cannot be measured, designers should be thinking more about the bottom line if they want to bring clients onside, he continued. "We looked at all the benefits that design has, but we focused on the link between design and what effect it has on the bottom line. "Once you are able to create metrics and create objectives for projects, then we start creating a better understanding of what the final outcome is … That will also increase the appreciation on the client side of why they are using design and when design should be used … So, it is very much a communication tool, making the client understand how and when to use design, not only 'I like it' or 'I don't like it'." The prototype tool marks the end of the first phase of the Design ROI project. For the next phase, the researchers hope to collaborate with businesses and designers to fine-tune the tool and develop it for wider use.

[29] *The ROI mainly depend on: Initial factors particularly the time of the return and inflation; The percentage of return to investment input; How much cash in hand and how much in debt (for good leverage 30-40% are the best rate of debt in investment); how much expenses are reduced.*

Another recently spreading way to evaluate the values and impacts of campus design is through ranking scores. This method of assessment is very important yet very challenging in developing a validated assessment tool, purely quantitative, with unbiased system-based model. The tool can be integrated through emerging campus costs/investments and is used for ongoing assessment of investee campuses. A recent example is shown in the study by Amir Hajrasouliha[30], who devised a "Campus Score" to measure the "urbanism, greenness and on-campus living" of 103 research universities in the US. He examined 10 qualities, which included the proportion of pervious open space; density of tree canopies; proportion of surface parking areas; proportion of students living on campus; campus compactness; diversity of land uses; and the centrality of the campus to its county. The research found that universities with the highest campus scores tended to have a higher proportion of students who stayed at the university after their first year and a higher proportion of students who graduated within six years. Professor Hajrasouliha said that "the research shows that physical campus characteristics ... matter more than universities realize … The most common strategies to improve retention and graduation rates are financial- and academic-related strategies, such as revising the financial aid strategy, reregulating student selectivity policy, investing in academic and advisory services, and revising curriculums and programs … But sometimes we forget that a valuable asset for student success can be the physical campus itself and its surroundings. In terms of recommendations for universities in urban settings, he recommended investing in green spaces on and adjacent to campuses, while he said that encouraging infill and mixed-use development on or adjacent to campuses could lead to improvements for suburban and rural institutions *(Hajrasouliha, 2017).*

4.3 The Overall Framework Lit-3/3: The Multi-Criteria Evaluation of Student-Space-Value

In an economic climate with too many, complex variations and with both public funding bodies and fee-paying students - task is even more demanding and pressing than ever. This third phase includes database from phase1 (university profile - educational related data) and phase2 (patterns of use and associated COS typologies and features) and integrates them with the information from assessing the development costs and student experience (frequency of use and durations of stay). It proceeds to examine the business case for the above relation. Meaning that it explores and assesses what features and typologies contribute more to encourage and transform more positive experiences among students.

This last phase of the conceptual framework *(as defined by (Huberman & Miles, 1994; Miles & Huberman, 1994)* concludes the system of concepts, assumptions, theories and practices that supports and informs the research study. *Miles and Huberman (1994)* defined a conceptual framework as a visual or written product, one that "explains, either graphically or in narrative form, the main things to be studied, the key factors, concepts, or variables - and the presumed relationships among them" *(p. 18).* This design and evaluation framework is derived from Radcliffe interaction of pedagogy, space and technology *(Radcliffe, Wilson, Powell, & Tibbetts, 2008).* The table below summarizes the three levels or the framework domains - with their specific indicators - covered in the three chapters (2, 3 & 4). The first educational domain used to characterize the university/campus (general information about the university name, type, location, age, positions).

The framework will be tested using the initial findings drawn from the literature, university documents and masterplans, as well as the preliminary site visits. The mentioned characteristics are key factors in reflecting how supportive and active are the selected COS. Each aspect is measured by its provision, amount and/or

[30] Assistant professor in city and regional planning at California Polytechnic State University-San Luis Obispo

ratio/percentage. The second domain with design and use indicators will be applied on two levels. First, emphasizes the urban qualities of campus: layout/functional, diversity, integration, connectivity, accessibility, meaningful, level of comfort, and aesthetic indicators. Second, indicates the COS physical features including 10 indicators: COS area, cost, seating, enclosure, circulation, intersections, vegetation, greenness, shade, and site furniture. It also indicates the typology of use or (level of sociability/livability).

Table 9: The overall Framework COS-DI : containing the 3-levels (Social/Design/Value) at the 3-scales (University/Campus/COS)(By the researcher)

	Factor	Description (**Quantitative & Qualitative Measures**)
Level 1: Position of University & Campus - EDUCATIONAL Perspective Meeting Participatory and the Diverse, Socio-Cultural Aspects		
Scale A: Assess University Profile	**Name & View**	1 (or 2) photo/s showing the plan and/or top views of the selected COS
	City & Location	City and exact location of the university grounds.
	Boundaries	Main boundaries that limits the North, East, South & West sides of university campus
	Landmarks	Most popular/valuable natural or man-made structures inside the univesrity
	A1. Type	Public/4 year programme or Private/4 year programme (Forprofit or Nonprofit) College / 2 year programme (excluded from this study)
		All selected cases are research universities which are doctoral degree-granting institutions and conduct research. There are 2 types of research universities: Research (R1) Very high research activity (as Research/Postgraduate in UK) Research (R2) High research activity (either lack research facilities or do not have a lot of people conducting research). (Sources: Carnegie Classification, 2019)
	A2. Campus Setting	City / Urban / Suburban / Rural. Compact (clear boundaries) / Scattered (buildings not a campus) Open / Closed or gated
	A3. Age	Date of foundation: year the university was established. Indicates age & style. Historical (before 1945) / Moderate (1945-1990) / New (after 1990) / Mixture
	Campus Scale	**A4.** University Land km²: The total land area of the university including campus and/or related institutional residentials, and commercial areas
		A5. Campus Area km²: Area of the central, academic campus under study
		A6. No of students : The total number of Full Time Under Graduate students (this category of students who live, study and use the campus). Classified into 3 scales: Small < 2000 / Med 5000-15000 / Large > 15000 students
	Position 2018/19	**A7.** Selectivity: Acceptance Rate (equals to Offer Rate in UK universities)
		A8. Rank: evaluate universities based on various factors. Key source of comparative information for various stakeholders. This includes local/national ranking (within a single country) and global/international university rankings (worldwide).
		A9. Tuition fees: Money that student pays to a university for academic year 2018/19. Although this factor is a sign for the value of university, all universities seek to offer more with lower tuition fees. $\overline{Tuition}$ = [home or instate tuition fees + internationl or outstate tuition fees] ÷ 2

Level 2: Physical COS Characteristics – DESIGN & USER Experience Accommodate Student & Academic/Educational Needs		
Scale B: Assess urban qualities & values of user experience (Quality of public realm)	**COS Site visits**	No of visits: The number of visits conducted to the selected COS.
		Duration: Total time/hours spent for observation.
		Period : The total period of visit conducted by days. Can also indicates period by Day/Week/Month or by Morning/Noon/Eve.
		View: most significant (aerial) photos or plans showing the selected COS context.
		Adjacents: Description of adjacent building/s and open space/s around the COS.
		Height: Hieghts of surrounding building/s by floors or zero for adjacent open spaces.
	1. Layout / Functional	Way of arrangement & layout responding to spatial features: scale, enclosure, focal points of activity, visual landmarks, permeability, COS intensity within campus area, ..
	2. Connectivity & Accessibility	Making the best use of legibility/wayfinding, node connectivity, ease of movement, achieving well connected and accessible spaces.
	3. Aesthetic	Appearance, character & style of campus in support of visual & emotional experience
	4. Meaningful	Sense of place/place attachment (personality) - responding to psychological & personal needs.
	5. Landscaping	Examine the factors of soft and hardscaping including levels of greenery, vegetations, seating, shade, and urban or campus or site funriture.
	6. Diversity	Accommodate different modes (Interactive/engaging - Social/livable - Active/dynamic/walkable - Comfort/relaxing)
	7. Interactive & Learning	Creative/Inspiring/enterprising - Instructive/multicultural - Supportive/collaborative - Sense of belonging/participation
	8. Flexibility	Future-proofed
Scale C: COS Physical Features	**B1. COS Area**	Exact total area of the selected COS measured in m².
	B3. Seating	% of areas used for seating = (seating area * 100) / COS area The more seating areas the better opportunities for students to meet, chat, eat, etc.
	B4. Enclosure	% of the degree to which COS is visually defined by buildings, walls or trees barrier. Used as indication for levels of coherence, opennes, and views in and out, opportunities for expansion.
	B5. Circulation	% of total area allocated for circulation = (circulation area * 100) / COS area m² Use as indication for how dynamic the COS (not always more circulation areas encourages more flows in and out but better design does)
	B6. Intersections	Int = (The number of intersections/nodes * 100) / COS area m². The higher the number of intersections, the greater opportunities for integration hence the higher values of furation and intensity of occupying space.
	B7. Vegetation	% of area for dense planting (walking/passing thro is not an option, contributes to functional/shade, aethetic/decorations, economic/harvests, and environmental/healthy values).
	B8. Greenness	% of green areas/lawns within the total area = (green area * 100) / COS area Mostly adds to the recreational/relaxing, aethetic & environmental/healthy values).
	B9. Shade	% of total shaded areas (naturally/tree, structures/umbrellas, arcades). Encourage students to stop, stay, and meet by different means.
	B10. site furniture	% of total area allocated for racks, light, signs, bins, artworks, water & other urban fixtures. Contribtes to all above factors of campus design.

Gate counts	North	Numbers of users passing IN & OUT the North gate/s of the selected COS	
	South	Numbers of users passing IN & OUT the South gate/s of the selected COS	
	East	Numbers of users passing IN & OUT the East gate/s of the selected COS	
	West	Numbers of users passing IN & OUT the West gate/s of the selected COS	
	COS users	Average COS users count per hour ($\overline{COS}$ users = avg user-counts of the 3 peak hours)	
Duration	Du1 *	Up to 20 : Numbers of users spent less than 20 mins (exluding crossers) **x 10**	
	Du2 *	21-40 : Numbers of users spent more than 20 mins & less then 40 mins **x 30**	
	Du3 *	41-60 : Numbers of users spent more than 40 mins & less then 60 mins **x 50**	
	Du4 *	1 hour and more : Numbers of users spent more than 60 mins (1 hour) **x 90**	
Exp Outcome	**C1. Frequency Fu st/m²**	No of students passing through COS in a speicific hour - measure the rate of COS use **Frequency of use (Fu)** = $\overline{COS}$ users ÷ COS area m²	
	C2. Duration Ds st /m²	**Duration of stay (Ds)** = Mean of Duration of stay $\overline{Du}$ ÷ [COS Area /100m²] $\overline{Du}$ = [((Du1*10) + (Du2*30) + (Du3*50) + (Du4*90)) * 60 * 10] ÷ [180 * COS Area]	
	C3. Intensity Iu st/m²	*Function of the Frequency & Duration normalized to the population & size of campus* **Intensity of use (Iu)** = [Fu + Ds]	
Level 3: Economic – VALUE		Cost efficient	
Scales A/B/C: Ranking Score	**1. Developments with high Returns on Investments**	- Increased funding potential (public & private). - Increased economic viability for adjacent uses/opportunities. - Increased local tax revenue. - Calculating & comparing higher rental returns and enhanced capital values. - Supporting the 'life giving' mixed-use developments that responds to markets, student and academic needs. - Deliver more lettable area (higher densities). - Creating an urban regeneration and place marketing dividend. - Differentiate places & raise prestige. - Opening investment opportunities, raising confidence in development opportunities & attracting grant monies. - Beneficial public use.	Black & Smith 2006; Brooks 2005; Commission for Architecture and the Built Environment 2004; Baum & Lee 2019; Den Heijar 2011; Johnson & Lomas 2005; Jorge & Schneider 2015; Lefebvre 1991; Schalin 2010; Verne & Jarvis 2010
	2. Reducing Costs	- Reduced running costs (maintenance, security, energy use, health care, crime prevention, and urban management over life). - Reducing costs to the public purse of rectifying urban design mistakes. - Contributing to more contented and productive workforces.	
	3. Land Value	- Evolution of land and property values around the selected developments compared to the average in the locality. - Higher sale values (resale) & rental returns. - Addressing the running costs of the development and their impacts on the university reputation & performance.	
		Accom fees: The avarage annual rate for students accomodation 2018/19.	
		Endowments: Represent money or other financial assets donated to universities.	
		Budgets: List university incomes minus essential expenses & how they balance out.	
	B2. Cost £/m²	COS actual cost of development or its estimated cost of current state per sqm.	
	ES-COS	Overall rating normalized to the size (campus area), scale (number of FT students), and value (tuition fees) of the university. **ES-COS** = [Iu (st/m²) * COS area (m²) * *Tuition* (£)] ÷ [COS Cost (£/m²) * No of FT students (st) * Campus area (km²) * 100]	
Ecological – Environment (Excluded) Meeting Energy Efficient, Healthy and Less Polluting Development			

Ch5. RESEARCH METHODOLOGY

This chapter explains the used methodology and why it is used. It outlines the research strategy, approaches and methods used for collecting and analysing the data. The research process is developed to examine a variety of quantitative measures for each campus space (design & use), considering the value and position of the university. It starts from testing the framework variables (compute summary variables from huge raw data - all of which is complicated and time-consuming), selection of cases (university and campus settings), collecting the fieldwork data (defining and sampling COS segments within sites, piloting visits, observations, and interviews, as well as the ethical and risk considerations), data analysis (integrative multi-level scale rating, correlation analysis). As a key start point, the framework variables are derived from extensive literature on campus planning and development particularly at the addressed England and California contexts; campus environment research; student outdoor experiences; hard financial values, and others based on recommendations from studies like *(Banta, Jones, & Black, 2009; Banta & Palomba, 2014; Creswell & Clark, 2004; Creswell & Creswell, 2017; Creswell, Fetters, & Ivankova, 2004; Duffy, 1987; Fowler Jr, 2013; Gillham, 2000b; Gliner, Morgan, & Leech, 2011; L. Johnson & Castleden, 2011; Lidsky, 2002; Ming-ren, 2001; Nardi, 2018; Nijkamp, Rietveld, & Voogd, 2013; Rouse, 2004; Stage & Manning, 2015; Su, 2012; Swetha & Sundaram, 2020; Yin, 2013).* After developing evidence-based frameworks for determining factors and links between SE and campus design, comes the secondary then primary data collection. Data collection collected from both contexts are developed to generate a multi-faceted picture of the design and use of COS in each case from the university campus and the surrounding setting. The secondary and primary observed data were than analysed using rating scores along with four statistical tests to compare and correlate between the different variables and typologies of COS. The validity and reliability were investigated using both qualitative and quantitative tools.

RESEARCH PROCESS

This research is considered explanatory, as dedicated to defining campus outdoor issues, areas for potential growth, alternative design concepts, and prioritizing areas that require statistical research. Data are collected in the participant's settings and data analysis is inductively developed from general/sub to particular/main themes and cases. Theories are built deductively; variables are examined, and the collected data is analysed through mathematical and statistical procedures. This chapter will explain the methods of data collection using: desk-based and archival work, fieldwork, and key personnel interviews within the selected universities, planning consultants or authorities, masterplanning practices, as well as community groups. The process is applied in both contexts: 1 year is conducted at SDSU, California and at UOS, England during the study between 2016 till April 2020 when all universities closed due to the COVID-19 pandemic.

In social sciences, three research approaches are normally employed: a) qualitative, b) quantitative, and, c) mixed methods *(Creswell & Creswell, 2017; Creswell et al., 2004; Tashakkori & Teddlie, 2008; Teddlie & Tashakkori, 2006, 2011).* Qualitative research for exploring and understanding the meaning that individuals or groups ascribe to social or human issues, while Quantitative research test objective theories by examining the relationship among variables. Mixed methods research is used for the combination of both, integrating the two forms of information and using distinct designs for the broad purposes of breadth and depth of understanding and corroboration *(Teddlie & Tashakkori, 2006).* The design of mixed methods also allows grants a variable sequence, that is, the choice of qualitative methods, followed by quantitative methods or vice-versa *(Creswell & Creswell, 2017).* The study deemed as sequential explanatory study selected from the following three sequential mixed methods: a) qualitative methods (theory) to qualitative observational methods (measuring design and use), b) qualitative methods to quantitative methods (manual counts for tracking use patterns), and c) quantitative methods (mathematical calculations of and statistical correlations between the variables) to qualitative methods (expert interviews for validation).

Methodological issues are critically addressed to carry out the best strategic methods for capturing the range of student experiences, tangible/physical and less tangible, created by well-designed campus places. Research methods therefore are structured in the following seven main stages:

5.1 **The 3-level integrative framework.** Reviewing literature provides with evidence the most suitable methods for data collection and analysis to answer the research questions. It also provides the basis for the selection and combination of variables to get a clear understanding and definition of a comprehensive measure of COS design & experience. This step concludes with the 3-level framework.

5.2 **Case study approach and the selection of cases.** Explains and justifies the general and detailed profiles.

5.3 **Primary data collection (fieldwork) – testing the variables.** The third step explains and justifies the methods used for the primary data collection from the fieldwork. They are two main methods: qualitative and quantitative observation – in which all variables from the framework are tested.

5.4 **Data analysis – mathematical scoring.** An exploratory, multivariate analysis is used to investigate the overall structure of the dataset, assess its suitability, and explain the methodological choices. Step four explains the mathematical calculations use to score the campus experience.

5.5 **Data analysis – statistical relations.** correlation analysis. Indicators are classified and correlated using three statistical analysis – which are applicable to the underlying conceptual framework.

5.6 **Recommendation & validation.** This includes the analysis undertaken to validate the methods, robustness of the indicators, the normalization scheme, the imputation of missing data, the choice of weights and the statistical methods, and finally the recommendations.

5.7 **Methodological conclusions.** Summarize and outlines the significance of the used methodology.

5.1 The 3-level Integrative Framework

The first step starts with determining the main themes and the most relevant, literature-based variables – i.e. secondary data selection. It compiles a list of selection criteria for the underlying variables, e.g., input-output-process. The dataset focusses on recent developments of compact campuses that are carefully selected to check the quality of the available indicators (strengths and weaknesses of each selected indicator). Indicators are selected on the basis of their analytical accuracy, measurability, availability, relevance to the study and relationship to each other. The secondary data collection refers to the use of existing research data to find answers to a question that was different from the original work (Heaton, 2008). Another definition for the secondary documents by (Bailey 1994: 194) is documents produced by people who were not present at the scene but who received eye-witness accounts to compile the documents or have read eye-witness accounts. All resulted databases together with potentially relevant literature are entered and categorized in an EndNote database. After all, areas where the literature in the database seemed inadequate are identified, and further searching is undertaken, either to obtain further supporting evidence or to show gabs/lacks. The secondary data is derived mainly from recent journal and book sources, some HE documentary from British and American universities, as well as recent campus masterplans developments.

These secondary data covered three main, parallel and linked disciplines. First, a general overview of universities in England and California with noteworthy rankings, students' numbers and data, with focus on extracurricular and outdoor activities/events, as well as other relevant social and (informal) educational models and styles – all summarized in framework 1/3. Second, framework 2/3 contains data relevant to the campus urban/landscape design and planning universities from the relative university reports, plans, university rankings and profiles, internet sources, academic articles and reports, and masterplan developments. The data includes information about the history of university development, general and detailed design characteristics. It also illustrates and compares design strategies, theories and practices for student-oriented campuses that support the SE (e.g. goals for supportive design elements, guidelines and design recommendations, policies that support community and city connections to campus whenever related to the university, etc.). These two phases of documentation are linked and assessed together from an investment perspective in the third phase. That final phase lists and compares different assessment and evaluation frameworks. Those three phases/chapters of literature ends with a 3-level integrative framework used specifically for the analysis of the campus masterplan with the key physical parameters and urban qualities of the seven COS' typologies (quad, court, corridor, plaza, field, inspired spaces & entries/edges). The framework aims to analyse master plans and develops a proper understanding of the spatial, social, and cost parameters – at 33 comparable university campuses from England and California.

5.2 A Case Study Approach & the Selection of Cases

After forming and filtering the secondary data, comes the selection of cases. This step is very important particularly with a case study approach. *Yin (2013)* has described case study methodology as a distinctive

means of empirical enquiry particularly suitable for exploring the how and why of contemporary phenomena within a real-life context. He noted along with other researchers that this methodology is particularly relevant when the researcher believes the context to be highly relevant to the subject under study, hence the rationale for this research methodology. Case study techniques provide means to examine a diversity of perspectives and influences on or impacts of a design entity or an experience pattern and clarify or test ideas and processes. As discussed and proved by many studies, the case study approach is, therefore, the most appropriate strategy to facilitate the extraction of an urban development and its relevant impacts and investment strategies *(Hakim, 2012; Kuntz, Petrovic, & Ginocchio, 2012; Martinez & Hayes, 2013; Poplin et al., 2017; Tiyarattanachai & Hollmann, 2016; R. L. Wells, 1996; Yaylali-Yildiz et al., 2014; Yin, 2013; Zimring, 1982)*. As *Seawright and Gerring (2008)* note, the generalizability of case studies can be increased by the strategic selection of cases.

For time limitation, two case studies with detailed comparisons complemented by a number of general/sub cases have been recognized as a research methodology. This allows for the utilization and combination of both a relatively deep as well enormous/diverse range of design, data collection methods and analysis. Multi case study analysis is also chosen to avoid the inter-related issues of methodological rigor, researcher subjectivity, and external validity. Several studies identified the advantages of multi case studies more particularly with complex cases that are implicitly comparative such as: deviant, subjective, and context-based and that hugely vary from different disciplines and/or multiple sources of quantitative and qualitative evidence *(Bartlett & Vavrus, 2016; A. Bennett & Elman, 2009; Franz et al., 2015; Gillham, 2000a; Krehl & Weck, 2020; Pérez & Rey, 2013; Verschuren, 2003).* The justification and process for the selection of cases are explained below.

5.2.1 Selection of UK (England) and US (California)

On both local and global scales, past till most recent days, both UK and US are distinguished countries holding leading universities in the field of HE worldwide. As of 2018 the UK remained the second most worldwide destination for international students to study HE globally after the US[31] (see below fig). Their academics are world leaders in research and innovation, and their graduates are in demand worldwide. This is supported by many sources such as the world university rankings compiled by the Times Higher Education that shows that more than half of the world's top 200 universities are located in either US or UK, and according to QS, all of the top ten universities in the world are in US or UK except one. A considerable part of these universities' rankings and university websites advertise their well-established reputation all over the world in offering high-quality education, top research facilities, their attractive campus experience. This attracts students, both local citizens as well as international students from many countries with top student satisfaction and a distinctive student experience.

In addition, both countries share a rich tradition when it comes to the campus planning – seeking excellent environment for learning – both indoors and outdoors. Many studies confirm this fact that also both countries leading in the creation and continues development of new and existing campus universities, remarkably considering public space design as alternative ways of learning and realizing the fact that SE is highly being charmed by the entire campus, not just the buildings and indoor facilities *(Fisher & Newton, 2014; Kärnä & Julin, 2015; C. C. Strange & Banning, 2015).* As illustrated in Chapter 3, campus designs in both the UK universities (sections 3.3) and the US universities (section 3.4) play an important role to accommodate diverse cultures mostly for fresh and international students, facilitating the best, quick, suitable and satisfactory learning environment.

[31] *www.universitiesuk.ac.uk/International/Pages/intl-student-recruitment-data.aspx*

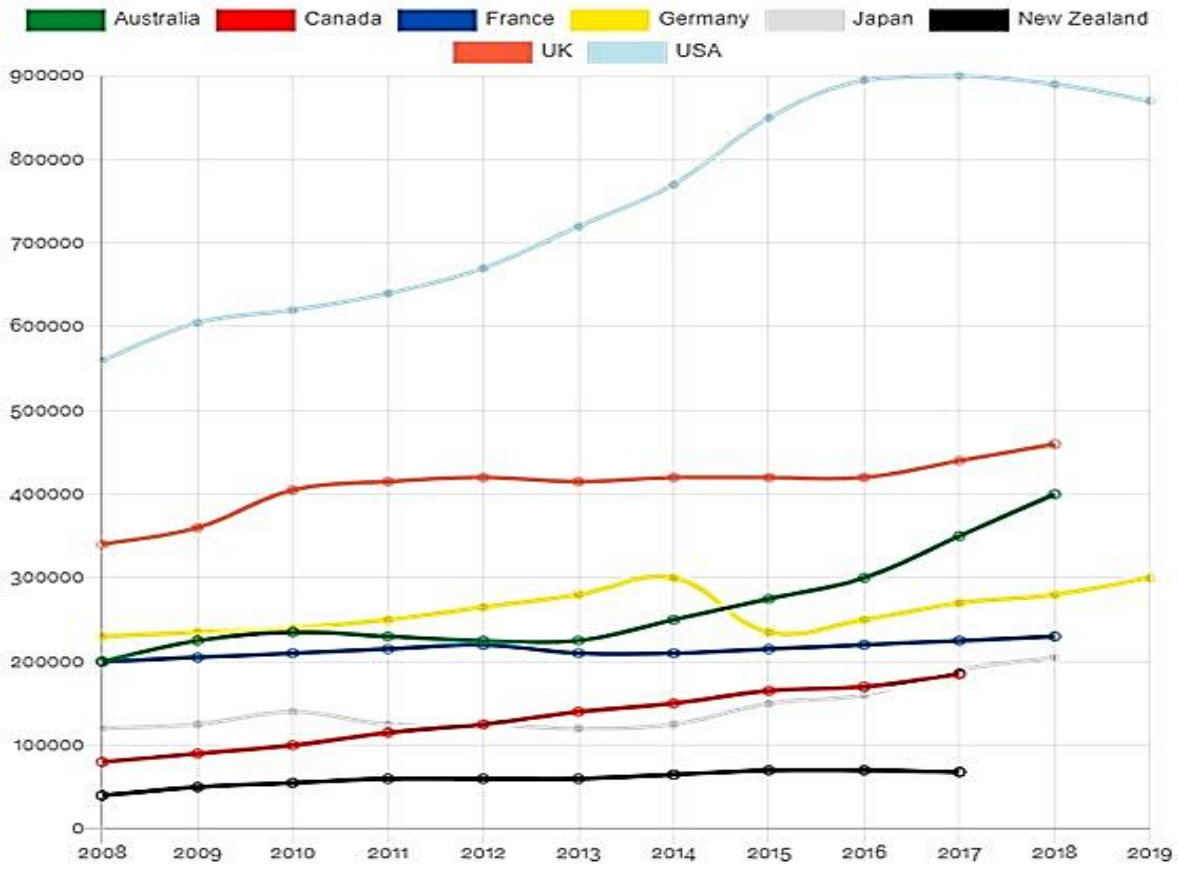

Figure 6: Countries with top number of international students [32]

5.2.2 Selection of the Case Studies and Supplementary Cases : Making the Decision

After selecting two of the most well-known countries with leading universities in terms of ranks, reputation, planning, and funds, the selection process proceeds with the criteria for selecting the universities campuses and then the outdoor spaces within these campuses. The selection process is followed by and based on broad research and exploration among UK & US universities campuses. A list of research universities in UK and significant ones in each state of US was prepared (see appendices 2 & 3). Additionally, to meet the research's aim and objectives, the cases were chosen based on the following criteria.

Criterion 1 – Location & Context

This is the strategic choice of cases based on their contexts and their locations. Compact campuses with known boundaries (whether physical or virtual). This excludes other types of city and rural campuses as those collegiate universities tend to be bounded to more complex variables, budgets and expenditure (see campus types and typologies). In Oxford and Cambridge for example, a significant amount of facilities expenditure is by the colleges, but it has not yet been possible to extract comparable data from the college accounts *(Dill & Soo, 2005).* The selection credibility of all cases was highlighted by the two study zones England, UK and California, US. University campus must be well recognized within its context. The two selected casestudies UOS and SDSU are located in Salford and San Diego respectively. Both UOS & SDSU are typical universities, and their campuses are prized location with high profile assets with rich contextual, environmental and historical setting, hence, they enhance the natural, learning and social environment. The campus responds to as well as impacts the surrounding context.

[32] *http://www.universitiesuk.ac.uk/*

Both Salford and San Diego are cities that should see significant change in the near future. As for Salford, it is a city and metropolitan borough of Greater Manchester, England, named after its main settlement Salford. Greater Manchester is considered the second city/capital of the UK and one of the most wanted city/habitable destination in England after the capital, London [33]. *Salford* is bounded on the south east by the River Irwell, which forms part of its boundary with Manchester to the east, and by the Manchester Ship Canal to the south, which forms its boundary with Trafford. Some parts of the city, which lies directly west of Manchester, are highly industrialized and densely populated, but around one third of the city consists of rural open space. Salford has a history of human activity stretching back to the Neolithic age [34], with over 250 listed buildings in the city. Salford has the world's first free public library and the first street to be lit by gas. Salford's MediaCityUK became the headquarters of CBBC and BBC Sport in 2011, joined by ITV Granada in 2013. Over the next 20 years, the Greater Manchester Forecasting Model suggests Salford will report the strongest employment and GVA growth rates in Greater Manchester [35]. UOS has the utilizing biodiversity assets in Peel Park, the creation of living campus for blue and green infrastructure and identifying the value of social infrastructure such as green spaces: cycle racks, leisure facilities and community spaces to aid financial modelling and decision making. The latest facts and proposals build on the early successes driven by the Central Salford Strategic Regeneration Framework helped to kick-start change for the University planning. For instance, The Quays Strategic Framework vision for the area: "the UK's smartest place to invest, innovate, create, and produce, in an environment where people work, live, learn and relax" *(Balbo, Kocaturk, & Medjdoub, 2010; Davies & Nutley, 2000).*

San Diego is a coastal city on the Pacific Ocean and immediately adjacent to the US–Mexico border. With an estimated population of 1,423,851 [36], it is the eighth most populous city in the US and second most populous in California (after LA). Historically, San Diego is frequently referred to as the "Birthplace of California", as it was the first site visited and settled by Europeans on what is now the West Coast of the US [37]. The city is known for its mild year-round climate. US Weather Bureau describes San Diego's weather as the closest thing to perfect in America. Holiday Magazine described San Diego as the only area in the US with perfect weather. Pleasant Weather Rating Service Poll voted San Diego as the best year-round weather in the nation, and the second best in the world. The city is also known for its extensive beaches and parks, natural deep-water harbour and long association with the US Navy and Marine Corps. San Diego is ranked the second America's Most Playful Cities where people are being the most playful, and where there are the most opportunities to have a little fun. It is also ranked the third Most Comfortable Cities of the Summer third for the Number and Size of their Parks [38].

The location is also an important factor for easier access of the researcher to be able to visit the campuses more regularly. Hence, only the area of North West (11 universities including Manchester, MMU, Salford, Liverpool, Liverpool Hope, Liverpool John Moores, Cumbria, Lancaster, Chester, and Central Lancashire) and Yorkshire (12 universities including Sheffield, Sheffield Hallam, York, York St John, Leeds, Leeds Beckett, Leeds Trinity, Leeds Arts, Huddersfield, Bradford, Hull, and the University of Law) are considered from England – as the closest to Salford.

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[33] *Sources: https://yougov.co.uk/topics/lifestyle/articles-reports/2015/05/21/manchester-uks-second-capital*
[34] *The final period of the Stone Age (Dates between 10,000–4,500 BCE).*
[35] *Sources: UK Census; Salford City Council; Government of the UK, Office for National Statistics; visitsalford.info*
[36] *Sources: Population and Housing Unit Estimates, 2019*
[37] *Sources: McGrew, Clarence Alan (1922). City of San Diego and San Diego County: the birthplace of California. American Historical Society. Retrieved July 23, 2011*
[38] *Sources: https://www.sandiego.gov; Bestplaces.net; teleport.org, retrieved 2020*

Criterion 2 - Accessibility and availability of required data

This criterion means choosing campuses and masterplans that are simpler to access/collect and analyse its data. As a key source of secondary data collection, the study counts on 'document analysis'. A key factor, therefore, is availability and accessibility of databases (past/existing/future social and economic campus developments). Hence, comparing only two case studies for providing in-depth analysis to afford enough data to address the addressed variables considering different development stages. This criterion is also very important as used for comparing the other significant cases from similar/comparable contexts. If sources are unreliable, scarce, or for one reason or another inaccessible, the case is of little value. Besides the presence of databases, researcher has to spend at least 1 year at the two main universities for ethnographic (experience, observe, track and record changes in different seasons, as well as interview students and staff when needed). By the meteorological/academic calendar, the four seasons are defined as spring (Mar, Apr, May), summer (Jun, Jul, Aug), autumn (Sep, Oct, Nov), and winter (Dec, Jan, Feb).

Criterion 3 - Statistical representativeness

Statistical significance here indicates 3 sub criteria. Significant indicators, statistically significant or typical selected case, and representative observation time. First, it helps draw more accurate findings by quantifying the most suitable indicators/causes. So if some design or use criteria is not considered or can't be observed for any reason than this case (campus or space) is excluded, only cases clearly showing all the criteria. Second, more strategically common (repeated or known for its unique features). A representative case means a typical or standard university of the capital region which designates an important regional centre at city and country levels. More particularly, it is representative in educating and serving the needs of students and community with industry and commerce with a significant campus design. This also help for findings to be generalized. Third, in terms of selecting the times for observation, random samples may not always be the most appropriate, given that they may not provide the richest insight, even that a random and unknown deviant experience/pattern may appear. Therefore, a representative observation time here is the typical or extreme (peak) times. This is often used for site fields and observations to reveal more information because they activate more actors, and more basic mechanisms in the situation studied *(Flyvbjerg, 2006).* Sub criterion 2 and 3 help accounts for potential sampling errors.

Criterion 4 - Comparability/standardization in terms of campus type and size

Equally significant factor is the size of the university and the type and scale of its campus. As the study is focusing to examine specific features in comparable settings, typical or average scales of area and population (avoiding the two extremes) were considered. However, for a larger impact it aims to represent larger population – meaning the density/population of students must be of considerable (large) amounts. This will widen and enrich the outcomes and impacts. While comparable average large-sized universities (above 15,000 students) is preferred, the focus is on compact urban campuses - defined by known boundaries not city campus or scattered/individual buildings *(Freestone, Pullan, & Saniga, 2021)*. For data collection purposes, campuses within definite physical and financial boundaries are also preferred which are less overlapped with other authorities/systems (e.g. council, charities, private sector, etc.).

Criterion 5 - masterplan developments

To fit the purpose of this study, another important qualification that adds to the issue of case selection is for the selected case study to be recently involved in or exposed to a masterplan development (or partial development for all or parts of the COS). The average period time for the implementation and/or evaluation of campus development is usually 5-7 years, yet it different from university vision to another. Like UOS, the

study also considered a number of cases subject to a future development to ideally compare the three cases: previous, current, and future, which significantly further narrowed the selection frame. The study also considers the two typical planning patterns of a university campus: “newly-constructed campus” and “reconstructed or developed campus” – yet the more focus on a comprehensive design, i.e. offering multifunctional solutions such as efficient planning and student-oriented campus developments.

5.2.3 Selection of the Open Spaces within the Selected Campuses

The 1st general phase provides cross-case analyses by developing and comparing campus profiles, selected among England and California universities. The profiles also provides information about the Campus Outdoor Spaces that are sharing basic similarities yet holding significant developments with potential investments in enhancing outdoor experiences, presenting different design typologies/settings, and with diverse practices. The 2nd phase is cultivating deeper analysis by observing the daily academic and social life within the COS of the two main university campuses. It reviews design practice, policy implementation, and processes and features of the change associated with student characters and urban experiences. As such, the COS were selected from each university campus for all or some of the following reasons:

- Clearly recognised: Within campus area and defined by campus spaces/buildings.
- Most representative: Clearly represent the classified typology. This also includes representing the design or the style of the campus.
- Most significant: including most popular, most seen or observed, best accessible/location, significant design solutions (e.g. diverse sets or depict the most common/significant design features).
- Mostly used: highly demanded by students for different uses.
- Most valuable: for all or specific numbers of students).
- Under development: Recently developed or exposed to future development.
- Accessible: both in terms of data and physically by the researcher and users.
- Scale: preferred average size areas (200 – 5000 m²). Typical size (avoiding too extremes).

5.3 Primary Data Collection Methods: Testing the Variables

This section explains the methods used for primary data collection as key part of examining and filtering the criteria/variables which specify how well each COS typology best enhance the student experience taking into account costs. In this study primary data collection is the fieldwork data collected to identify existing behaviors along with urban patterns to generate or modify the used theories, moving back and forth. The study aims to set up and experiment in the field a multidisciplinary work of urban design and value evaluation by manipulating the role of the mixed methods approach. The process starts with establishing a soundly based set of criteria and sub-criteria as the measures for experience-based COS design, then grouped and classified into a series of sets, and finally examining the relationships between those sets. Classifying the sets eases the process as it can sometimes be helpful to assess weights firstly within groups of related criteria, and then between groups of criteria.

5.3.1 Ethical considerations

In order to ensure research integrity, and prior to initiating the fieldwork, research approval has been obtained to meet the standards laid out from the University of Salford, SOBE "Ethics of Research Policy and Procedure and the Research Governance and Integrity Policy". This includes compliance with all legal and ethical requirements relevant to the undertaking of this study in an honest, transparent, accountable and responsible manner possible. Interviewees are supplied with a PIS for an informed decision regarding participation, containing research purpose, methodology, the proposed use of data and what participation would entail. Interviewees were informed that their participation was voluntary. Consent was requested of each participant to sign a consent form, confirming they had been provided with details of the study, given the opportunity to ask questions and discuss the research, and received sufficient information to decide.

5.3.2 Piloting to Mapping Uses & Scanning the University at Multi-Levels

During and after reviewing the first step of the process - masterplan data and more facts and figures from the university estates along with investment features and values - the study proceeds with the pilot study. Piloting is the first practical guide for fieldwork investigation and forming interviews of individuals associated with the outdoor corporate campus realizing campus links and it is responsiveness to university, community and city. It is a small, yet important experiment designed to test logistics and gather information prior to a larger study, in order to improve the latter's quality and efficiency *(Wilson & Randall, 2012).* In this study, piloting included a small-scale study for each case study which is conducted to increase the validity of research by ensuring the type and time scales of observations needed, the right questions are asked, and is directed to the right users. The pilot study covered the elements of primary data collection as follows:

- Preliminary site visits including initial walk-through visits with the masterplan as part of the selection process of the university campus and campus spaces (realizing developments, spaces & users profiles).
- Testing the methods of the Guiding Viewbook Categories for recording/photting the scenes and taking field notes and sketches; and press clippings on maps *(Metcalfe, 2015; Metcalfe & Blanco, 2019).*
- Quick (30-minute) initial interviewing, audio-recorded and no need for transcribing data, used to deeply verify the nature of the selected setting, make sure methods of observations provide the required data, as it would be analysed as a key part of this study.

5.3.3 Field/Site Appraisal Methods – Primary Data

Research questions that involve the human qualities of the environment (how a place looks, feels and impacts) are especially appropriate for direct observation. Field observations are mainly directed to test the derived 'spatial developments' from the visual configurations of the urban layouts. Thus, for defining the relationship between student patterns of use and campus design settings at different levels, quantitative data is collected through this direct, ethnographic observation with systematic classification, and random walk-in interviews (whenever needed) as all described below. The site observations aim to take a journey through the campus spaces, deciding and taking records of many factors such as: understanding the nature of campus, typologies of design and use, preferred times of observations, and justifying the Gehl methods. During randomly repeated visits, using different route and different times, the researcher made a record of every possible change, stopping regularly to make written notes, and taking photographs or sometimes a video recording of the journey. This was conducted using a large-scale campus map, tracing out a circle on the spotted/recorded areas which require further investigations. Those maps

along with all photos, sketches and notes were summarized and presented on the COS design index for each selected COS. Structured walking interviews were tested which helped reviewing the amount (time scope) and types of questions, clarity and complexity, the order of questions, and if responses are meeting the research objectives. Based on observations, interviews can be deeply redeveloped and reoriented to spot on the potentials-challenges with the space against theory and how it can be improved. The associated questions are to inform: General information like characteristics (e.g. age, sex and activity or usage of the space), and attitudes (e.g. do they look happy/satisfied)? What is good, bad, and neutral in terms of design and SE? What things need developing (changing now or later)? What problems are getting worse? And other related questions that make each space a unique experience.

A. Guiding Viewbook Photograph Categories

This section is adapted from *(Al-Kodmany, 1999; Klassen, 2001).* The first step in data collection as well as in data analysis plan is to describe the data. One way to describe the collected data is using figures to give a visual presentation (graphs) and the statistics to generate numeric/visual descriptions of the data analysis. Many characteristics of the campus physical environment can be readily measured without the need for primary methods using direct observation, such as through GIS or aerial photos. As such, the selection of appropriate figures to represent a COS setting is crucial along with a focus on the set of data variables which depends on the measurement level of the variable.

B. Structured Direct Observations

Structured observations are categorized to design and use observations. First, the structured design observations include reporting the presence and qualities of COS features particularly hypothesized to affect the SE (e.g., typology of space, spatial and urban indicators as greenness and connectivity of spaces, aesthetic quality, etc.). Each element, as represented in the literature, has its own components and parameters used in the specific COS-Design-Index form. For assessing the campus features, COS segment is the typical unit of observation. Segments typically comprise two facing sides (or more) of one path block.

The second type of structured observations are used to mainly collect quantitative data of students usage within the selected COS using manual counts and statistical analysis. Such observational methods provide an accurate framework for space-use analysis, allowing to formulate the hypothesis that proximity, co-presence and encounters in space potentially establish an important factor for knowledge acquisition and dissemination *(Backhouse & Drew, 1992; Heitor & Pinto, 2012; Heitor & Tomé, 2009; Hillier & Penn, 1991; Sailer, 2011).* Regarding this argument, some authors have been developing studies in this field, both in campus-scale *(Greene & Penn, 1997),* as well in school building scale, addressing their analysis to organization, flexibility and adaptability of academic spaces; evaluation of mobility flows on academic spaces *(Heitor & Pinto, 2012; Heitor & Tomé, 2009; Heitor et al., 2007);* and the influence of spatial layouts on students' behaviour *(Pasalar, 2004).*

As part of the assessment process, COS were mapped into their different functions using a multifunctional approach to mapping. The advantage of the multi-functional approach is that it gives a much more accurate picture of the provision of open space. As such, the observation methods are adapted from four types of Gehl's methods described and ordered as follows:

B1) Gate counts: manual counts of the users at certain peak times to measure the frequency of use. The Gate counts method is directed to observe the density of pedestrian or vehicular movement flows represented graphically and statistically *(Vaughan & Penn, 2001)*. The Observer stand at the edge of each gate to maximize his visual field and count people crossing an imaginary line that ideally connects two parts of

the built environment using a stopwatch to perform the counting precisely. The gates are carefully selected and shown on the campus map/masterplan. Information is recorded, where numbers of pedestrians passing by logged in addition to special notes on the time, date, and weather conditions. On the gate count tables, logged in and out pedestrians are categorized by the five possible modes of accessing the campus: walking, cycling, car/taxi, bus, train.

B2) Static snapshots: Conducted to record the associated use patterns within campus spaces and comparing the four forms of students' outdoor activities (interacting/socializing, individual/private, structured/educational, and active/relaxation) to measure the type and duration of use. By tracking and mapping these activities in time, the patterns of space use are outlined and accordingly spotting the locations where more potential interaction takes place naturally. Snapshots are comparable to a photograph taken from above showing one moment of activities mapped onto the floor plan, taken at consistent intervals. The snapshots are taken in predefined areas that can be easily observed and from positions at which the observer maximize his visual exposure to the observed field of study and at the same time minimize his own visibility to the users. Categories of activities are noted on a large-scale (1:50) map for a period of 1 hour over regular intervals during the day. They are marked using different symbols on the layout. Other particularities that relate to weather conditions, peculiar behavioural patterns, IT use, or site settings are marked as well in the COS observation sheet.

B3) Movement traces: This method enables tracking and mapping the collective flow dynamics through the predefined area. It helps in understanding movement patterns and where people are likely to enter/exit the area from *(Garau et al., 2020; Penn, 2003).* The observer has also outlined islands where no movement traffic is recorded. Similar to snapshots, target areas are chosen to have a convex layout that is easy to observe from a visionary observer position. Different movement patterns (categories) are marked using coloured codes on the layout.

B4) Ethnographic including walk-in interviews with students (explained in separate section).

The researcher located himself at a discreet vantage point for maximum visibility of activity at the three one-hour time periods beginning at 8:30 am (morning), 12:00 pm (lunch time), and 4:00 pm (evening-end of day). These specific times could vary from one university or city to another, hence one of the initial visit purposes is to ensure the 3 peak hours of the academic day. Peak or rush hours are the typical times which the highest numbers of students use the COS. Other times are also considered but not compared as they vary from time to time and from space or campus to another. For the 2 main case studies, the systematic observations of the COSs were conducted at the three peak times for three of the five-week days, for 15 weeks for different purposes/methods. For research limitation, the other subcases in UK and US were conducted using the same techniques but with fewer visits and fewer observation times (visits vary from as short as 2 days visit up to 4 weeks visits). All cases in California were studied during a 12-months research secondment (2 academic terms at 2018-19). There is no standard 'typical day' at American/British universities for purposes of capacity & utilization calculations. All observations were conducted in good weather conditions, avoiding any unique situations that might affect the regular use (ex. extreme weather conditions or holidays).

C. Unstructured Direct Observations

Whenever required, additional unstructured observations were recorded under various categories and were described in detail using field notes. In addition, photographs and short videos (30 seconds to three minutes) were utilized to record unusual behavioural patterns.

D. Walk-in Interviews

The walk-in interviews helped towards the understanding of the set of research questions and identified areas to be focused on the field-testing. The researcher often acted as a participant-observer, taking sketches and notes along with walk-in interviews with students to clarify some experiences, their preferences, and their regular uses in each COS were also recorded. The face-to-face interviews with randomly selected students (n=108) were conducted during, before or after the observation periods as per the purpose. Example of asked questions are: what are students doing, how often, opinion/preference? why do students stay on campus? What types of activities are most preferred/ expected? Why? What are the problems of the current design? Their replies brought about developing the COS-DI (observation template), contributing to the development of the research and the progression of the investigation.

E. The COS-Design-Index Form

Activities were recorded in detail on the observation data sheets: COS-D-I tool. The COS-D-I is a paper form containing a template for filling the observation features (documenting date, time, and location, the spatial features, the density and intensity of each of the activity type) and notes from the walk-in interviews (open-ended questions or comments when needed). The activities are mainly categorized into population density, typology/patterns of use, frequency of use, duration of stay. Also attached with each COS are the maps and plans, supplemented with extensive field notes. Outcomes are obtained as broad set of campus-based variables associated with or anticipated for: urban qualities (university grounds/scales, types, forms); forms; landscape design features (the physical parameters of that setting); and the typologies of use. Uses includes nature (for health and wellbeing); educational (descriptive formal/informal learning); social activities and as most meaningful and inspiring to students. The COS-D-I was used to develop general and detailed profiles for all cases.

Normalization is carried out to render the variables comparable. Extreme values and skewed data are identified and accounted for. Correlation and compensability issues among indicators are considered and either are corrected or retained in the analysis.

5.4 Data Analysis: Mathematical Calculations, Techniques & Procedures

After using observations with photos (visual description) and completing the profiles (COS-D-I), rating system is used to provide a numeric description used for measuring the campus-related experience features. The rating system is explored via two methods: rating scores (explained in this section) and statistical correlation analysis (next section). Such analysis is realized via collecting and testing data, theories, practices, costs and design features of campus-based outdoor spaces that were established to promote positive and innovative experiences among the university students, community and its partners.

The first part of data analysis is achieved through mathematical calculations after considering a various Multicriteria Analysis techniques. Multicriteria Analysis is a valuable and increasingly widely used tool to aid decision-making where there is a choice to be made between competing typologies *(Chakhar & Martel, 2003; Nijkamp et al., 2013; Pérez & Rey, 2013)*. MCA has been regarded as a suitable set of methods which allow accounting explicitly for multiple criteria, in order to support individuals or groups to rank, select and/or compare different alternatives (e.g. design choices, products, technologies, policies) *(Cinelli, Coles, & Kirwan, 2014; Enz & Thompson, 2013; Handy, Boarnet, Ewing, & Killingsworth, 2002).* For more relevant information see appendix (10).

The analysis proceeds to develop a spreadsheet-based assessment tool to list, weight and score the criteria for the assessment (design, use, and cost elements) – which can be referred as primary weighting and scoring. A weighting system needs to be defined and assigned for each criterion to reflect their relative importance. As proved for design factors, not necessarily all the measured indicators (sub-score) contribute with the same importance to the evaluation of the total COS experience (synthetic score) *(Maggino & Ruviglioni, 2009; Munda & Nardo, 2009).* Combining the weights and scores for each COS design setting to derive an overall value. The Excel spreedsheet shows a description or numerical score assigned to each variable, using percentages of each COS typology to show the strength of preference scale. The percentages and other evaluations of design and use are calculated using simple mathematical formulas. For example, the COS covered with more greenery or circulation areas score higher percentage on the scale, also less availability or poor design/condition site furniture score lower percentages. All design physical features are scored by percentages except for one criterion (the number of intersections per area).

Using the right tool is critical and justified (in previous sections) to getting an accurate and mathematically complete ranking score. Tools here in this study refer to the Excel spreadsheets and the algorithms or formula used for rank calculations – all following theories of space syntax. This evaluation sheet finally provided results about the most un/desirable features within each COS typology, evaluation of each typology, and a multi-item scale to produce a quantitative experience score for each COS case.

5.5 Data Analysis : Statistical Analysis

The second method of data analysis is using statistics for obtaining data, and then organizing, summarizing, presenting, analysing, interpreting and drawing conclusions based on the data collected through variables. The subject of statistics is divided into two broad areas: descriptive and inferential statistics. Descriptive statistics are numeric or graphic summaries (or descriptions) of a variable (such as the range of data, their average or mean, standard deviation, correlation coefficients, and partial correlation). Inferential statistics are required to learn more about the study sample, make comparisons and draw conclusions from the collected data. In this study, inferential statistics are used to determine whether a predictor variable has a statistically significant relationship with an outcome variable. Meaning that this allows to make implications or interpretations and generalize beyond the study sample to wider contexts including: making decisions, tests of hypothesis, regression analysis, and canonical correlation analysis.

To dictate the most appropriate statistic method, the following steps are considered:

- Reviewing statistical alternatives from literature. The formulae for various inferential statistics, can be obtained from textbooks, statistical software packages, and biostatisticians.
- Discussing with co-researchers and seeking advice from experts/statisticians.
- Reviewing the relational research questions which seeks information about the relationship among the three sets of variables (position/value of university, design impacts, student relevant outcomes).
- Reflecting the study design to determine whether there is harmony among different sets of variables using the correlation analyses which examine the strength of a relationship or connection between the groups of variables at the same time (outcome/dependent vs predictor/independent variable).
- The level of measurement (nominal, ordinal, interval, ratio).
- Direct and indirect relationships in the data are found by assigning weights to each of the 16 variables in the multivariate sets that represent the highest level of correlation between them (linear

composites), with each relationship being unrelated to all others. A description of each latent relationship is done by observing the size and sign (+/-) of the weights of each variable.

- Statistical tests work by calculating a test statistic – a number that describes how much the relationship between variables in the test differs from the null hypothesis of no linear relationship. It then calculates a p-value (probability value). The p-value estimates how likely it is that the difference described by the test statistic if the null hypothesis of no relationship were true. If the value of the test statistic is more extreme than the statistic calculated from the null hypothesis, then a statistically significant relationship exists between the predictor and the two outcome variables[39]. If the value of the test statistic is less extreme than the one calculated from the null hypothesis, then it shows no statistically significant relationship between the predictor and outcome variables.

As such, the study uses four types of statistical analysis which are defined and rationalized below.

A. Significant Correlation Coefficients

The correlation coefficient is a statistical measure of the strength of the relationship between the relative movements of two variables. The values range between -1.0 and 1.0. A calculated number greater than 1.0 or less than -1.0 means that there was an error in the correlation measurement. For a more straightforward interpretation and better characterization of the underlying latent variable, instead of using the canonical weights, CCA estimates a coefficient or weight, referred to as the canonical loading, for each variable. For the first latent relationship (U1, V1), CCA seeks the best linear combination of A/B and C variables given the weighted sum of variables of each variable set.

B. Significant Partial Correlation Coefficients

The Partial Correlations procedure computes partial correlation coefficients that describe the linear relationship between two variables while taking away the effects of the other variables. Correlations are measures of linear association. Two variables can be perfectly related, but if the relationship is not linear, a correlation coefficient is not an appropriate statistic for measuring their association.

C. Canonical Correlation Analysis (CCA)

The Canonical Correlation Analysis (CCA) is an efficient method to find out the most influential factors in both sets of variables and assess the association between design characteristics and indicators of outdoor experience parameters. It is used to examine the strength of the correlation between a linear combination of the variables in one set and a linear combination of the variables in another set. The three multivariate sets of variables are: general profile of university and campus (A independent variables), COS design characteristics (B independent variables), and the outdoor experience output (C dependent variables).

D. Regression Analysis

Multivariable regression analyses are more complex methods as acquainted with research published in high-impact journals. The four tests are described and discussed in the last (discussion) chapter.

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[39] *Outcome variables are expressed by the rates of the Intensity of use (Iu). It is a function of both the Frequency of use (Fu) and the Duration of stay (Ds). The Fu measures the amount of use (quantity) while the Ds reflects the quality of use (stay longer durations and actively engage with the COS - chat, read/study, play, etc.)*

E. Data Visualization : Graphs and Figures Presentation

Statistical figures are useful for visualizing comparisons between variables or between subgroups within a variable. For example, interpreting complex urban variable, or interval/ratio-level variables may be illustrated using a pie or bar graph; yet, these types of variables often have too many categories for such graphs to provide meaningful information. Instead, these variables may be better interpreted using a histogram. Unlike a bar graph, which displays the frequency for each distinct category, a histogram displays the frequency within a range of continuous categories.

5.6 Conclusions and Recommendations

The focused set of questions reveals and validates the study areas including:

- What kind of SE are considered in the recent campus design/development?

To find out the planners' thoughts on experienced learning attributes on COS - the content, strengths and weaknesses of different typologies of design and use.

- How students/users respond/react to the design intentions?

Also to reveal further insights to their spatial and non-spatial perceptions and experiences.

- What are the spatial indicators that either succeed or failed to meet student experiences and why?

To reveal links and links between spatial features and social indicators.

- Are there any other attributes come to mind?

For further confirmation on spatial or even non-spatial attributes (e.g. the role of community engagement, social norms and attitudes, recommendations for future policy development and practice, etc.).

- What are the new and best ways to achieve better design qualities while reducing costs?

To find out expected perceived attributes that enhance learning experiences on the COS at the lowest cost, thus achieve higher investment potentials (application and development of the framework).

5.7 Validation Interviews and Triangulation

The final step of the methodology explains how reliability, validity, and triangulation were achieved to help provide more valuable and justified recommendations. The Reliability and validity are concepts used to evaluate the quality of research. Reliability is about the consistency of a measure, and validity relates to the precision of a measure. The validated methods and results help make judgment-based decisions and to gain in-depth and technical information among the variety of feasible design typologies in indicating the best institutional fit of student-space-investment (to enrich the campus experience, boost enrolment & stay competitive). In order to achieve reliability of research, and validation of the methods and outcomes, the study maintains several processes related to data collection and analysis as follows - *adapted from Ritchie, Lewis, Nicholls, and Ormston (2013):*

5.7.1 The selection of research methods and sample design

Chosen and executed in a manner that intended to reach an objective understanding of the subject matter under investigation *(H. E. Green, 2014).* Use of interview questions are carefully considered in terms of relevance, appropriateness and its non-leading application whilst allowing interviewees free expression of their views and ideas. **Unbiased sample design and selection** based on a criterion of selection that meets

the objectives of the study. Also considering criteria for interviewee selection to obtain as appropriate and unbiased interviewees as possible. In order to gain unbiased information as possible, interviewees will be assured of the anonymity of data attribution. Rigour of data analysis is reinforced by the use of verbatim (word-perfect) transcripts and specialized data software. All findings will be supported with evidence. In addition, the consistency in the application of **pilot study and preliminary visits** along with systematic and comprehensive analysis.

5.7.2 Validation interviews

Sample size: The sample number of interviews continues until reaching the "Saturation of knowledge" *(Bertaux 1981, p. 37).* Conceptually, saturation may be the desired end point of data collection. *Guest, Bunce, and Johnson (2006)* found that 12 interviews of a homogenous group are all that is needed to reach saturation. The selected number of interviewees and respondents was only 3-5 interviews from each main case study due to: in-depth interviews with less variable contents *(Guest et al., 2006);* the researcher's and supervisors' experience, fatigue and confidence *(Mason, 2010);* and finally meeting all of the purposeful sampling criteria not just from the main interviews, but adding more sub (less important) interviews from the sub cases *(Gillham, 2000b; Roulston, 2010; Seidman, 2006)*.

Selection of interviewees: Pilot study for interviews included a list of planned key interviewees selected with their informant profile (e.g. occupation, contact details, etc.), transcripts forms, and meeting minutes. The categories of interviews covered the three key areas of research. University staff and student unions representing the academia with an internationally recognized background on urban design. Interviewing academic experts is needed for discussing the role of informal learning models, more recent outdoor innovative activities, and the social interaction on how they are linked and enhanced with the campus fabric to impact the student experience. Interviewing campus planners planners/architects (senior practitioners/experts, real estate developers) is to validate the implementation of the methods (ranking score & statistical tests) as well as the design decisions (general & detailed/current & future recommendations). Finally, interviewing the University Estates and administration at UOS (or university planning and services office at SDSU) is for reviewing the budgeting and investments of campus development project [40].

The selection of 3-5 semi-structured (1-hour) interviews for each case study. Particular challenges are considered regarding refusal or delays in responses from interviewees. For example, on top of the UOS & SDSU interviewees, additional participants were interviewed with similar professional experience. Further 1-2 interviews were conducted from UK & US specialists and regional experts for a broader perspective.

Interviews content & sample criteria: The criteria for the selection of interviewees along with an overview of the discussion points and overall challenges/expectations of the research field trip is considered by means of correspondence with the directors of the chosen university. This selection allows deeper studies and interpretations that can best regenerate the theory and understanding of students usual and specific experiences *(Arber, 2006).* An interview guide will be prepared to allow for consistence process of seeking information, while tolerating flexible personal responses *(Flick, 2018).* The guide contains interview topics informed by the theoretical framework. A guiding set of questions will be listed under each topic, designed

[40] Jason Challender is the Director of Estates and Facilities at the UOS. The two planners for the UOS campus are: Hawkins\Brown (2009 campus masterplan including an £81 million student accommodation complex by Sheppard Robson, and a £55 million gateway project by Stride Treglown); 5plus Architects (responsible for the development framework for UOS estate and a future vision for the wider area).

to gather information not available or needed further clarification and validation. External experts are interviewed so that a comparison of achievements and challenges in different contexts could be explored. Letters of introduction were prepared accompanied by a Participant Information Sheet (PIS). All interviews were undertaken in the English language. After seeking permission, all interviews were digitally recorded with supplementary notes. The recordings are transcribed with an in-depth reading to extract and justify a clear sense of the findings in the text, relationships between categories of data and significance in terms of comparable emphasis attached to different COS typologies and qualities *(Moran-Ellis et al., 2006)*. Unfortunately, due to the Covid-19 pandemic, a number of planned interviews were cancelled. A list of all relevant interviews, meetings and events are briefly explained in the table below.

Table 10: Summary of the planned interviews

Focal question	Interviewee	Status	Discussion / Findings
Lit-1/3 What, why, how do students act/behave on campus ? how is related and/or monitored within the Higher Education system ? Discuss theories, practices, methods and approaches.	UOS - Student Union & campus user	Pilot interview 19 / 03 / 2018	The nature of, needs and common activities of students, high footfall areas as potential COS. Information about how students use COS for study/research and leisure, and be involved in management and development of the site (What sorts of events/activities that attract students most?)
	1. UOS – Academics	1 Interviewee 10 / 01 / 2018	Pilot study. Understand university mission regarding the SE.
	UOS – Academics	Cancelled 30 / 11 / 2019	Methods and findings for the COS experience score. Information about how they can use outside spaces for study and leisure and be involved in management and development of the site.
	Local community	Cancelled	Friends of Peel Park; Peel Park Ranger (SCC); Wildlife Society and other student societies; Promotion of Parks. Information about how they can help to enhance user experience, and collaboration in events and activities.
	2. SDSU Academics	Group meeting (7) 09 / 04 / 2018	MAPSLED 1st stage presentation. Understanding Cal HE system & universities (SDSU, UCLA, UCB & Stanford).
	3. SDSU - Director of Innovation centre	Group meeting (4) 23 / 04 / 2018	MAPSLED meeting with director & MAPSLED members. Nature of the innovation centre. Innovative ideas / events / activities / projects. Assessing innovative outcomes?
	4. UC Berkeley Academics	Group meeting (3) 16 / 04 / 2018	MAPSLED meeting with the director and other members. What and why this COS type is used for ? What about this space that attracts students? or keeps them from it? What makes students feel comfort, safe, active, etc.?
	5. Alberta Academic	1 Interviewee 13 / 10 / 2018	COS experience challenges (Canada weather conditions).
Lit-2/3 What is the role and process of campus masterplan in response to students needs and expectations ? Criteria for choosing masterplan alternative . What and why reflections on what places on campus do students most use ? most	6. UOS – Academic & campus user	1 Interviewee 05 / 07 / 2018	Discuss COS experience challenges & findings in UK. What spaces on campus encourage/discourage interaction? What favourite spaces on campus to meet others? Study with others? What spaces help feel connected to other students?
	Green Campus Group (GCG)	Cancelled Group meeting w/ staff, students and/or local community	Working closely with the Students' Union and the Peel Park Ranger to discuss information and engage with the University community about the current and future/potential use of COS and how they will and could be developed and enhanced.
	7. SDSU - Director of Planning	Group meeting (4) 05 / 12 / 2018	MAPSLED meeting conducted with the director and the MAPSLED members. Understand and request data on current campus planning - Data gathering procedure and different tools and calculation used for design/cost/use - methods and findings for the COS experience score.
	8. SDSU Academics & Design expert	Group meeting (3) 20 / 04 / 2018	MAPSLED Pilot study. Discuss the assessment tool made for monitoring people behaviour in public spaces
	9. SDSU & MAPSLED	Group meeting (5) 21 / 04 / 2018	MAPSLED opening presentation. Understand and request data on SDSU campus planning – discuss methods and findings for the COS experience score

prefer ?stay at most ?	Academics & urban experts		
	UCSD – Urban Design course	1-day event 29 / 02 / 2019	
	10. Author on cities (Richard)	Group meeting (6) 16 / 04 / 2018	MAPSLED meeting. People behaviour patterns - City and Urban Planning in California - Silicon Valley and Stanford
	11. SF Dept of City Planning & Zoning	Group meeting (4) 18 / 04 / 2018	MAPSLED meeting. San Francisco planning systems and classifications - Equity
	12. LA Dept of City Planning & Zoning	Group meeting (4) 19 / 04 / 2018	MAPSLED meeting. Planning systems and classifications - UCLA - GIS plans and data
	Chris Couch, UOL, Professor of Urban Planning	Cancelled	Author of Key of Publication about the development of Liverpool.
	Peter Brown, UOL, Planner/prof	Cancelled	Chair of Merseyside Civic Society (MCS)
Lit-3/3 What are criteria for choosing masterplan alternative ? what are the priorities for university, students , planners, investors ?	13. UOS – University States (Bawn)	1 Interviewee 22 / 01 / 2018	UOS masterplans : development process, judging criteria, costs and impacts, Cost-benefits analysis.
	UOS – Campus facilities (Cahllender)	Cancelled 30 / 01 / 2020	Justify COS experience score and strategic decision making in UOS and elsewhere.
	SDSU - Innovation centre, economist	Cancelled 23 / 04 / 2018	MAPSLED Pilot. Capital investment in students training (Kathy matrix for innovation incubator) - Using a proxy to measure economic value of investment in Public spaces.
	14. UCSD - Dep of Planning & Facilities	Group meeting (3) 10 / 12 / 2018	MAPSLED meeting conducted with the director and the MAPSLED supervisor. Understand and request data on UCSD campus planning – The room for the new improvements: challenges, opportunities, benefits and limitations.

UOS (3 interviews) SDSU (5 interviews) England / California (7 Extras)

Having the advantages of triangulation validation, the research conducts mix different approaches. As explained above, triangulation is verified through mixed methods studies including data triangulation (the use of a variety of data sources); investigator triangulation (the use of several different researchers); theory triangulation (the use of multiple perspectives to interpret the results); and, methodological triangulation (the use of multiple methods to study a research problem) *(Duffy, 1987).* The collection and analysis of secondary data set and primary data are obtained by documentation, observation, semi-structured interviews, alongside a review of empirical and theoretical literature. It is the triangulation of such information, notes *Yin (2013),* that contributes to the rigour of research, and has allowed for enhancing the validity and reliability of findings whilst helping to gain a deeper understanding of the phenomenon under study *(see also (Ping, 2011; Scott-Webber, 2004; B. Thompson, 2003; Trochim & Donnelly, 2001; R. S. Wells, Kolek, Williams, & Saunders, 2015; Wilson & Randall, 2012; Zohrabi, 2013)).*

5.8 Methodological Conclusions

Evaluation of urban design is much the same for university campus projects as for other major development projects. The secondary data collected from literature and campus masterplans provide an efficient and cost-effective way to achieve the research results. It also provides the base for a solid analysis of the development baseline information to develop the framework for the three phases used later for the site appraisal of current (and proposed) campus developments. In order to further investigate the initial findings drawn from the literature and survey the motives behind preliminary university documentary archives, primary data is conducted through the use of field observations and semi-structured interviews with key informants in the UOS. The three phases of the overall theoretical framework are integrated, examined and supported through methods of observation, followed by ratings scores and statistical tests,

and validated by in-depth semi-structured interviews (conducted with campus planners, university estates, and academics). It is focused on the design and field-testing across main and sub case studies for examining the perceived importance SE with elements of the outdoor physical campus environment.

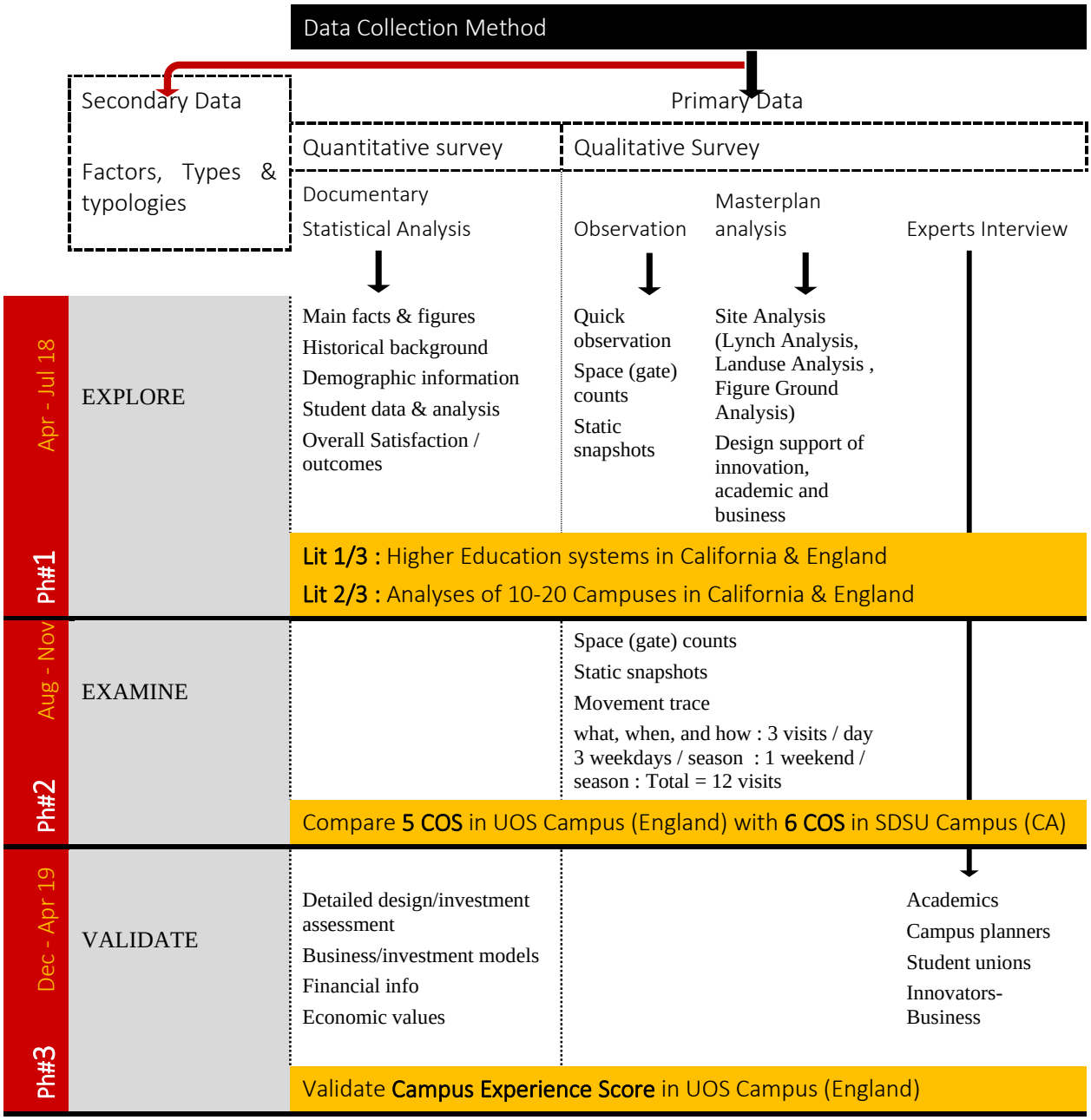
The decision-making is adapted from MCA, Multi-Criteria Decision Model (MCDA) and the Options Matrix Tool (OMT) in order to apply a set of experience-design-costs criteria which help substantial decisions judgment in comparing and ranking a variety of COS typologies. By working through a series of decision-process steps, as follows: 1 main case study in England supplemented by 3 sub-cases, and 1 main case study in California supplemented by 17 sub-cases.

The site observations aim to take a journey through the campus spaces, deciding and taking records of many factors such as: tracing maps and/or masterplans, understanding the nature and scale of campus, types and typologies of design and use, preferred times of observations, justifying methods, and confirming the selected COS and their features. During randomly repeated visits - taking different routes at different peak times - the researcher made records of common and notable behaviour patterns, stopping regularly to make written notes, taking photographs/sketches and/or sometimes a video recording of the setting. This was conducted using a large-scale campus map, tracing out a circle on the spotted/recorded areas which require further investigations. Those maps along with all photos, sketches and notes were summarized and presented on the COS-DI for each selected COS *(see appendix 07).* for research limitations, only few photos were attached on this study where any recorded human is anonymized. Each visit there are a number of associated questions to provide information about: 1. General information like characteristics (e.g. age, sex and activity or usage of the space); 2. Viewpoints of design (e.g. practical or comfort design, needs developing or maintenance, unsafe or dead area, and other related opinions about design that provide a unique experience); 3. Attitudes of use (e.g. they feel bored, inspired, happy, satisfied, too congested, etc.).

The aim of the assessment methods is to rate and find the links between the variables of the three sets (typologies and characteristics of design, typologies of use, and the educational setting). First, the physical characteristics of the seven COS typologies are observed and rated by their percentages of quantity and quality. Second, the experience typology is measured by counting the number of users engaged in each of the four categories: Individual (IEx), Social (SEx), Active (AEx), and Programmed Experience (PEx). It also rates the intensity of use as a product of the number of people - frequency of use (Fu) - and the duration of their stay (Ds). This is referred to as the social activity or liveliness of an environment *(Gehl, 2011).* The Fu is the users-counting crossing the COS which indicates the importance of the COS and its location as a corridor of movement. The Ds is calculated by counting how many users (engaged in any experience typology) by spending time grouped in four-time limits (Ds1, Ds2, Ds3 & Ds4). The four intervals of durations measure only static people (sitting and standing positions) for less than 20 mins, 40 mins, 60 mins, and finally Ds4 for all users who stayed the whole hour of observation or more. A corresponding score of total Ds was assigned. Meaning that more experiences are allocated if the COS has larger numbers of people staying more durations of time. The use of the space over the duration of the day is equally important as an indicator of the usefulness of the space. Third, is about a qualitative treatment on how the value of good design is perceived by the various stakeholders involved in the production and use of campus space, how this perception relates to design-related decision-making processes and how policy influences the outcomes of those decisions *(Baird, 1980; Cinelli et al., 2014; N. R. Council, 2002; Alexandra Cornelia Den Heijer, 2011; McCabe, 2000).* It also includes a quantitative, econometric treatment on measuring the value – or more specifically the costs and benefits – generated by given levels of design quality to inform the financial decisions of stakeholders. In such cases, assessing value normally means converting its various components

into prices, which can then be compared, and benefits offset against costs *(Belfield & Bailey, 2011; Boardman, Greenberg, Vining, & Weimer, 2017; Cordes, 2017; Institute for Higher Education Policy, 1998; McIndoe et al., 2005; Schofield, 2018).*

Table 11: Methods for the 3 phases of data collection



Ch6. APPLICATION ANALYSIS PH#1 : FINDINGS FROM THE SUB-CASES

Chapter 6 shows the first part of the main findings and analysis of this thesis using the selected methods for measuring certain COS settings and the associated SE. The theoretical and empirical studies from the previous sections were used to provide practical guides to effectively analyse universities campuses. This chapter involves the analysis and synthesis of the main similarities, differences and patterns across selected supplementary cases using the three-level design index. These cases are analysed to generalize about the COS design and development. It also shows how and why particular design development/s succeed to promote a more innovative, student-oriented city campus. Chapter 6 concludes the analyses of following sub cases: 1) 3 cases among England, UK; 2) 14 cases among California, US. The cross-case analysis formed the empirical heart of the research, encompassing the following:

- The identification of the case study: setting a comprehensive profile of the university context and approaches to its design and use. This includes and compares basic info about the university and student profile, location and boundaries, campus setting, and the main representative typologies.
- Comparing and analysing the 7 COS typologies of space and their associated 4 typologies of use. The data for both typologies is based on broad systematic review of literature such as theories of *(Jan Gehl & Kwon, 2010)* for behaviour mapping, typologies of SDSU planning, visual quality *(Langelaar, 2010),* etc.
- Gauging the performance and impacts of the COS design through recognising the key links of the COS design-use-value. This stage rates the measures of different COS design and use and find the correlation among the 3 sets of them.
- In-depth interviews with key stakeholders to justify/validate methods and analysis.

Table 12: List of visited and selected university campuses and COS in England, UK & California, US

Case	University	City	Nu	Selected COS Typologies
CS#01	**University of Salford**	**Salford**	**10**	COS1(2) + COS3(3) + COS4(1) + COS5(1) + COS6(1) + COS7(2)
UK SC01	Manchester Metropolitan University	Manchester	3	COS3 (1) + COS4 (1) + COS5 (1)
UK SC01	University of Manchester	Manchester	1	COS5 (1)
UK SC02	University of Liverpool	Liverpool	2	COS7 (1) + COS5 (1) + COS7 – OUT (Myrtle Street Gateway)
UK SC03	The University of Sheffield	Sheffield	3	COS1 (1) + COS2 (1) + COS4 (1)
UKsv#04	Liverpool Hope University	Liverpool	-	Excluded
UKsv#05	Liverpool John Moores University	Liverpool	-	
UKsv#06	Sheffield Hallam University	Sheffield	-	
UKsv#07	University of Bath	Bath	-	
UKsv#08	University of Lincoln	Lincoln	-	
UKsv#09	University of East London	London	-	
UKsv#10	University of Nottingham	Nottingham	-	
UKsv#11	University of Huddersfield	Huddersfield	-	
UKsv#12	University of Bolton	Bolton	-	
UKsv#13	University of Cambridge	Cambridge	-	
UKsv#14	University of Oxford	Oxford	-	
UKsv#15	Cardiff University	Cardiff, Wales	-	
Total in England, UK	**Visited : 17 campuses**		**Selected : 5 universities campuses with 19 COS**	
CS#02	**SDSU**	**San Diego**	**11**	COS1 (2) + COS2(2) + COS3 (2) + COS4 (1) + COS5 (1) + COS6 (1) + COS7 (2)
US SC01	UCB	Berkeley	1	COS7 (1)
US SC02	UCLA	Los Angeles	2	COS4 (1) + COS5 (1)
US SC03	USC	Los Angeles	1	COS6 (1)
US SC04	Stanford	Stanford	2	COS4 (1) + COS7 (1)
US SC05	UC SD	San Diego	4	COS3 (2) + COS4 (1) + COS6 (1)
US SC06	USD	San Diego	4	COS1 (2) + COS4 (1) + COS6 (1)
US SC07	PLNU	Pont Loma, San Diego	1	COS6 (1)
US SC08	USFCA	San Francisco	1	COS7 (1)
US SC09	SFSU	San Francisco	1	COS5 (1)
US SC10	SCU	Santa Clara	1	COS1 (1)
US SC11	Chapman	Orange	2	COS3 (1) + COS4 (1)
US SC12	UCI	Irvine	2	COS2 (1) + COS5 (1)
US SC13	UCR	Riverside	3	COS3 (1) + COS4 (1) + COS6 (1)
US SC14	Pomona	Claremont	1	COS2 (1)
SV #16	SJSU	San Jose	-	Excluded
SV #17	EVC	San Jose	-	
SV #18	UCSB	Santa Barbra	-	
SV #19	UCSC	Santa Cruz	-	
SV #20	UCD	Davis	-	
Total in California, US	**Visited : 20 campuses**		**Selected : 14 universities campuses with 37 COS**	

6.1 Supplementary Cross-Case Analysis of the UK University Campuses

The future growth, wealth and health of our economy will depend on the creativity, innovation and enterprising spirit at the heart of UK design. We need a strategy for nurturing energy, enthusiasm and ideas to grow sustainable businesses.

University Alliance (www.unialliance.ac.uk)

This section addresses three cases, used to support the analysis and findings of the main case study from England as well as benchmarking and offering some succinct lessons from Masterplans developments. Each case highlights a particular concept related to enhancing and assessing the SE: The wellbeing valuation from the University of Manchester along with the Manchester Metropolitan University (MMU case), the

adapted masterplan from the University of Liverpool (UOL case), and the responses-based masterplan from The University of Sheffield (TUOS case). The four selected universities are explained in the following three sections - including general information about the university and campus with a particular focus on the COS design and use. All universities are members of the Russel Group, which represents 24 leading UK universities committed to maintaining the very best research, an outstanding teaching and learning experience, and unrivalled links with business and the public sector. Studying and visiting these significant universities brings forward landscapes and urbanism as and where necessary (added values) in response to changing and arising students' needs and expectations, in order to be a source of new ideas on how campus outdoors can succeed as nodes of tailored experience-driven designs and enhanced users actions.

6.1.1 SC#1: MMU of Living Campus [The Wellbeing Valuation]

This is the only section that considers two different universities together: The University of Manchester UOM and the Manchester Metropolitan University MMU. Both universities collaborate and share many similarities hence they are addressed here together using data from different references *(Dooris, Cawood, Doherty, & Powell, 2010; Hebbert, 2019; Jefferies, Cheng, & Coucill, 2020; Karvonen, Martin, & Evans, 2018; Whitton, 2018)*. They are distributed across Manchester city, which is most popular and populated city (second or third in England) as well as known for many listed buildings and spaces, plenty of galleries and museums, shopping centres and markets, etc. MMU is home to the Manchester School of Art, the Manchester School of Theatre, as well as the Manchester School of Architecture (MSA) administered in collaboration with UOM. The following are the most relevant and significant qualities emphasised at this case.

- The "Living Campus Plan" was implemented in 2016 as part of the University Environmental Sustainability Strategy. It addresses the challenges of a growing urban campus alongside the opportunities a healthy environment provided for people and nature. The project conducts a Post Occupancy Evaluation (POE) methodology as a way to investigate and capture the social value of the project (social return on investment - SROI). The research project is evidence that the combination of social (wellbeing) measurement and financial valuation is a powerful tool for capturing and communicating the value of investing in HE campus environments. It reaches a wider set of audiences and has the potential to inform future decisions, with a strong sense of place that contributes to the health and wellbeing. The project aims to promote the development of an estate that embraces nature and provides high quality spaces for educational, research, cultural and recreational activities. An important part of this is the link between green infrastructure and the health and wellbeing outcomes for staff, students, visitors and the surrounding local community. A long-term evaluation strategy has been developed to monitor and measure the impact of the Living Campus plan on the wellbeing of students and staff, through the collection of baseline data for comparison against future results. It is made up of a survey including questions about attitudes to the environment, behaviour in relation to the green spaces on campus, and resulting wellbeing impacts. Survey data was collected from 5 main groups: academic staff, Professional Support Service (PSS) staff, undergraduate and postgraduate students. A range of quantitative information was produced, including wellbeing scores per group. This is followed by financial proxies to the results to place a monetized value on the wellbeing outcomes. This means that the social returns per every £1 spent on a project can be distributed and the payback period can also be calculated. This includes the collection of cost data to understand ongoing investment in the campus, which can be fed into flexible ROI metrics. It showed that even before the Living Campus' implementation the UoM campus was already producing about £68 million of value in wellbeing outcomes across the student and staff groups in a year. The total impact for the building

users was found to be £134,800 per year, projected to £3,572,800 over the 60-year lifetime of the building using HM Treasury discounting rates. The toolkit and collated evidence base are to be used to disseminate the commercial potential of wellbeing valuation in the urban built environment and demonstrate its practical implementation in buildings and the public realm in cities.

Table 13: Research results using the SROI methods (Fujiwara, 2014)

Group	PSS staff	Academic staff	PGR	PGT	UG
UoM Total Population	4855	6490	3555	8310	26725
Avg hrs spent on campus /wk	35.19	35.03	17.43	17.12	16.40
Working weeks /year	*48*	*48*	*48*	*31*	*31*
Financial proxy description	Value of relief from depression or anxiety £36,766/year OR £4.20/hour, adjusted for average number of hours spent on campus per year.				
Proxy	£7,089	£7,056	£3,510	£3,089	£2,133
Annual value produced	£34,418,506	£45,793,765	£12,480,179	£25,675,299	£57,025,031
Wellbeing score %	68	*64*	*72*	*74*	*68*
Deadweight proportion	0.32	0.36	0.28	0.26	0.32
Attribution proportion	0.58	0.46	0.63	0.62	0.60
Annual value produced - deadweight & attribution	£13,547,276	£13,538,207	£5,652,023	£11,843,502	£23,266,212
Impact / year	£13,547,276	£13,538,207	£5,652,023	£11,843,502	£23,266,212
				Total impact	£67,847,222

- The MMU is currently moving along its largest physical change to its estate since its foundation, with a £350 m investment programme. In 2014, the Elizabeth Gaskell, Hollings and Didsbury campuses were closed, with faculties being relocated to campuses at All Saints and Birley Fields. Birley site locates the Faculties of Education and Health as well as the student accommodation for up to 1,200 students comprising ultra-modern, environmentally sustainable townhouses and traditional student apartments (£140 m development). The Crewe campus was also closed in 2019 for financial reasons.
- 84.4% of students were found satisfied with the university experience.
- THE 'unseen' value of Universities in social terms is estimated to be at least £1.31 billion a year, according to new research by a leading independent think-tank. The continues MMU research on how universities benefit society attempts to put a monetary value and offers an alternative to the production-line model of education. It has facilitated above average social mobility in the local area, through widening the participation of and opportunities for students as well as local people. With 43% of students from low-income backgrounds, compared to the national average for university of 7.8%, Manchester Metropolitan is adding £147m per year in social value.

Table 14: Manchester Metropolitan University profile

UK SC #01 : Manchester Metropolitan University (MMU)		
Variables		**Data Records:** MMU Transparency Data; www.topuniversities.com/universities/mmu; MMU Annual Report & Financial Statements; www.timeshighereducation.com/world-university-rankings/manchester-metropolitan-university
		Figure 7: Manchester Metropolitan University campus plan (https://www.mmu.ac.uk/travel/manchester/)
General profile	University	Public – Research (5 faculties, 13 research centers)
	Age	1970 (Manchester Mechanics Institute & Manchester School of Design forming Manchester Polytechnic). 1992 (MMU)
	Cam type	Urban – Scale : Large
	Location	MMU has 2 campuses on All Saints & Birley (Hulme) in Manchester, England.
	Boundaries	Divided geographically by the Sheffield Inner Ring Road: The Upper Hanover Street section of the ring road splits university buildings into the Western Bank and the St George's campus areas. The university has expanded from two academic foci about 1 km apart: Firth Court on Western Bank and Sir Frederick Mappin Building on St George's. The completion of the Information Commons and Jessop West buildings (late 2000s), bridges both west (Western Bank) and east (St George's) campus, and in 2017, a new pedestrian crossing was installed on the Upper Hanover Street, physically connecting the two campus.
	Landmarks	Arts Tower (one of the UK's tallest academic buildings). Firth Court (1905, one of the oldest and most distinctive buildings on campus). ICOSS building (Interdisciplinary Centre of the Social Sciences). Sir Frederick Mappin Building (Opened 1904). Information Commons (combines IT resources with library facilities and a range of study spaces open 24/7).
	Size areas	University land: 0.24 Km². Campus size: 0.09 km²
	Students	FT UG students 24,726 – Selectivity 71.4%
	2019 Ranking	#601 World University Ranking & #125 European Teaching Rankings (Times Higher Education) #751 Global World University Rankings (QS ranking) #2 Greenest university (People and Planet University League) - Zero carbon university by 2038
	Fees £/year	UK & Int tuition: £9,250 & £15,500 - Basic living £10,812 (www.which.co.uk/money/university-and-student-finance/student-budget-calculator) - Income £336m - Surplus £5.7m - Cash inflow £26.3m - investment £164.3m - Campus investmenmt £400m

COS

Corridor COS3 - MMU3 : Jenjkinson Street. This corridor serves and is surrounded by the MMU Library (North), Business School & Student Hub (North & West), Oxford Road (East), All Saints Park (South), and St Augustine's Church & Cambridge Hall student accomodation (South). It was recently developed with the student hub. The modern floor patterns circulated landscaped green geometrical pots and site furniture inspires the students in an academic formal environment.

Plaza COS5 - MMU3 : Brooks. Recenctly developed plaza along with the Brooks building. Innovative open space to work with plenty of IT resources and a coffee shop fulfilling students need. Protocols are set up to reduce possible transmission of Covid-19. The building main façade contains big Spanish stairs inside and benches or grassy areas for 5ye sunny days. This plaza is relatively busy during the peak times with some special events running throughout the acadmic year.

Park COS5 - MMU3 : All Saints Park. Central and compact park which serves both the university students as well as local community. It is currently underdevlopment, removing the normal vehicle traffic from two adjacent roads (Lower Ormond Street and Cavendish Street) to extend the public realm and provide more spaces for sitting, relaxing and studing/working. The new proposals aim to have a positive impact on the experience and safety of students, staff and visitors by reducing the dominance of vehicles. They also encourage the use of more sustainable transport options, and promote health, wellbeing, and social interaction. The park is fenced and contains rich variety of lawns, plants and trees, variety of seating areas (fixed, stepped descks, steel movable benches), children play area, statues and art works.

Park COS5 - UOM1 : Brunswick Park. This compact park is surrounded by MMU educational buildings including: Roscoe Building & Williamson Building (North), Chemistry Building (East), Simon Building & Zochonis Building (South), and Brunswick St (West). The park is charachterised by the various seating areas along the paths with trees, lights & signs & bins.

6.1.2 SC#2: The University of Liverpool [Adapted Masterplan]

The University of Liverpool (UoL or Liverpolis or Lpool) sub case has been chosen for the following reasons collected from several references *(Carey & Sutton, 2004; Connolly, 2013; Couch, 2017; Paul Jones & Wilks-Heeg, 2004; Melhuish, 2015; Munck, 2003; Vision, 2012).*

- As the focus of this research, the city and University of Liverpool strategy to 2031 focusses on the three pillars of productivity; people; and place. In 2011 the university made a commitment to invest £660m into the 'SE'. The masterplan and public realm have been prepared in close collaboration with a key team of stakeholders and represents a broad spectrum of internal consultations as well as valued feedback from external interested parties from the City of Liverpool and beyond.
- The Masterplan is carefully woven into the fabric of the city, providing a welcoming and distinct campus identity. The University Estates has commissioned URBED (Urbanism, Environment, Design) to develop the masterplan in 2016. The last major campus masterplan was undertaken by Lord Holford in 1940s. The 2016 masterplan has environmentally led approach with 1,000 trees across the campus which contribute to a verdant aesthetic, and a positive contribution to the overall biodiversity and heath. A new central green offers the University something new and unique; a space to gather, linger, study and relax. Existing courtyards are given a new lease of life, to become quiet spaces where staff and students can take a moment, read, eat lunch and chat. The public realm is underpinned by the aspirations to create a high-quality, coherent network of pedestrian routes, streets and spaces which offer students, staff, visitors and the wider community the opportunity to experience, and engage with, the campus. The campus is unified by an improved and extended pedestrian spine, and seamlessly integrated with surrounding neighbourhoods by balanced roads (allowing vehicular, cycle and pedestrian movements) and safe pedestrian crossing points. New gateway spaces enhance the arrival experience, aiding orientation and forming a positive first impression.
- The UOL forms an important part of Liverpool's Knowledge Quarter. The Liverpool Knowledge Quarter, developed and designated in 2012 as a Mayoral Development Zone, is an area that brings together the key players in one of the largest concentrations of academic, research, medical and business clusters in the UK. Some of what it includes are the three main universities of Liverpool: University of Liverpool; Liverpool John Moores University (LJMU); and Liverpool Hope University. Together the Knowledge Quarter institutions generate well over £1 billion for Liverpool each year, more than 15% of Liverpool's total GVA *(Vision, 2012)*.

Table 15: University of Liverpool profile

UK SC #02 : University of Liverpool (UoL)		
Variables	**Data Records :** HESA, 2018/19; www.which.co.uk/money/university-and-student-finance/student-budget-calculator; The university of Liverpool Facts and figures; Annual Financial Statements (www.liverpool.ac.uk/finance/financial_statements/).	
Figure 8: University of Liverpool campus plan (https://www.liverpool.ac.uk/)		
General profile	University	Public - Research
	Age	Founded 1881 (as a college & 1903 UoL Royal Character). One of the six original 'red brick' civic universities
	Cam type	City 'Civic University' – Scale : Large
	Location	Brownlow Hill, Liverpool, Merseysid, England: A strategic site on the edge of the city centre (heart of the city region)
	Boundaries	Campus is distinct from the core retail, commercial, civic and cultural uses that lie further down the hill.
	Landmarks	The centerpiece of the campus remains the University's original red brick building, the Victoria Building (Opened 1892 & recently the Victoria Gallery and Museum with cafe and activities for school visits).
	Size areas	University land: 0.4 Km² (100 acre). Campus size: 0.18 km² (contains 3 faculties, 35 schools/dept)
	Students	FT UG students 22,735 – Selectivity 77%
	2019 Ranking	#121 Best Global University & #88 Best Colleges/National Universities (US News & World Report) #163 World University Rankings & #27 European Teaching Rankings (Times Higher Education) #181 Global World University Rankings (QS ranking)
	Fees £/year	UK tuition: £9,250. Int tuition: £18,500. Basic living: £11,508 – Turnover £577.7 million (8th UK largest endowment)
COS		
Quads COS1 - UOL1 : The Quadrangle. This enclosed quadrangle is surrounded by George Halt Building (North), Ashton Building (East), Victoria Gallery & Museum (South), and the School of Engineering-Harris Building (West). This historic space is semi-private for students to relax, study and socialize.		

Parks COS5 - UOL2 : Abercromby Square Park (Gated Public Park). Relatively big area (8,900 m² excluding street parking) in a very significant and central location of the univerity. Many students enjoy the lawns when the weather is nice. As many open spaces, the park looks very different between the different seasons of the year.

6.1.3 SC#3: The University of Sheffield [Responses-Based Masterplan]

The University of Sheffield (Sheff or TUOS) is one of the original red brick universities, a member of the Russell Group of research-intensive universities, the Worldwide Universities Network, the N8 Group of the eight most research-intensive universities in Northern England and the White Rose University Consortium. Sheffield ranks number one in the UK for income and investment in engineering research *(HESA, 2019)* as well as having some unique planning features *(Adams & Watkins, 2014; Barbosa et al., 2007; Dabinett, 2004; Kenny & Meadowcroft, 2002; Ketikidis, Ververidis, & Kefalas, 2012; Madanipour et al., 2018; Whittle & Jones, 2013)*.

The last TUOS Masterplan in 2014 was underpinned by a landscape-led approach which seeks to create a legible and coherent public realm - a seamless theme of streets, squares gardens and spaces - that help to link together the east and west campus, and reveal the physical, cultural and lifestyle aspects of the university and to redefine the university experience for students, staff and visitors. The concept is to better integrate the university with the city, to define a distinctive university quarter and to create one unified place providing a rich offer of high-quality landscape and public realm to inspire learning. The Masterplan strategies for the landscape have been developed to integrate the many factors that influence how public realm and infrastructure function and the benefits that they can bring to the University community and to Sheffield, to create a truly sustainable University neighbourhood which are fitting for their place. The masterplan development maintained the boundaries of the campus to allow the opportunity to grow and continue to contribute to the economic regeneration of the city. Based on this organic growth, the development ensured through the public realm the arrival and unique experience at campus for visitors, staff and students. The research focuses on the “response” (the fourth step of the six-stage Master Planning process) to the challenges that need to be overcome, and opportunities that should be taken towards meeting the Strategic Objectives and delivering a transformational Masterplan for the University of Sheffield Campus. As shown

in the figure below, the response to these challenges and opportunities included the following[41]:

IDENTITY & PLACE MAKING: The Masterplan offer strategies that give coherence, consistency and legibility to the visual identity of the campus-built environment and external realm. These qualities applied at all scales: the hierarchy of public spaces, the palette of materials, and the furniture and fabric that allows people to settle. The campus identity (external realm character) strategy was achieved through five landscape features including: 1) Paving hierarchy. The proposed materials palette is intended to complement the guidelines and specifications outlined in the Sheffield City Council Urban Design Compendium whilst seeking to establish a unique identity for the University Quarter and to respond to environmental performance criteria. 2) Furniture strategy. All street furniture and signage shall be of a contemporary simple design that complements the overall University streetscape. 3) Thresholds & gateways. Thresholds between city and University are defined by key moves on both the ground plane and vertical elements; Strategic wayfinding shall be integrated into the streetscape to enable students, staff and visitors to orientate their way within the Quarter. 4) Water. The proposed Sustainable Urban Drainage Systems integrates water collection, filtration, storage & distribution to maximize opportunities for reuse. 5) Planting (building on the title of 'England's Greenest City' and making it a unique part of Sheffield, as well as bringing social, economic and environmental benefits to the University and city).

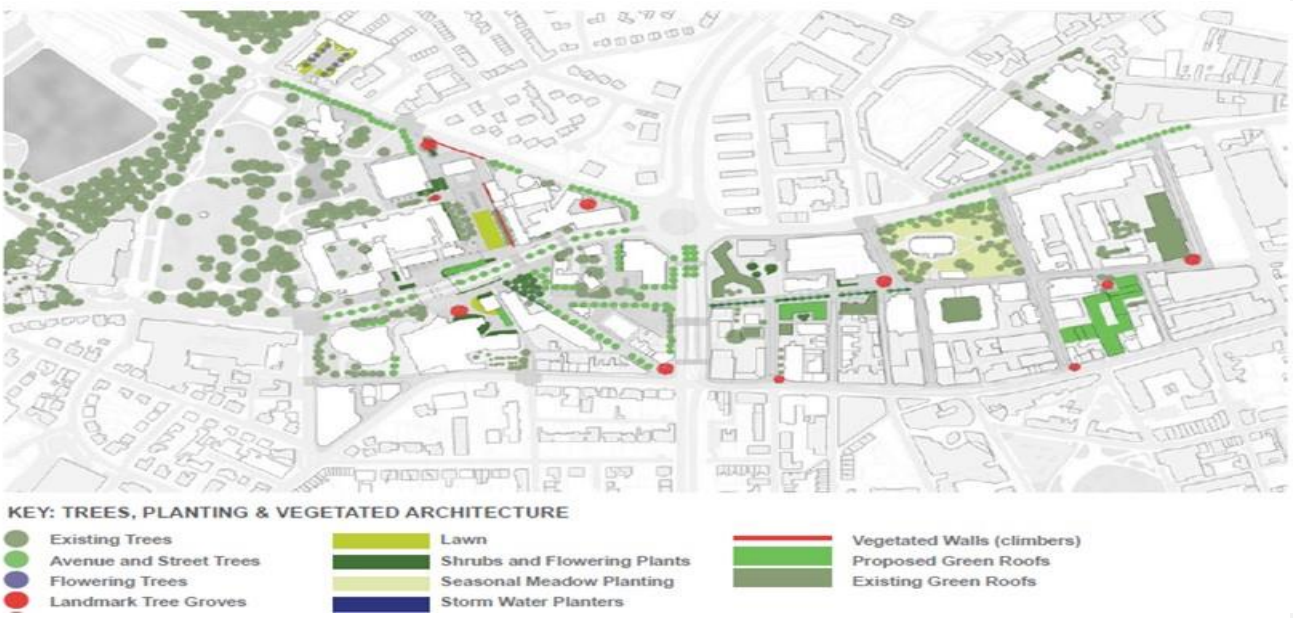


Figure 9: Planting layout (Full Campus Masterplan, 2015)

INTEGRATION: In parallel to establishing an identity, there is a need to create coherent thresholds and gateways at the perceived edges of the campus. These should balance the needs for both continuity in the external realm and a strong sense of arrival at the University Quarter. The extension of the City Gold Route provided an excellent opportunity for the University Quarter to integrate with the City Vision.

COHESION: The Masterplan should look to consolidate its estate via a consistency in the external realm combined with an activation of facades to certain buildings. New buildings could potentially align more with a consistent architectural identity. First and foremost, the campus can be knitted together by improving crossings on Upper Hanover Street and Western Bank.

[41] *See Feilden Clegg Bradley Studios, Grant Associates, & AECOM. (2014). The University of Sheffield masterplan 2014.*

GROWTH: The Masterplan demonstrates that there is room to grow, with a major opportunity to be found in the Hounsfield Favell Site. The foremost requirement for expansion is with the Science Faculty. The positioning of this Faculty at the centre of the campus would help to consolidate the east and west campus.

POSITIVE MOVEMENT: The masterplan made the experience of walking or cycling around the campus a positive experience, giving maximum priority to redressing this imbalance and improving access to all in the Hounsfield Site.

A SUSTAINABLE CAMPUS: The design of the external realm improved the environmental performance of the University in many ways: from making it easier to walk and cycle to implementing creative methods for reducing rainwater run-off.

GREEN SPACE: By maximizing the potential of the existing green spaces on campus, particularly St George's Green, and maximizing opportunities for new green spaces and other forms of greening the urban environment to help promote learning, wellbeing and healthy lifestyles.

LEARNING SPACE: The campus external realm comprised strategically located study-rich external environments, particularly to encourage cross-faculty interconnection. The character of these external study spaces can help to define what is unique about the University Quarter.

Figure 10: Masterplan 8 "responses" to the campus challenges (Full Campus Masterplan, 2015)

Figure 11: Landscape-led development (Full Campus Masterplan, 2015).

1) New Arts Tower Court, 2) Enhanced Concourse, 3) Crossings at Western Bank, 4) New Public Space in Hounsfield Quarter, 5) Crossing at Upper Hanover St, 6) Enhanced Leavy greave Road, 7) Enhanced St George's Green, 8) Enhanced secondary streets.

The masterplan provided 8 different COS within this research led university, creating the opportunity for more accidental academics-researchers interactions, relying on interdisciplinary endeavour. The aim was to create a sequence of coherent public spaces along the University Gold Route with a continuity of identity whilst also a variety of scale, character and activities. Coffee bars, social spaces, and places to meet are already provided within university buildings, but external spaces of this type simply do not exist on campus. These places also provide an opportunity to socialize, relax, study or just pause. The quality of the campus environment is substantially improved with the provision of such spaces.

Table 16: University of Sheffield profile

UK SC #03 : The University of Sheffield (TUOS)		
Variables		**Data Records :** The University of Sheffield, Annual Report and Financial Statements 2018-19; The University of Sheffield, Facts and figures summary (https://www.sheffield.ac.uk/about/facts); HESA, 2018/19.
General profile	*Figure 12: The University of Sheffied campus plan (https://www.sheffield.ac.uk/)*	
	University	Public – Research (contains 5 faculties & Int faculty, 50 academic dept)
	Age	Founded 1828 (Sheffield Medical School), 1905 THOS Royal Character
	Cam type	City 'Civic University' – Scale : Large
	Location	Sheffield, South Yorkshire, England.
	Boundaries	Divided geographically by the Sheffield Inner Ring Road: The Upper Hanover Street section of the ring road splits university buildings into the Western Bank and the St George's campus areas. The university has expanded from two academic foci about 1 km apart: Firth Court on Western Bank and Sir Frederick Mappin Building on St George's. The completion of the Information Commons and Jessop West buildings (late 2000s), bridges both west (Western Bank) and east (St George's) campus, and in 2017, a new pedestrian crossing was installed on the Upper Hanover Street, physically connecting the two campus.
	Landmarks	Arts Tower (one of the UK's tallest academic buildings). Firth Court (1905, one of the oldest and most distinctive buildings on campus). ICOSS building (Interdisciplinary Centre of the Social Sciences). Sir Frederick Mappin Building (Opened 1904). Information Commons (combines IT resources with library facilities and a range of study spaces open 24/7).
	Size areas	University land: 0.36 Km² (90 acre). Campus size: 0.14 km²
	Students	FT UG students 19,610 – Selectivity 84%

2019 Ranking	#121 Best Global University & #88 Best Colleges/National Universities (US News & World Report) #121 World University Ranking & #101 World Reputation Ranking & #22 European Teaching Rankings (Times Higher Education) #93 Global World University Rankings (QS ranking)
Fees £/year	UK & Int tuition: £9250 & £18,500 - Basic living £10345 - Income £677m - Expenses £658m - Endowment £46m - Budget £708m

COS

Quadrangle COS1 - TUOS1: Durham Road Garden

Courtyard COS2 - TUOS2 : Firth Court

Plaza COS4 - TUOS3 : Student Union

6.2 Mapping out the California State: Subcases from the Executive Report

California state has the most and best ranked universities among all other US states with 39 public and private (Stanford University, Caltech, UCB, UCLA, UCSD, UC Davis, USC, UCSB, UC Irvine, UC Santa Cruz, UC Riverside, SDSU, USD, USF, University of the Pacific, UCSD, SCU, LMU, USD, CLU, Pepperdine University, CSUF, SJSU, University of Redlands, Chapman University, DUC, SFSU, Saint Marys College of California, CSUN, CPSU, CSU East Bay, CSU LA, CSU Dominguez Hills, CSU San Bernardino, Pomona, CSU Monterey Bay, SSU, University of La Verne, Woodbury University). After this come the New York with less ranking of 36 universities and then Massachusetts with only 16 universities.

This part compares the key data and analysis of 15 of the most significant universities in California, US. The data relies mainly on the university documents and master planning studies followed by observation data for a widespread comparison through the maze of factors resulted from literature. Studying those significant campus masterplans imparts a comprehensive view of the campus planning and design. This step is important before detecting more on the specific COS features and impacts, where the collection of 32 COS is compared in the next section (1 or more COS from each of the 15-university campus).

Table 17: Key marks of comparison between the selected university campuses (By researcher)

University Site-Visit no. & Location (city)		Dates of devps	Univ type & Rank CA/US	Campus type	Enrolment / Campus size (n/m2)	2017 Endowment	2017 Acceptance rate	Cost & Aid
UC Berkeley	**SV #1** Berkeley	1868 / 1999 / 2020	Public R1 #3 / #21	Urban Large	40,174 / 4.99 km² =.008 n/m²	$4.1 billion	16%	$14,098 In-state $42,112 Out-state $17,274 Room&board
UC LA	**SV #2** Los Angeles	1919 / 2002 / 2019	Public R1 #4 / #21	Urban Large	44,947 / 1.7km² =.026 n/m²	$3.9 billion	18%	$13,256 In-state $41,270 Out-state $15,441 Room&board
USC	**SV #3** Los Angeles	1880 / 1929 / 2011	Private R1 #4 / #21	Urban Large	43,871/1.25km² =.035 n/m²	$4.6 billion	16%	$54,259 Tuition $14,885 Room&board
STANFORD	**SV #4** Stanford	1885 / 2018 / 2035	Private #1 / #5	Urban Medium	16,914/33.1km² = 5.11 n/m²	$22.4 billion	5%	$49,617 Tuition $15,112 Room & board
UC SD	**SV #5** La Jolla	1960 / 1989 / 2035	Public R1 #8 / #42	Suburban Large	34,979 / 8.7km² =.004 n/m²	$1.3 billion	36%	$16,183 In-state $44,197 Out-state $13,254 Room&board
USD	**SV #6** San Diego	1949 / 1996 / 2016	Private R2 #12 / #90	Urban Medium	8,508 / 1.1km² =.008 n/m²	$449.8 million	51%	$47,708 tuition $12,630 Room&board
Pomona	**SV #7** Claremont	1887 / 2004 / 2015	Private R2 #16 / #140	Suburban Small	1,660 / 0.6km² =.009 n/m²	$2.0 billion	9%	$51,075 tuition $16,150 Room&board
UCASF	**SV #8** San Francisco	1855/1858/ 1880/ 2007/2028	Private R2 #13 / #110	Urban Medium	11,018 / 0.2km² =.049 n/m²	$297.5 million	71%	$46,250 tuition $14,330 Room&board
UC SB	**SV #9** Santa Barbara	1909	Public R1 #6 / #37	Suburban Large	24,346 / 4km² =.006 n/m²	$429.2 million	36%	$14,409 In-state $42,423 Out-state $16,218 Room&board
UC SC	**SV #10** Santa Cruz	1965	Public R1 #6 / #37	Suburban Large	19,457 / 8.1km² =.002 n/m²	$188.7 million	51%	$13,949 In-state $41,963 Out-state $16,407 Room&board
UC DAVIS	**SV #11** Davis	1905	Public R1 #10 / #46	City / Suburban Large	29,546 / 36km² =.811 n/m²	$1.1 billion	42%	$14,382 In-state $42,396 Out-state $16,136 Room&board
SCU	**SV #12** Santa Clara	1851	Private R2 #33 #2 Reg West	City Medium	8,422 / 0.43km² =.019 n/m²	$840.7 million	48%	$49,858 tuition $14,490 Room&board
SJSU	**SV #13** San Jose	1857 (oldest public) 1995	Public R2 #103 CA	Urban Large	27,778 / 0.6km² =.045 n/m²	$125.6 million	67%	$7,721 In-state $18,881 Out-state $15,594 Room&board
California Institute of Tech	**SV #14** Pasadena, LA	1891	Private R1 #2 / #12	Suburban Large	2,238 / 0.6km² =.045 n/m²	$2.6 billion	8%	$52,362 tuition $15,525 Room&board
SDSU	**CASE #1** San Diego	1897 / 2007	Public R2 #16 / #140	Urban Large	34,688 / 1.1km² =.030 n/m²	$223.2 million	35%	$7,460 In-state $19,340 Out-state $15,966 Room&board

TOP results in a column BOTTOM results in a column

The above table compares 8 key marks of university campuses which are defined below.

Column #1 Location of the University - in which city at California state.

Column #2 Date of foundation (and/or key dates of development/s).

Column #3 Type of the university (public or private, research or teaching); rank of the university among California state; rank among US universities.

Column #4 Campus settings as one of the following *(Coulson et al., 2017; Jamieson et al., 2000):* 1) Rural Campuses: located in the country near farms or a small town. Majority of students live on campus with more access to outdoor learning opportunities particularly in fields like agriculture or environmental science. On-campus transportation options for students. 2) Suburban Campuses: in small cities, large towns or residential areas near cities. Combine some of the best features of urban and rural areas, offering access to nearby cities and to outdoor activities, with college's transportation options. 3) Urban Campuses: located in cities which can be generally classified into 'city campus' if spread throughout a city, and 'compact campus' if self-contained and enclosed within a city *(Freestone et al., 2021).* Both usually offer off-campus learning experiences through cooperative classes and internships. Urban campuses tend to

attract culturally diverse students. They offer entertainment options such as museums and concerts on and off the campuses, as well as relatively the strongest public transportation options.

Campus size as one of the following[42]: **1) Small:** fewer than 5,000 students, typically private colleges and sometimes small public colleges. More likely to offer less but more specific classes with fewer students and enable professors to give students more individual attention. **2) Medium:** presents the majority of universities with students between 5,000 to 15,000. It has the best advantageous of two. **3) Large:** more than 15,000 of FT full time students. May seem impersonal on the surface, but most offer many opportunities to become part of a smaller community of students with common interests. Classes may be more lecture-oriented supported by lively discussion sessions. Offer students more various/flexible academic, extracurricular and residential options.

Column #5 Campus size (km^2) / total enrolments = number of users / m^2

Column #6 An endowment is a donation of money or property as an investment fund for the ongoing support of the university. Donors usually include alumni, parents, corporations, and foundations. Endowment is important indicator for the university's wealth, supporting the teaching, research, and public service missions. For example, Stanford University has the third highest endowment worldwide (2016) and was ranked #4 on the 100 Richest Universities (2017) & UC Berkeley has over 66,000 donors.

Column #7 Selectivity is the percentage of students who are admitted. The lower the percentage, the more selective the university is[43].

Column #8 Cost & Aid represents the in-state and out-of-state tuition fees. Roam and board are the average fees for housing, meals and other essential expenses. Tuition/fees figure is a base number that can be higher depending on the program. Budget represents the total sources of money the university spends from. This includes tuition and fees, state support, federal and other contracts and grants, gifts and investment income, auxiliaries (such as athletics, Performances, Museum, etc.), sales and service operations. While expenses include Salaries & wages, benefits & retirement, scholarships & fellowships, Utilities/bills, Supplies & materials, miscellaneous expenses such as interest, insurance, rents, event production, travel, and more.

6.2.1 SC#01 : UC Berkeley (UCB)

The excellence of UC Berkeley come from a number of substantial grounds: a significant location on the bay area; placed as the top public university in multiple rankings (US News and World Report, Academic Ranking of World Universities, and Times Higher Education); offer best investment opportunities (40% of undergraduates pay no tuition); the university library system (with 20 libraries and 11 million volumes and electronic journals is the top-ranked research collection among public universities in US); A huge multi-functional campus that contains multidisciplinary Labs, research centres, museums and institutes; in addition to delivering over 100 programs of instruction, research, along with the unique enhancement of quality of life on campus and to the State of California; associated with 100s of Nobel Prize winners (notable graduates as Apple co-founder Steve Wozniak, Intel co-founder Gordon Moore, MySpace co-founder Tom Anderson, computer mouse inventor Douglas Engelbart – who also taught at the school after finishing his Ph.D. – and Nobel Prize winners Willis Lamb (physics), Thomas Schelling (economics) and Hamilton Smith (medicine)) *(Douglass, 1998; Helfand, 2002; Pelfrey & Cheney, 2004).*

Landscape Master Plan -LMP (Published by UCB in 2004)**:** The idea of LMP was introduced to identify the cultural & physical values of the campus landscape and provides a vision for its future. LMP presents a broad physical framework for the use and treatment of open space within the central campus *(Berkeley, 2004; Charbonneau & Resh, 1992; Helfand, 2002; Orenstein et al., 2019).*

[42] *https://www.collegedata.com/resources/the-facts-on-fit/college-size-small-medium-or-large*
[43] *https://www.collegedata.com/resources/the-facts-on-fit/understanding-college-selectivity*

Table 18: The Landscape Master Plan of UC Berkeley campus (Summarized by researcher)

Campus landscape 5 typologies

Used to describe and organize the physical attributes and historic context of the COS system. The order reflects the sequence of their development

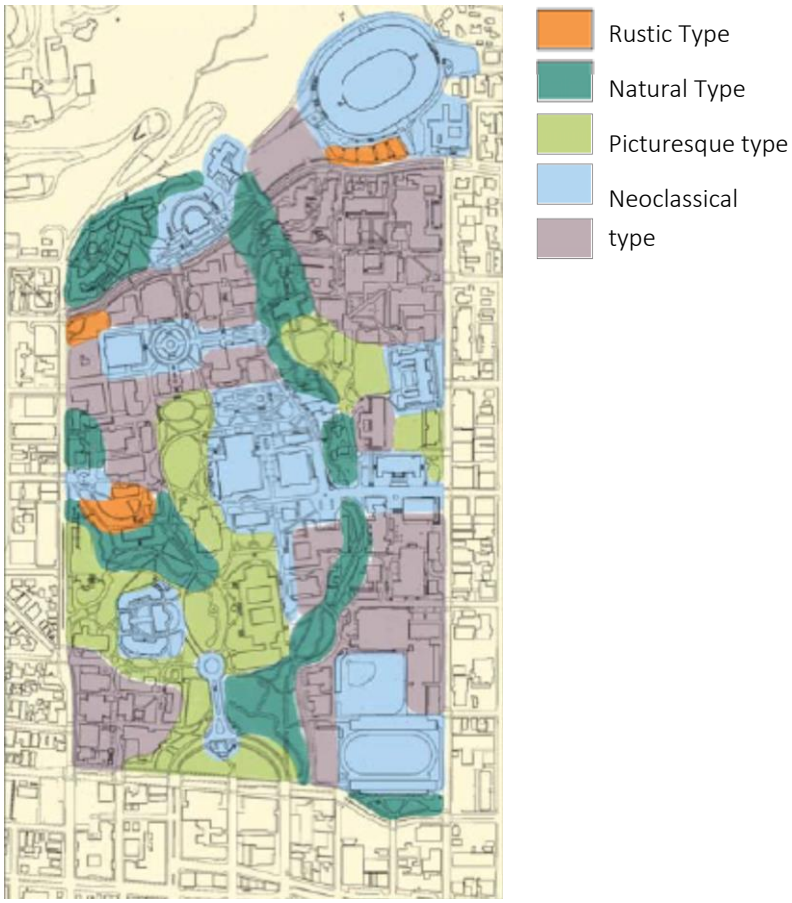


Figure 13: The 5 main landscape typologies of UC Berkeley campus (LMP, 2004)

Rustic type	The original campus landscape character featuring native plant dominance, rustic character, low maintenance requirements, and relating to neoclassical arch.	Founders' Rock
Natural type	A landscape that appears natural with native plant dominance and low maintenance requirements, but has been altered supporting neoclassical architecture.	Grinnell Natural Area
Picturesque type	The picturesque Olmsted style landscape of rolling pastoral lawns, informal mixed tree borders, mixed exotic and native plants, high maintenance requirements, and not directly related to particular architectural styles.	Faculty Glade
Neoclassical type	Rigid architectural landscape framing neoclassical and Beaux-Arts campus buildings, with typically exotic plants selected to enforce the architectural styling and moderate to high maintenance requirements.	Campanile Esplanade
Urban type	Exotic landscape plantings in contemporary, geometric urban plazas. Popular as places of interaction with building forms dominant (medium maintenance requirements).	Sproul Plaza

The Natural Environment

Evolved from the native/original landscape

1. Natural System	Includes: forks of creek, upper and lower tree canopy, and topography of the land.	
2. Strawberry Creek	Provide unity to the campus organization via two creek zones, structuring a dramatic spatial experience. The creek banks provide places for gatherings as well as secluded spots for reflection or study. Culturally, the creek functions as a link between the present & past generations of campus users.	
	Zone 1	The riparian landscape, at least 100' in width, centered on the stream course along the entire length of the creek.
	Zone 2	Includes other rustic woodland areas, consists of large trees with a naturalized understory, have a strong complementary relationship to the creek and often have a strong historic and symbolic identity in their own right, such as the Eucalyptus Grove.
3. Tree Canopy	A legacy of established tall native and specimen tree canopy imparts a sense of spatial order, visual clarity and a sense of time and grandeur to the campus. A few distinctive trees and groves (e.g. Eucalyptus Grove) have become campus landmarks based on their history and visual prominence.	
4. Lower Canopy	Arrangement of groundcovers, shrubs and small trees has a direct impact on students' perception of the landscape.	
5. Topography	Heightens the visual impact of natural and architectural features, and affords a dramatic westward vista to the Golden Gate. Through the 1920s, neoclassical campus buildings were placed atop grassy man-made terraces that accommodated the campus' natural topography and created a dignified series of plinths for buildings. This technique of stepping down terraces through the campus, allows for the creation of dynamic open spaces and framed views.	

The Designed Systems

Figure 14: The "open space elements" of the campus landscape designed systems *(LMP, 2004)*

Woodlands (Redwood Grove, Goodspeed)

Places of interaction (Campanile Esplanade)

Glades (Memorial Glade)

1. Open Space Elements	Provide settings for a variety of activities as well as the common social fabric for the campus community. This careful sequencing typology of contrasting are categorized as:	
	Glades	Characterized by organic, open expanses of lawn. The Central Glade, including the West Crescent, West Oval and Memorial Glade, forms an axial sequence of open spaces that define and spatially unify the central campus. Faculty and Grinnell glades are more intimate spaces separate from this central axis. They have a distinct and rich sense of place about them which derives from their topography, venerable plantings and the high-quality of the surrounding architecture.
	Woodlands	Includes: Grinnell, Goodspeed and Wickson. Campus woodlands are utilized for field studies by a variety of undergraduate and graduate level courses.
	Greens	Located within the larger athletic/recreational zone of campus. Edwards Stadium and Evans Diamond are within walled structures while Maxwell and Hearst North are open fields. These greens are vitally important to the health of the campus population, including the physical education program, intramural sports, club sports, intercollegiate athletics and the marching band. Access to these facilities is limited and in high demand.
	Places of interaction	Architectural and social spaces, including plazas and esplanades. Plazas are defined as centrally located paved open spaces that facilitate social interaction. Esplanades are unique to the Classical Core and are circulation spaces with a formal structure of pathways and plantings. Places of interaction play a vital role on campus by creating a sense of community, fostering new academic initiatives through casual interactions and facilitating campus safety through the activation of outdoor spaces. Neoclassical places of interaction, such as the Campanile environs and Gilman-LeConte Way, feature elements from traditional European landscapes such as axial pathways, terraces, flat planes of lawn and allées of pollarded London Plane trees. These spaces accommodate heavy foot traffic and limited service access within well-defined areas of hardscape complemented by regularly placed plantings. Modern places of interaction, such as Dwinelle Plaza, the Sproul Plazas, Spieker and College Avenue Plazas, serve as entry courts and casual breakout spaces for large modern academic facilities. They are designed in a format similar to urban plaza prototypes, which support the density of campus gatherings.
2. Circulation elements	Includes pedestrian, universal access, bicycle, vehicular and service routes. Providing convenient and safe access to campus facilities while enhancing the campus landscape is becoming a greater challenge as the campus density and hours of operation increase. The safety and convenience of the pedestrian is the primary consideration in campus circulation.	

Figure 15: The perimeters and gateways of the UC Berkeley campus (Charbonneau & Resh, 1992; Helfand, 2002; Orenstein et al., 2019)

3. Perimeters and gateway	A separation is between the central/academic campus & the residential surrounding context unlike the traditional paradigm of the intermixed residential campus. Yet the campus edges are porous and open to support the relationship between them.	
	The **Perimeter** of the central campus is established by public roads on four sides	
	Neighborhood	Northside: maintains the leafy appearance of an Arts and Crafts community, primarily residential area.
		Southside: a lively mixed-use character with small stores and large University housing complexes.
	Central district	West: large business buildings on a city grid.
	Woodland	East: Wooded foothills University housing and the Lawrence Berkeley National Lab.
	The **Gateways** define the University's image and emphasize the campus' sense of place	
	South Gateways	Along Bancroft Way reflect the lively context and the intensive flow of pedestrians accessing the campus. Sproul & College Plazas are broad with heavy foot traffic. Gateway at Spieker Plaza is greener & less frenetic.
	West Gateway	A ceremonial entrance with lush plantings and mature trees to screen the campus from downtown Berkeley.
	North Gateway	Tolman Plaza and North Gate reflect the quieter, residential flavor of the neighborhoods they face.
	East Gateways	Along Gayley Road fuses the campus' densely developed with the rustic scenery of the foothills. Has lower pedestrian use than other campus gateways and serves largely as a vehicular gateway. The east side's most accessible, well-articulated pedestrian gateway is via the courtyard route of the Haas School of Business.

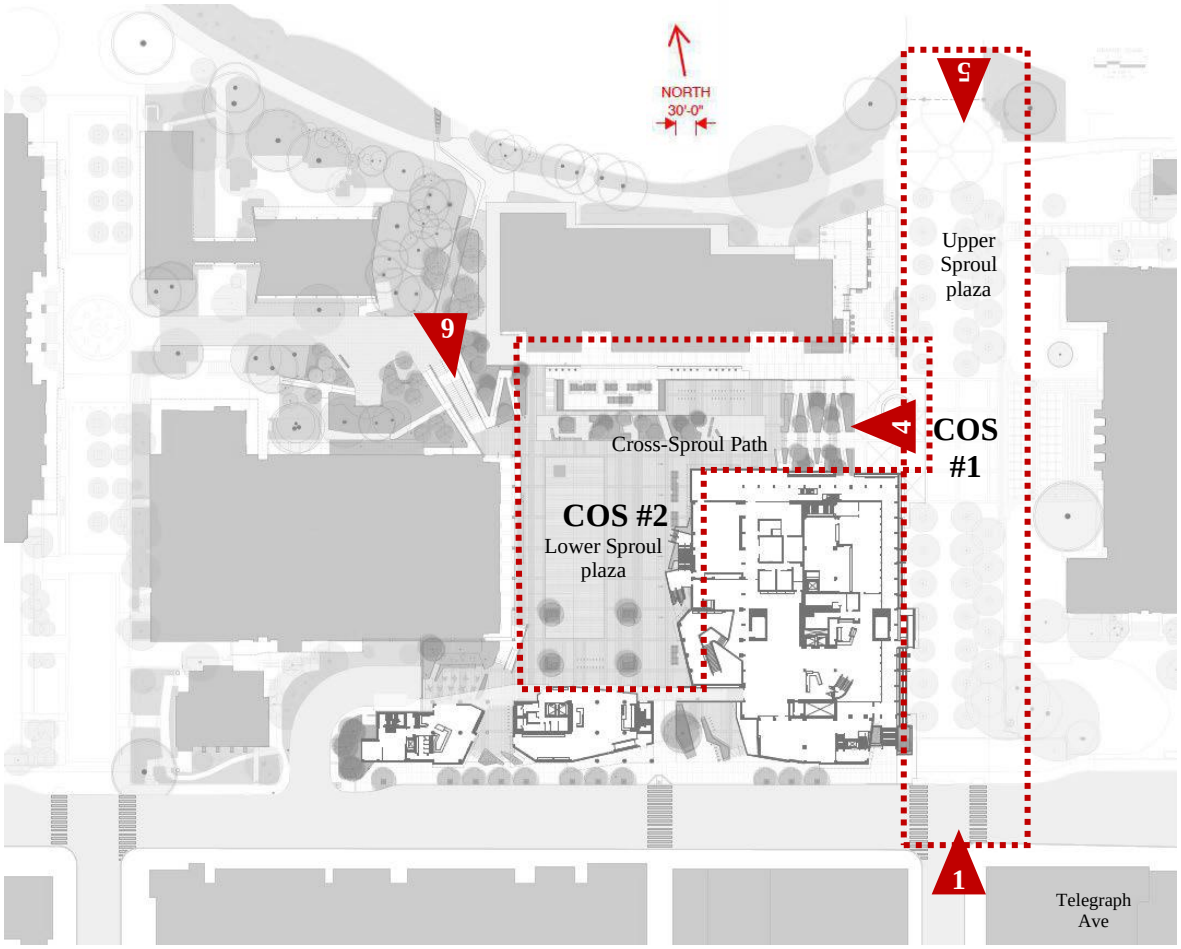


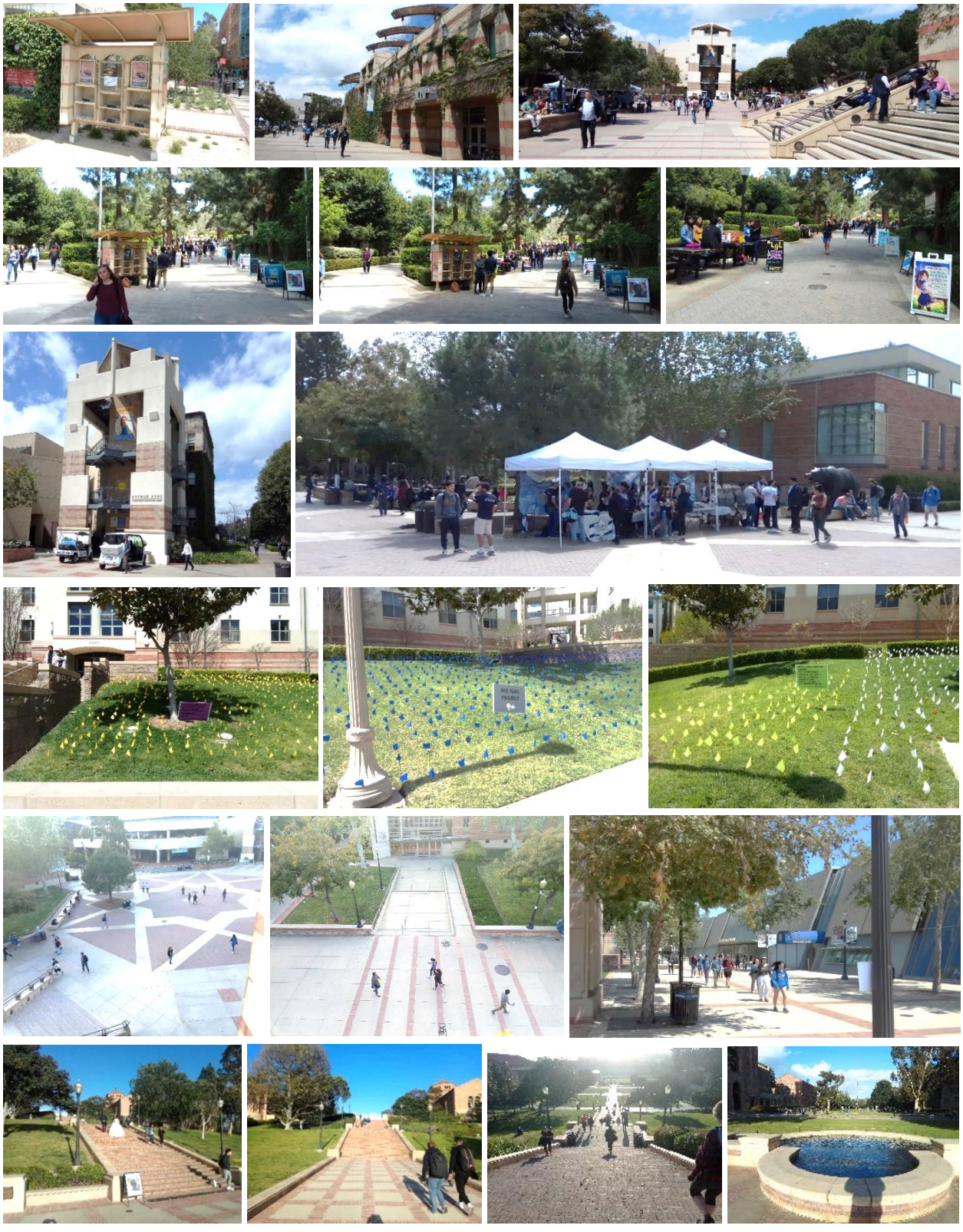
Figure 16: Masterplan with 6 snapshots at 6 COS (collection by researcher)

Space#1 : Sather/main Gate (night) *Space#2 : Botanical bridge* *Space#3 : Lower Sproul Plaza*

Space#4 : Entrance Approach Corridor *Space#5 : Main corridor* *Space#6 : Stairs landscape*

6.2.2 SC#02 : UC Los Angeles (UCLA)

The UCLA Long Range Development Plan (LRDP) describes physical planning objectives/standards and the approach for development of campus buildings, infrastructure and landscape. The data of this part was collected from the university masterplan, field survey and from other relevant studies *(Clough, 1997; Douglass, 1998; Chancellor & Waugh, 2015).*



1. Open Space: An essential component of the aesthetic and social life of the campus. Enhancing its urban character, 34% of the total campus area (142 acres) consists of green space. The classification of open space falls into 4 categories:

- Preserves: Several campus open spaces have been developed to an exceptional level of spatial and aesthetic excellence or hold cherished places in campus history and tradition; including Dickson Plaza, Wilson Plaza, Janss Steps, the Mathias Botanical Garden, the Murphy Sculpture Garden, the University Residence, Stone Canyon Creek Area, Meyerhoff Park, and Bruin Plaza.
- Recreational: important to the health of the campus community and the quality of campus life. Major recreational areas located in the Central and Northwest zones of campus including: The Sunset Canyon Recreation Area, the Intramural Field, Drake Stadium, North Athletic Field, Spaulding Field, and the Easton Softball Stadium. The Intramural Field, North Athletic Field, and Wilson Plaza cover subterranean parking.

- Formal: Highly valued formal courtyards and plazas including: The Court of Sciences, Dickson Court, the Rolfe Sculpture Garden, the Inverted Fountain, and several smaller courtyards and plazas incorporated into the hardscape adjacent to academic and health sciences buildings.
- Campus Entries and Perimeter Buffer Areas: Campus entries also function as open areas that interface with off-campus uses and are marked with landscape monuments of brick or stone. The major southern entry to the campus functions as the campus "Gateway" and is located at the intersection of Le Conte Avenue and Westwood Plaza. Landscaped buffer areas provide open space and a visual separation between the campus and the urban areas on the north, west, and east boundaries of the campus.

2. LRDP Design standards

- Circulation: Organized to facilitate on campus travel, limiting vehicular travel to the peripheral loop road (Charles E. Young Drive) and access to parking structures. Roads in the central portion of campus are limited to emergency and service vehicles and to provide proximate parking for the disabled.
- Utility Infrastructure: Including distribution systems (electricity, gas, heating and cooling, water, sanitary sewer, storm drain, telephone, telecommunications, and waste disposal) that serve the campus are continually evaluated and upgraded in conjunction with the campus' Climate Action Plan in order to ensure adequate facilities and services, and substantially reduced utility consumption and significant additional reductions.
- Sustainability and Green Buildings: Incorporating energy efficiency into new buildings and renovations as part of the Green Building Program has allowed UCLA to continue to reduce the amount of energy used on a square-foot basis, despite overall campus growth.
- Building Material Standards: Typically include UCLA blend brick and buff stone, terracotta, or concrete. These are applied in a variety of idioms, responsive to the function of particular buildings and their particular sites. They are enduring materials that express a quality of permanence and durability.
- Pedestrian Circulation and Campus Hardscape: The large pedestrian population on campus moves through a network of campus walkways composed of brick and buff concrete that creates a unifying ground plane element. The colour and patterns of UCLA brick blend and a buff-coloured concrete varies from project to project depending upon the specific context but unified to provide significant visual connections to the heart of the campus.
- Open Space & Landscape: Have become the foundation of the campus reputation for a garden-like environment.
- Campus Furniture & Signage: Consistency of detail in way-finding signage, building identification, lighting, benches, and other street furniture is essential to reinforcing the campus identity. The Architectural Guidelines denote specific selections for these elements based on successful experience with these items over many years. Many of the furniture items are painted a dark brown colour known as "Charles E. Young Brown." A special font, UCLA Gothic, is utilized on exterior signs, typically with white letters on a dark brown background.
- Site Character and Context: Considered through these strategies: - Recognize major organizing axes in the campus plan, - Maintain orthogonal orientation as an orienting device, - Respect and reinforce the open space and edges. The physical design guidelines are meant to apply to the entire campus and create unity and continuity across the distinct architectural character for each of the eight zones.

3. Land Use Zones: Patterns of use and adjacency have defined areas characterized by dominant uses and differing densities roughly contained within eight campus planning zones: Botanical Garden, Bridge, Campus Services, Central, Core Campus, Health Sciences, Northwest, and Southwest zones.

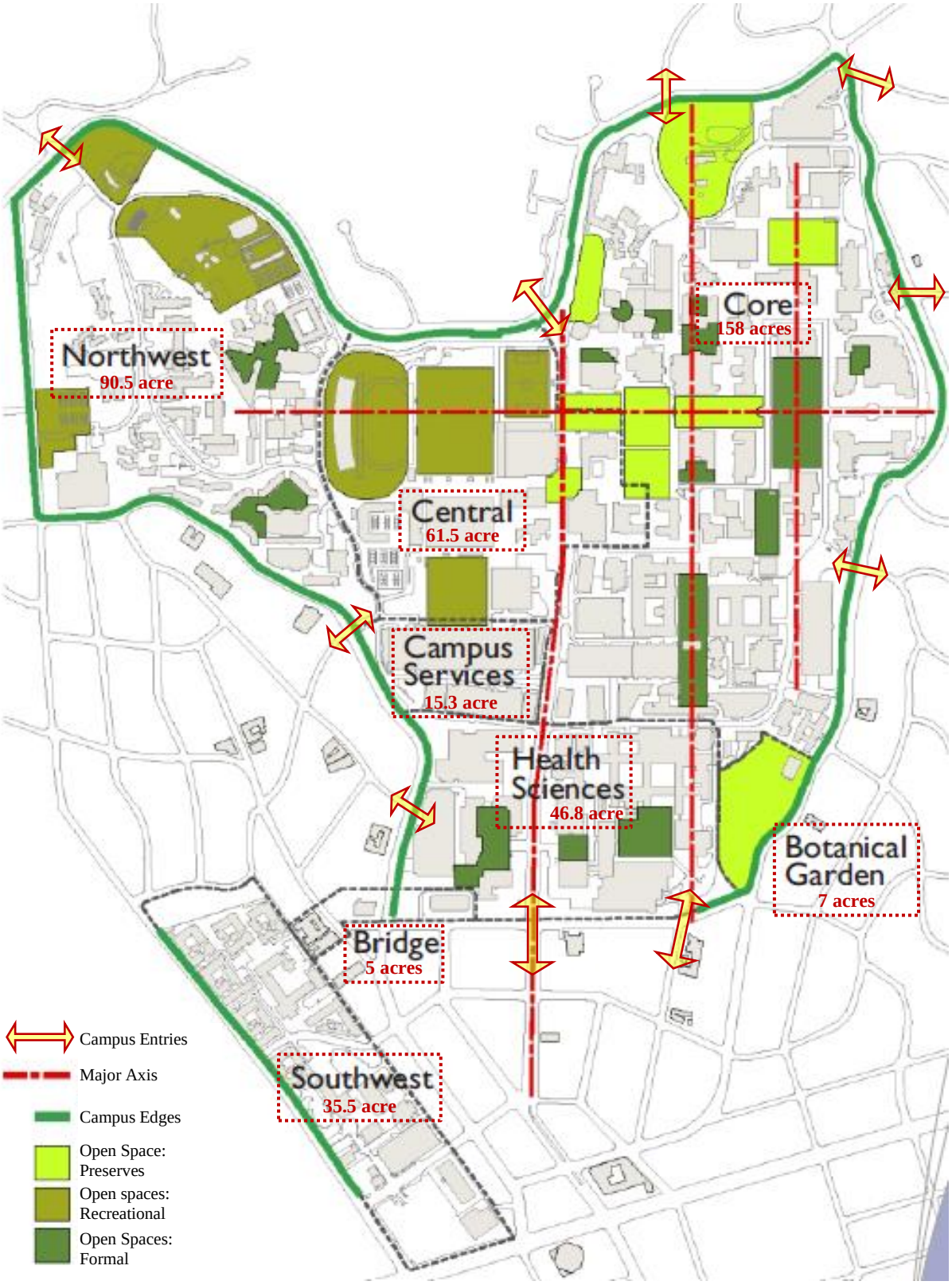


Figure 17: LRDP Zoning Diagram, 8 zones & 4 open space typologies, UCLA (Chancellor, 2015)

6.2.3 SC#03 : University of Southern California (USC)

The data is collected from the USC university and masterplan documents, as well as other studies *(J. E. Becker, 2007; Wigintton, 2013).* USC is the oldest private research university in California. Established relationships with research and cultural institutions throughout Asia & the Pacific Rim. An engine for

economic activity, USC contributes $8 billion annually to the economy of the Los Angeles metropolitan area and California.

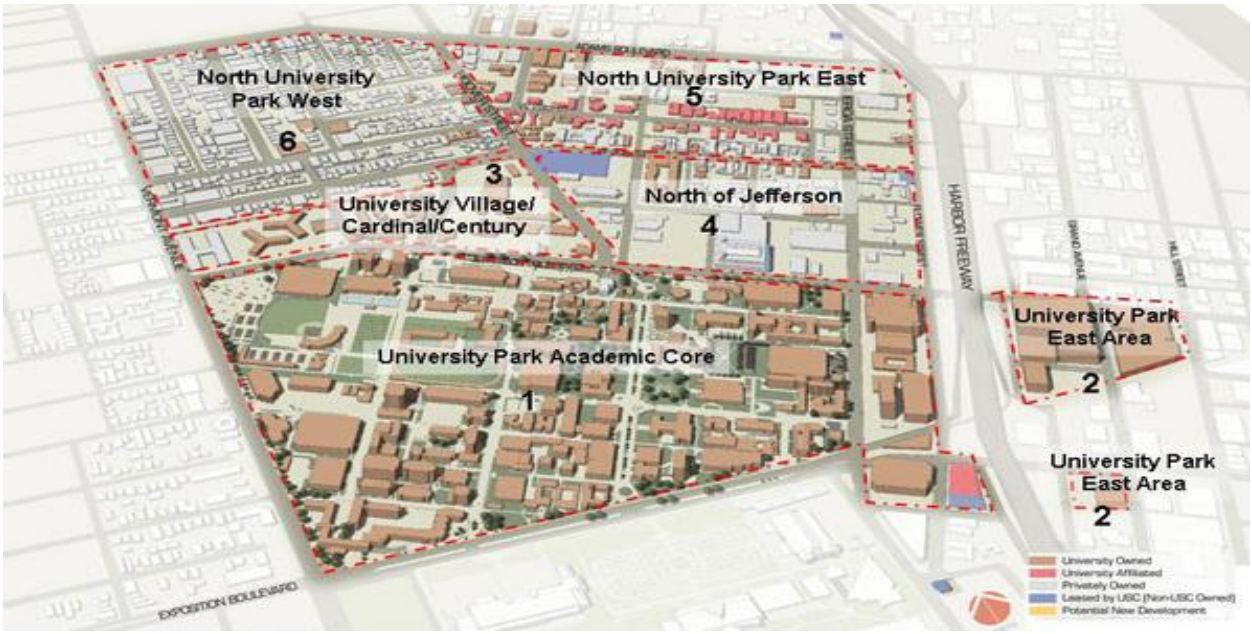


Figure 18: Master Planning Districts: Existing conditions *(Wigintton, 2013)*

6 Master Planning Districts: 1. University Park Academic Core with student housing 161-acre; 2. University Park East Area 28-acre - Campus support services; 3. University Village 35-acre - Student housing, retail & academic support; 4. North of Jefferson 56-acre - Private & university-owned student housing, retail & academic support; 5. North University Park East 75-acre - Private and university-owned student housing; 6. North University Park West 98-acre.

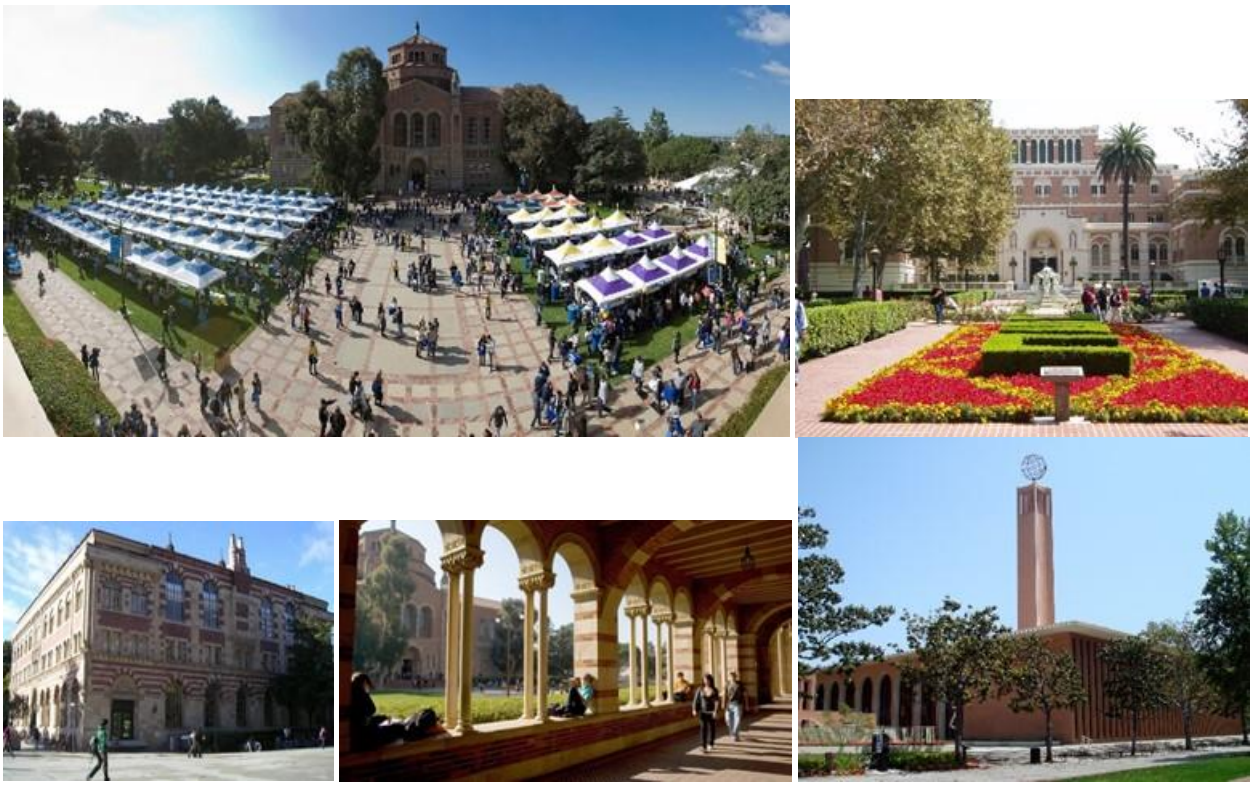


Figure 19: USC Campus settings

1) Bruin Day 2017 Powell Library; 2) Doheny Library; 3) USC Gwynn Wilson Student Union; 4) School of law arcade; 5) The Von KleinSmid Centre of International and Public Affairs

6.2.4 SC#04 : Stanford University

As all other cases, the data is collected from field survey, Stanford university and masterplan documents [44], as well as many other studies *(Griffith, 1994; Lockwood, 1998; Stanford, 2003; White, 2003).* Stanford campus is distinguished by its formal open lands and natural open spaces which frame the academic core. Outside the central academic campus are "the foothills" - undeveloped lands which are nearly half of the community plan area and two-thirds of the University's total area.

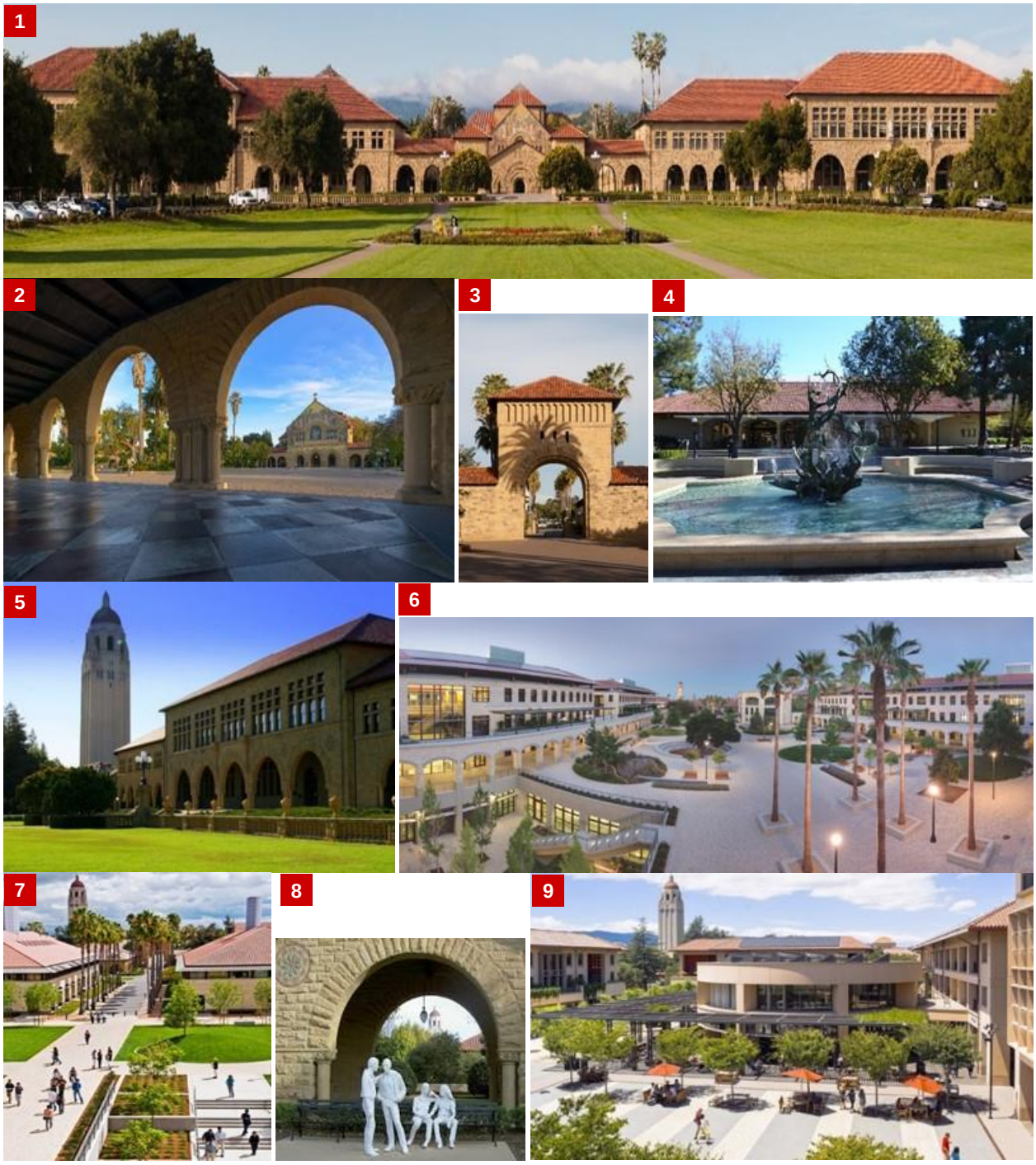


Figure 20: Stanford Campus settings

1. Main quadrangle & Memorial Church. 2. Stanford Quad with Memorial Church. 3. Gate to the Main Quad. 4. White Memorial Fountain-The Claw. 5. Serra Mall & Hoover Tower. 6. Science-Engineering quad. 7. Jen-Hsun Huang Engineering Building. 8. Arts District. 9. Knight Management Centre

[44] *Neuman, D. J. (2006). The Stanford Campus: Into Its Second Century. In Stanford University (pp. 8-12). Princeton Archit. Press. Turner, P. V. (2006). The Stanford Campus: Its Place in History. In Stanford University (pp. 2-7). Princeton Archit. Press. Joncas, R., Neuman, D., & Turner, P. V. (2006). Stanford University: An Architectural Tour. Princeton Architectural Press.*

Figure 21: Palm Drive (main gateway to campus)

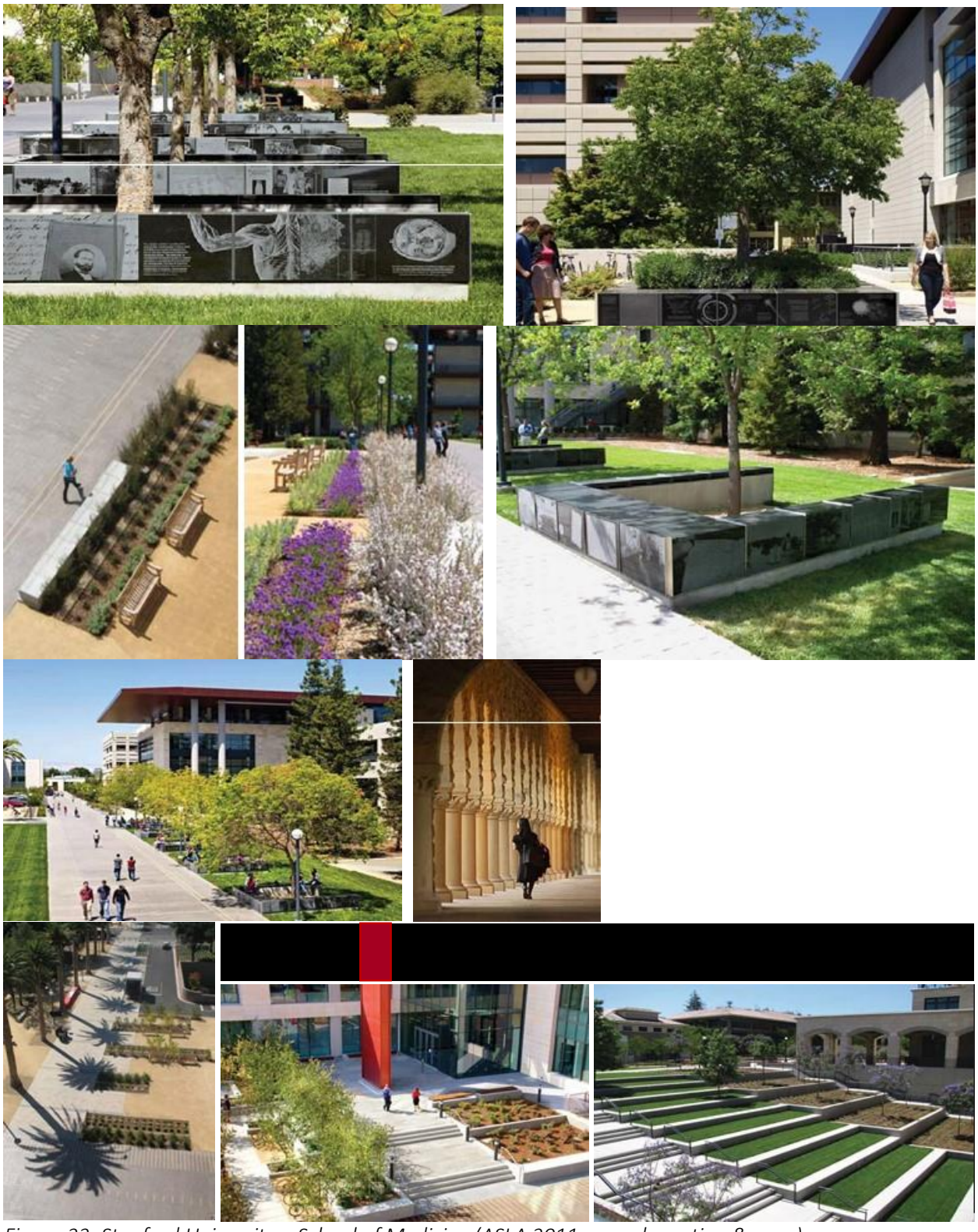


Figure 22: Stanford University – School of Medicine (ASLA 2011 annual meeting & expo)

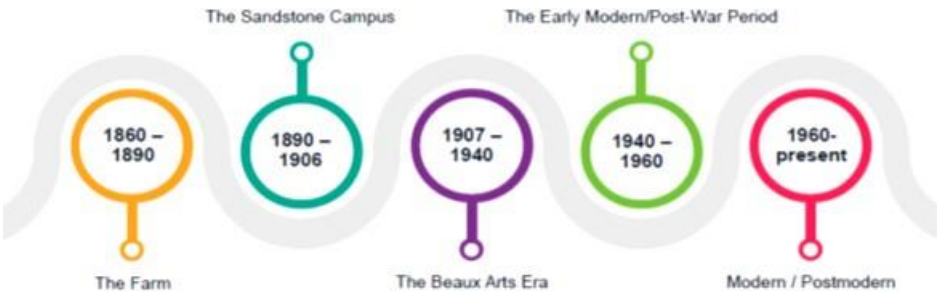


Figure 23: Stanford Historic Context

The fourth–wealthiest school in US and the sixth–highest–ranked in the world, Stanford University is known for its schools of education, engineering, law, medicine, and business, among others. The massive university is located on valuable land in the San Francisco Bay Area. In fact, much of the 1940s was spent encouraging staff and alumni to find the companies that would lead to the rise of nearby Silicon Valley. The Silicon Valley exploded in the region, and high-profile business-minded alumni include Google co-founders Larry Page and Sergey Brin, Yahoo! co-founders David Filo and Jerry Yang, Hewlett-Packard co-founders William Hewlett and David Packard, Instagram co-founders Mike Krieger and Kevin Systrom, and Netflix co-founder and CEO Reed Hastings, not to mention Gap co-founder Doris F. Fisher, and Nike co-founder and chairman Phil Knight. Other prominent graduates include the US's first woman in space, Sally Ride, the first female space shuttle commander, Eileen Collins, and famed geologist Thomas Dibblee. More recently, Stanford has solidified itself as the leading fundraising college in the US Since 2001, it has received several sizable monetary gifts from big–name donors such as the Hewlett Foundation, Dorothy and Robert King, and real estate mogul John Arrillaga. In 2016, Philip K. Knight, co–founder of Nike, gave Stanford its largest donation ever, at $400 million. Stanford's current endowment is an impressive $26.4 billion [45].

6.2.5 SC#05 : UC San Diego (UCSD)

UCSD has reduced carbon emissions and energy usage on campus, earning a "gold" sustainability performance rating in the Sustainability Tracking Assessment and Rating System (STARS) survey.

1

2

[45] *www.nytimes.com/2016/02/24/business/philip-knight-of-nike-to-give-400-million-to-stanford-scholars.html*

Figure 24: UC SD Campus settings : 1) Geisel Library; 2) Price Centre; 3)

Figure 25: ActivateUCSD research project (photos and reported by researcher).

During fall quarter, January through April 2019, the Urban Studies and Planning Department joined the Campus Planning and Transportation Services to present an urban design research project: Activate UCSD - Transforming campus space and student life. The project aims to create a micro mobility and pedestrian friendly environment to the heart of campus. The project was a real-world experiential learning opportunity that allowed current UCSD students to respond to students/users experience and to use their unique perspectives as users and designers UCSD when using the university campus. Student teams were required to submit written proposals for an interim vision plan in the University Centre that was followed by tactical plan to identify financially responsible temporary solutions that the campus could implement quickly to accomplish these specific goals and objectives. The students of the course were grouped into Four teams of even students each has their task. The teams also had access to industry experts in mobility planning, urban design and traffic engineering. The teams then present and discuss together their vision and proposals based on the user evaluation report of 5 urban factors: lighting, shade, seating, greenery, and mobility which was done on site survey and using online Pop-Up/survey form (bit.ly/activateucsd). Many similar projects were conducted in collaboration between students, faculty, staff, government, urban societies and industry leaders, and/or planners of USCD.

To name some: Urban Studies and Planning Pepper Canyon Mobility Hub Designathon, 2019 (transform the incoming Pepper Canyon station into a dynamic multimodal mobility hub, advancing connectivity between the station and the rest of campus); The Glade at Park, UCSD Triton Pavilion, 2020 (a new unique and iconic 10-acre open space/gateway integrating into the overall campus landscape framework); the Urban Design Challenge, 2020 (an experiential learning proposals by current students and alumni for an interim mobility plan in the University Centre that could be implemented after the covid-19 pandemic and before the trolley opens and remain in place until more permanent public realm improvements could be made); and the Ridge Walk improvements, 2021 (will create an enhanced pedestrian and multi-modal experience and traverse six of the seven colleges to be the primary non-vehicular circulation route of the UCSD west campus).

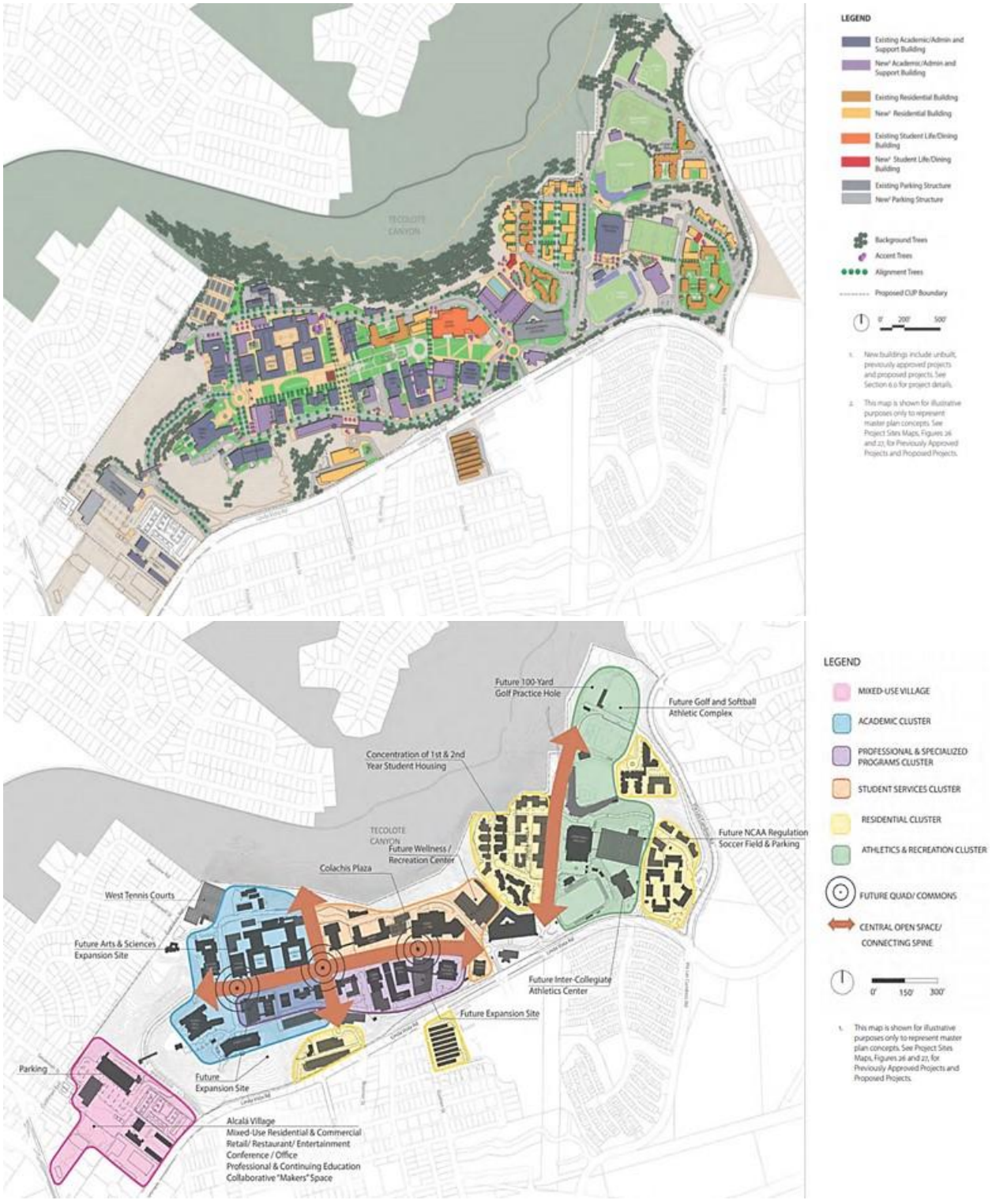
6.2.6 SC#06 : University of San Diego (USD)

This data provided as this section is collected from the USD Master Plan and Design Guidelines made on July 18, 2017, and the Subsequent Environmental Impact Report and Public Review made on January 6, 2017. The University of San Diego has updated the campus Master Plans with the City of San Diego twice in 1996 and then in 2017 while staying true to their Catholic Mission. As specified in the 1996 Master Plan, the buildings were designed and built in a distinctive 16th Century Spanish Renaissance architectural theme with plazas, gardens, courtyards, arcades and the Marian Way Mall and Colachis Plaza. Since 1996, significant positive changes have also taken place that strengthen the USD's position in the community, the city and the region. First and foremost, USD has and continues to invest in the student experience, with enhancements, programs and buildings that support student activity on campus and encourage students to stay on campus, including a substantial investment in award-winning dining locations on campus. USD has also enhanced the edges of campus bordering the community and Tecolote Canyon, with improvements to the Main and West Campus entrances as well as landscape restoration along canyon edges and slopes.

The Master Plan Recent Update is a tool to mainly: prioritize the highest and best use of campus land; confirm adequate space is available for possible academic growth and enrolment; and update the living/learning environment to reflect campus life and academic goals. USD has shown remarkable example in the continued improvements and enhancements to the campus environment and the student

experience. The campus environment supports academic excellence, personal development and a collective spirit. The premiere location of the campus and its high visibility in the City defines a distinctive sense of place and a clear campus identity. In recent years, USD has made a concerted effort to improve campus social life and the student experience through built projects and programs. These include but are not limited to implementing Living/Learning Communities (LLCs) on campus, building the Student Life Pavilion, increasing dining opportunities with a focus on healthy foods and providing more outdoor gathering areas and plazas for informal and social activity. The campus has seen an exponential growth in student organizations and clubs on campus over the past few years, with now over 200 organizations offering students different ways to connect to the university, the surrounding community and San Diego region. At the same time, the beauty of the campus' physical environment may at times be perceived as too formal, thus inhibiting social interaction and affecting campus life. Topography and distance often make connectivity to and through the campus challenging. Large gathering spaces for student organizations to host major campus events are often hard to come by and students desire more late-night dining and recreation options. In the Fall of 2014, the Associated Students spearheaded a "Get on the Grass" initiative to encourage students to use the lawns, plazas, courtyards and outdoor spaces on campus for social interaction and recreation. There is a sense that by changing the culture and the design of some areas of campus, more students will feel invited to stay on campus and make it their home.

The majority of the university property was developed supporting the campus facilities (academic buildings, sports facilities, parking lots, etc.) and its special ornamental landscaping. Topography on site ranges from approximately 50 feet above mean sea level (AMSL) in the western portion of the campus to approximately 260 feet AMSL in the eastern portion (16.2 acres of steep slopes). Nearly 10% of the total university land is dedicated for natural vegetation including: Diegan coastal sage scrub, maritime succulent scrub, southern willow scrub, southern mixed chaparral, and non-native grassland. Nearly 4% of campus area fall within the Multi-habitat Planning Area (MHPA), which is the City's Multiple Species Conservation Program (MSCP) Preserve. Academic uses are generally concentrated on the west side, while the eastern end is predominantly used for residential and athletic purposes. The academic buildings (professional programs) arranged in a line of buildings that stretches across the campus through the main central plazas (Marian Way and Colachis Plaza), which they also serve as pedestrian malls. The COS or known as "out of doors" is what gives the USD campus its image with a range of natural and built open spaces characterized by the spectacular views and steep slopes and canyons on the campus edges and the plazas, gardens, courtyards, arcades and pedestrian walkways that connect spaces between buildings. The constructed landscape is highly manicured and pristine, resulting in a formality that is appealing but can be inhibiting. In contrast to this, the surrounding landscape is natural and rugged, particularly along the southern edge facing Linda Vista Road and the northern edge that enters Tecolote Canyon. The City's 2008 General Plan classifies Tecolote Canyon Natural Park as a resource-based park because it contains distinctive natural features and serves the entire city. The central portion was closed to cars and re-configured as the Colachis Plaza in 2005. USD does not have a central quadrangle or large open green space for gathering or informal recreation. However, many buildings contain interior courtyards, providing a unique continuity of indoor and outdoor spaces and enhancing both built and natural spaces. The result is a hierarchy of open spaces ordered as: Marian Way and Colachis Plaza; quadrangles or Informal lawns (Plaza Mayor & Eagen Memorial Plaza); Courtyards (Camino-Founders Patio Camino/Founders Patio; Gardens (e.g. Garden of the Sky and Garden of the Sea in front and behind the Joan B. Kroc Institute for Peace and Justice); and, the Natural Edges (e.g. Tecolote Canyon).


TECOLOTE CANYON
Future 100-Yard Golf Practice Hole
Future Golf and Softball Athletic Complex
Concentration of 1st & 2nd Year Student Housing
TECOLOTE CANYON
Future Wellness / Recreation Center
Future NCAA Regulation Soccer Field & Parking
Colachis Plaza
West Tennis Courts
Future Arts & Sciences Expansion Site
Future Inter-Collegiate Athletics Center
Future Expansion Site
Parking
Future Expansion Site
Alcalá Village
Mixed-Use Residential & Commercial
Retail/ Restaurant/ Entertainment
Conference / Office
Professional & Continuing Education
Collaborative "Makers" Space
LEGEND
MIXED-USE VILLAGE
ACADEMIC CLUSTER
PROFESSIONAL & SPECIALIZED PROGRAMS CLUSTER
STUDENT SERVICES CLUSTER
RESIDENTIAL CLUSTER
ATHLETICS & RECREATION CLUSTER
FUTURE QUAD/ COMMONS
CENTRAL OPEN SPACE/ CONNECTING SPINE
0' 150' 300'
1. This map is shown for illustrative purposes only to represent master plan concepts. See Project Sites Maps, Figures 26 and 27, for Previously Approved Projects and Proposed Projects.

LEGEND
Existing Academic/Admin and Support Building
New¹ Academic/Admin and Support Building
Existing Residential Building
New¹ Residential Building
Existing Student Life/Dining Building
New¹ Student Life/Dining Building
Existing Parking Structure
New¹ Parking Structure
Background Trees
Accent Trees
Alignment Trees
Proposed CUP Boundary
0' 200' 500'
1. New buildings include unbuilt, previously approved projects and proposed projects. See Section 6.0 for project details.
2. This map is shown for illustrative purposes only to represent master plan concepts. See Project Sites Maps, Figures 26 and 27, for Previously Approved Projects and Proposed Projects.

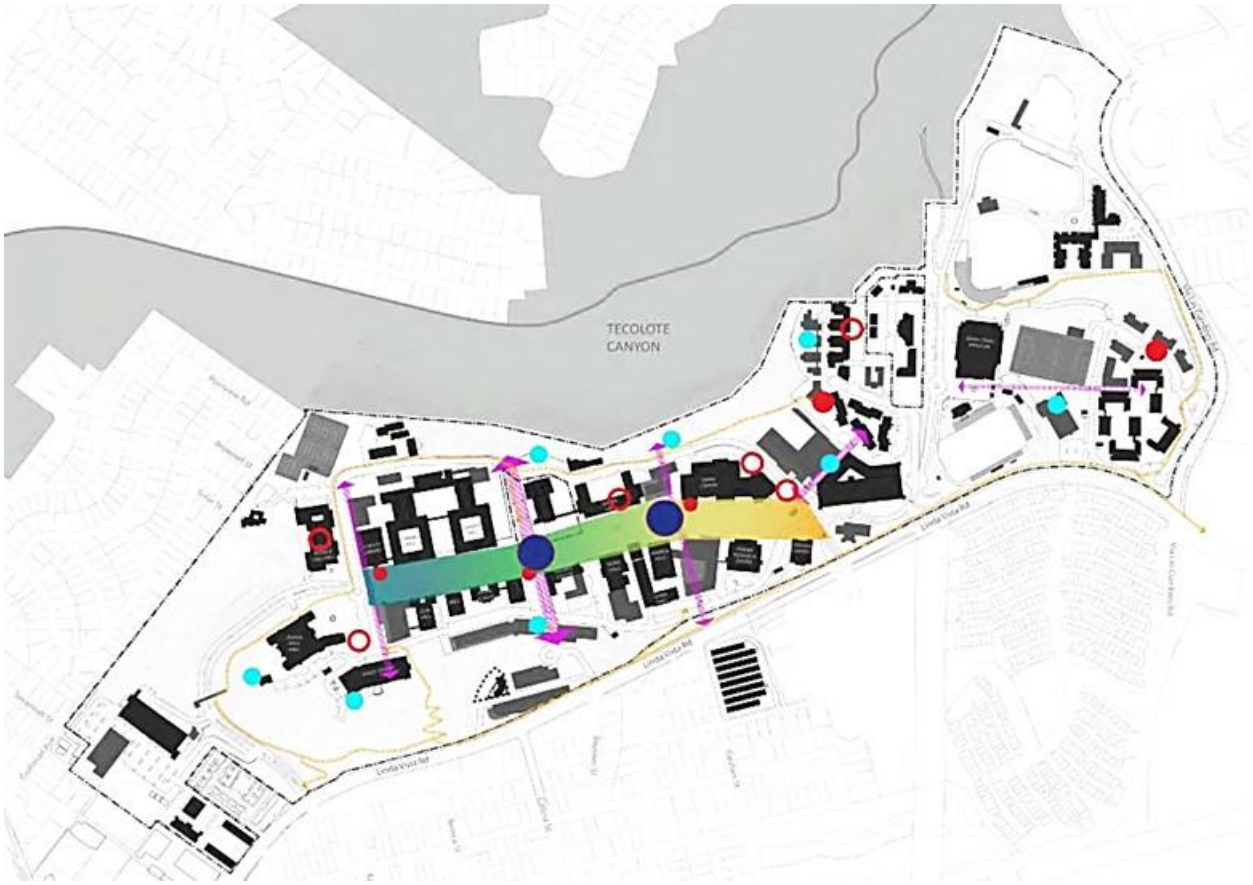


Figure 26: 1) Previous (1996) & new (2017) USD masterplan. 2) Uses strategy, USD masterplan update 2017. 3) Classifications of COS according to their uses. [46]

The campus courtyards/plazas were designed for three purposes: Academic Courtyards (to improve usability via flexible site furnishings, moveable chairs and tables to accommodate all types of groups and users, outdoor meetings or outdoor classes associated with the adjacent space); Social Courtyards (to promote social interaction, student creativity and involvement in their community, school spirit and cohesion through organic vegetable gardens and edible landscaping, exterior art and display space, outdoor music venue, outdoor lounge, outdoor cooking & dining space, outdoor TV/Movie lounge, flexible use yoga or exercise lawn, sport court or game area); Event Space and Plaza (Usable lawn areas and large, open expanses of paving to accommodate all types of events such as graduations, alumni events, concerts, shows and festivals).

Figure 27: USD Campus settings.

[46] *USD Master Plan and Design Guidelines, 2017*

6.2.7 SC#07 : Pomona College

Pomona's founders envisioned "a college of the New England type" when they created this school with small classes and strong student-faculty relationships, like the finest colleges of the East and Midwest. Richard Dober's 1978 Centennial Plan continued the representation of the campus in a landscape. It clarified vehicular circulation and improved pedestrian access. Bonita Avenue is identified as the College gateway from Indian Hill Boulevard. College Way is opened from Bonita Avenue to Sixth Street as a walkway with limited traffic. A north-south walkway east of Bridges Auditorium extends from North Housing and Sixth Street to Second Street. A Physical Education Centre is sited east of Bridges Auditorium. Stover Walk is extended into Blanchard Park, the Wash. The Plan established a "recreation green belt" for outdoor play fields in the eastern portions of the Wash, along Mills Avenue. The 2009 Land Use Plan describes a framework for improved program and open space development, expansion of the pedestrian experience and greater clarity and identity of the campus districts. The Plan formalizes the Columbia Avenue entry from First Street, and it concentrates parking in a new south campus structure and athletic field. In the north campus, parking is concentrated in a structure below Athearn Field. Parking lots and roadways are vacated, creating sites for academic and residential development, new and extended pedestrian ways and new open spaces.

Figure 28: Pomona campus settings. Smith Campus Centre & College Gates at the Northern edge.

6.2.8 SC#08/#09 : University of San Francisco & San Francisco State University

The USFCA Planning Code requires the UC San Francisco or University of San Francisco (USFCA) to provide an Institutional Master Plan (IMP) Update every two years that includes a description of all projects that have been completed, ongoing, scheduled to begin, or no longer being considered by the institution. In 2017, San Francisco State University (UCSF) received what is not only the largest donation in school history, but one of the largest in US history, an incredible sum of $500 million from the Helen Diller Foundation.

The two universities are discussed together as they share many similarities in common. Both universities suffer from challenging student connection to campus. They are commuter campuses (about 75% of students live more than 50 miles from campus) located on the same city, San Francisco. This is due to limited on campus housing or with relatively high costs. Lack of living learning experience has a direct effect on first year retention and overall graduation. 30% of freshmen and sophomores live in a unit type that does not foster a sense of community and is not conducive to their development *(Eliassen, 2007; Schudde, 2011).* Therefore, student basic needs centres (shelter, food, etc.,) were developed on other higher education campuses such as the UC Berkeley Basic Needs Centre, with funding from the state and local government. As such, both Universities seek to be open to dramatic new uses of campus spaces - more shared, open-ended workspaces for students, more smart, more buildings and spaces with versatile walls and furniture that can be moved and adjusted throughout the day.

The UCSF campus is evolving its socio-technical systems changing funding structures and technological development for increasing global competition. These evolutions are explored through the lenses of spatial transformation theory in three dimensions: shifts function from local towards global; the changing funding structure shifts meaning from individual towards communal; and digitalization alters form from spaces of places towards places of flows. Hence universities are increasingly operated like highly branded businesses. In addition, just as other institutions have changed, a university should consider both the structure and function of their buildings and spaces to serve the student of the 21st century which may lead to better student retention and success – as discussed in many studies *(Mah & Ifenthaler, 2019; J. J. Miller, 2011; Reynolds, 2007; Thomas, 2002; Phil Waite, 2010; Whiston, 1989; Yorke & Longden, 2004).*

Considering learning space is an important part of the teaching and learning experience, UCSF has developed the Instructional Spaces followed by the three main themes of that they found among faculty and students *(Granito & Santana, 2016)*: 1) The Conditions theme, which represented all the issues and conditions of the room/space, temperature, and light, 2) the Outcomes theme, which entails all the consequences such as concentration, engagement, and student grades, and 3) the Values theme, which exemplifies the extent of space impacts on teaching and learning. The aim to create instructional spaces that, through their design and availability of appropriate technology, facilitate student development of the abilities encompassed by the vision for the undergraduate students of the future (built environment that fosters interdisciplinary learning). However, UCSF faculty and students as learners are currently having little control over the "Conditions theme". Fixed furniture and rigid designs are not flexible to facilitate different group work, etc. SFSU has adopted Campus Solutions where a student or faculty could use a search feature to identify unoccupied rooms or special spaces that could serve as meeting rooms, for review sessions, student group work, outdoor event, etc.

6.2.9 SC#10 : Santa Clara University (SCU)

Santa Clara University is constantly planning for the future through the University Operations in collaboration with the City of Santa Clara and various stakeholder and consultants, to implement the updated Campus Master Plan and Integrated Strategic Plan. This plan includes the construction of multiple new buildings and major remodels, to support the increase in enrolment and associated growth in staff and faculty. The design standards used in Planning and Projects for all University projects are based on three divisions, Site Guidelines (a set of design principles to guide the siting of buildings and formation of open spaces), Building Guidelines (highlight the key architectural form and character appropriate to building design), and Precinct Studies (provide examples of applying site design and guidelines to a specific precinct to create a coherent site design concept for that area).

The careful composition of views, landscape features and the layout of paths and planting blending with clearly defined (older) building entrances. The older campus building entrances are modest and appropriate in scale and ornamentation to the structures they serve. The modestly massed rectilinear buildings (older areas of campus) – organized along N-S/E-W axes – create well defined COS that are connected to one another. This ensures the continuity of campus setting. The previous campus boundaries remain as a legacy of gates and other outdoor elements, adding richly to the experience of the cultural and historical significance. The dynamic and pleasurable campus experience is enhanced through a variety of formal and informal uses, and the distinctive scale, form and character of COS 'Discreet Outdoor Rooms'. Covered walkways along with arcades (transitional spaces between outdoors and indoors) are used to encourage mobility within campus. The building arcades and covered porches are also designed in new buildings to create connections and to give definition to the COS.

6.2.10 SC#11 : Chapman University

A vibrant campus environment, buildings and spaces is created and enhanced through the Office of Campus Planning and Design (CP&D). CP&D manages all phases of Chapman's campus planning and capital development with services ranging from space programming and campus GIS mapping to long-range planning and entitlements, to the design and construction of campus buildings and landscapes. The data here is derived from their masterplan documents (particularly the Strategic Plan of Chapman University). The University's physical planning and capital projects program seeks to advance the rich set of activities-living, learning, teaching, and research-that are the campus's reason for being. Since the early 1990s, Chapman University has experienced unprecedented growth and academic achievement. This growth has been accomplished through the implementation of a series of five-year strategic plans and the support and hard work of the Chapman Family. The serios of the five-year strategic plans are: 1993-1998 Improving the quality of incoming students by increasing student selectivity; 1998-2003 Establishment of new and growing of existing professional programs; 2003-2008 Enhancement of Physical Facilities; 2008-2013 A Path to National Stature; 2013-2018 Moving into the Health Sciences; and finally the sixth, 2018-2023 “Engineering the Future”. With the development of this new strategic plan comes a renewed energy and push to optimize the Chapman ‘brand’ and ‘Experience’.

The Chapman Brand is telling the story of significance – the distinct look, feel and voice that builds national recognition. The Chapman Experience is the commitment to deliver an exceptional experience consistently and intentionally to the members of the Chapman Family: students, staff, faculty, alumni, parents and families, donors, board members and friends. A clear, compelling and consistent brand (the promise) reinforces the Chapman Experience (the delivery on that promise). The aim of the chapman experience is to make Chapman a place people fight to get into, do not want to leave, love to support, and never forget. The process to build and develop this Chapman experience is assisted by the Disney Institute, which has a 30-year history of assisting universities such as Yale, Georgetown and Duke. The collaboration with Disney Institute is to learn from their best practices and years of experience specially in leadership, service and employee engagement.

Chapman has developed new approaches and technologies for the delivery of education since 2013. All universities faced major concerns that new technologies and educational approaches would disrupt the traditional models of teaching and learning. The rationale for these changes lies in the increasing importance of information technology in the academic mission of the University. These potentially disruptive changes are more important particularly after the COVID-19 pandemic such as the Massive Open Online Courses (MOOCs) and Competency Based Education (CBE). Consequently, IS&T has become more than a service department; it is an important intellectual driver of the entire institutional culture. In addition, a virtual cadaver technology (anatomy lab) and a “TechHub” in DeMille Hall, where faculty and students can consult and collaborate with IS&T staff, and test out new technology for teaching and collaboration. Chapman has also built new projects in the past 10 years including: the opening of the Rinker Health Sciences Campus, the Panther Village residence, the Beckett office building, the Digital Media Arts Centre and adjacent parking structure, the new Launch Labs, home of the Leatherby Centre for Entrepreneurship and Business Ethics, the Lastinger Tennis Complex, the Hilbert Museum of Art and the spectacular Musco Centre for the Arts. These are in addition to major renovations designed to update the historical buildings on campus.

Figure 29: Chapman campus settings: Aitken Arts Plaza

6.2.11 SC#12 : UC Irvine (UCI)

This section data is derived from the last Physical Design Framework in 2010 developed by the UCI Office of Campus and Environmental Planning and the Design and Construction Services unit *(Pereira, 2013; R. Thompson & Martin, 1999).* Development at UCI historically has been guided by a strong physical plan. The UCI's inaugural Long Range Development Plan (LRDP) started in 1963, followed by subsequent versions until the last update in 2007. In the 1962 LRDP, The Regents appointed Daniel G. Aldrich as founding chancellor of UCI, a decision that had a profound effect on plans for the fledgling campus. One of the innovative ideas incorporated into UCI's academic structure was creating and maintaining an academic environment conducive to interdisciplinary instruction and research. William L. Pereira and Aldrich developed the basic plan of UC President Clark Kerr into six spokes emanating from the centre of a circle and culminating in six quadrangles, each representing an academic unit/discipline, at the rim of concentric circle – Aldrich Park. The circle unified the central campus both functionally and aesthetically. This arrangement also shortened the distance between each of the quads and enabled orderly incremental growth out from the core. The 1970 LRDP successfully served as a guide to the development of the campus for nearly two decades. By the late 1980s, a number of factors supported a decision by the University to re-examine and update the LRDP after a slower rate of campus growth than previously projected. Since 1992, the LRDP framework has provided a crucial link between individual projects and the overall campus development plan. Between 1990 and 2002, The Regents approved several minor amendments to the 1989 LRDP which re-established, reinforced, and clarified the main planning concepts mandated originally.

The five planning sectors (Academic Core, East Campus, South Campus, West Campus, and North Campus) share some common characteristics such as defined edges and points of entry and some special focus or centre. The Academic Core functions as the heart of the campus while the outer campus comprises the four other sectors. Development in the sectors is clustered to efficiently utilize the land resource. Each sector special architectural and landscape themes. Unlike campuses that are unified by a single, controlled architectural style, UCI is characterized by a diversity of architectural expressions - ranging from the original monumental modernist buildings in the inner campus core, to the modern and post-modern idioms that distinguished the 1980s and 1990s, to the contextual architecture of more recent construction. Due to the scale of the outer campus areas, each sector has an individual identity characterized by architectural and landscape themes and sensitively adjusting to topographic and natural features. Public spaces such as malls

and plazas vary from sector to sector and form “armatures” that are as important as individual buildings. The central Aldrich Park contrasts with the densely built Academic Core and provides a venue for passive recreation. The formal, concentric ring and radial geometry of the Core is again contrasted by the more informal character of the outer campus sectors, where roadways and open space corridors adapt to the natural terrain and development patterns are more organic.

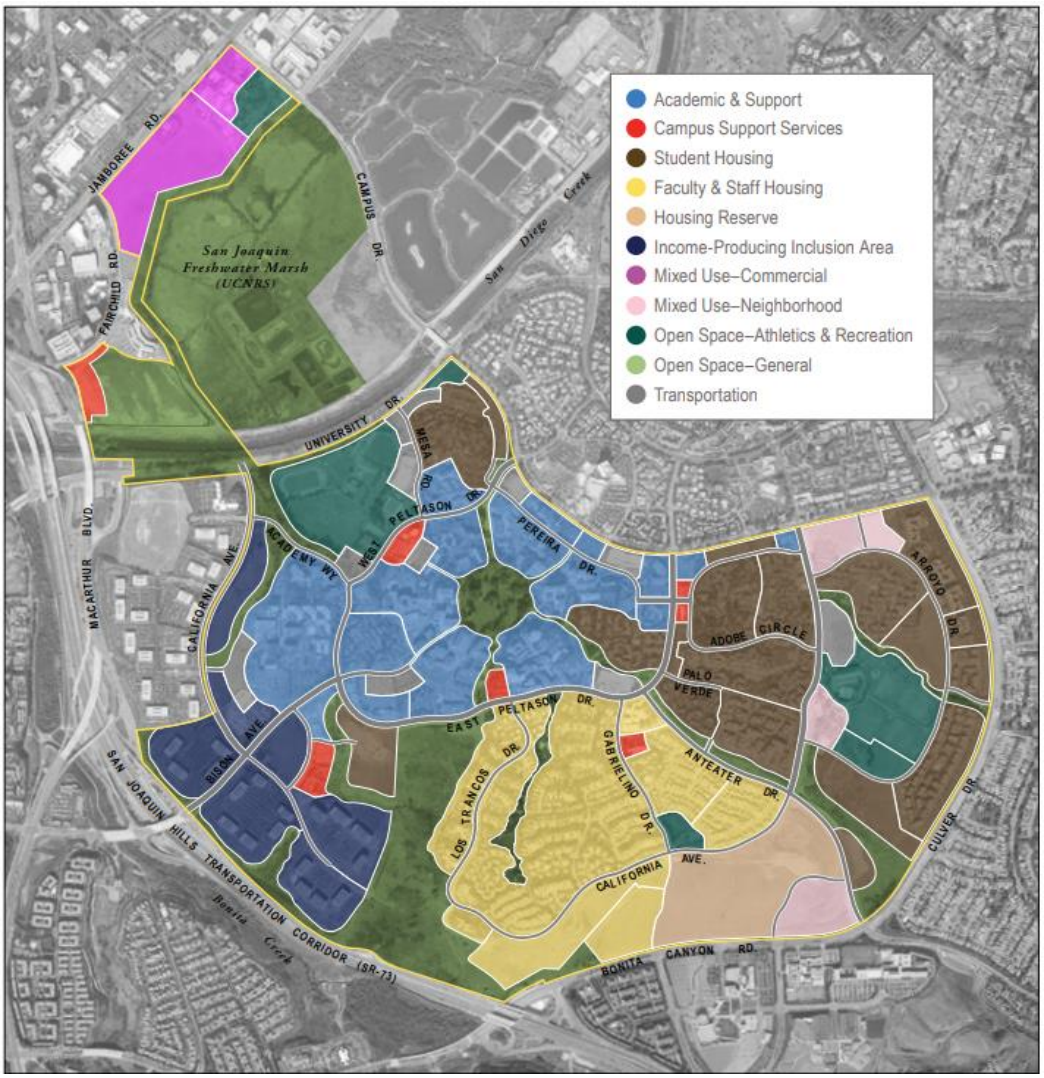


Figure 30: Land use plan from the 2007 LRDP

UCI unity and coherence are derived from consistent design vocabulary, colour and materials, sensitivity to climate factors, building scale and siting relationships, outdoor public spaces, and landscape themes. The landscape guidelines are significant in establishing the UCI character and identity. One’s visual experience of the UCI campus occurs primarily while moving along the various pedestrian and bicycle paths and roadways. The experience varies from axial vistas or “view corridors” down circulation routes, to panoramic views over a wide viewing angle, to near-range vistas of memorable campus spaces and buildings, to zones of view penetration or “windows” into the campus from surrounding roadways and pathways. Visual access to the campus is strategic to the orientation and individual enjoyment of the campus environment. Existing campus views is protected and enhanced by special landmarks, building setbacks, and appropriate landscape. Campus entries are provided with enhanced landscaping and monument signage. Points of arrival within the Core occur where the radial roads terminate at Peltason Drive; these locations are accented by special landscaping and directional signage and, in some cases, a landmark building site.

The five sectors are connected both programmatically and physically to promote cohesiveness and interaction. The open space network within the Academic Core radiates from Aldrich Park and consists of

an interlinked system of tree-lined pedestrian malls and public spaces, small gardens and parks within the academic quads, and greenbelts. Within the central campus, vegetation in the central campus appears as an oasis of green - a virtual arboretum planted with groves of eucalyptus and pine trees that provide identity to the setting as well as a tranquil environment for learning and interaction. The Academic Core is also urban in character and intensively developed to conserve land resources and to facilitate pedestrian and bicycle circulation. The outer campus is characterized by lower development intensity and provides open space for recreation and environmental preservation. In the outer campus neighbourhoods, the open space network includes both formal and informal open space such as pedestrian malls, greenbelts and pedestrian passes, neighbourhood and community-level parks, habitat corridors, and informal open space corridors linking campus land use areas. Physical linkages include pedestrian pathways, bikeway systems, roadways, transit and shuttle service, and a network of open space connections. The spatial distribution and interconnection of COS work together to form a system that has a powerful effect on the visual cohesion of the campus, whether developed through landscaping or left in a natural state. The various components (roads, paths and their associated view axes; entries and arrival points; and street landscape) are all essential to the campus' overall coherence and to the creation of a sense of place. For instance, a pedestrian bridge between the Academic Core and the University Centre serves to connect UCI with the community and promotes the town-gown relationship. The main direction for future landscape entails two approaches. The first utilizes landscape in more formal ways to help define major vehicular and pedestrian circulation, to unify and compliment the urban character sought in the academic core, and to develop more individual identity and "sense of place" for the various subsectors. The second expands the informal character of the major open space areas into the outer campus to enhance and conserve a more natural appearance. Both approaches provide opportunities for landscape to meet campus sustainability objectives.

Uses in the outer campus sectors - including University housing, community support facilities, recreation and open space, and private industry - support the academic functions in the Core. To create an environment that facilitates learning, advances innovative research, and promotes public service, campus buildings and landscapes evoke a sense of continuity and stability while also being flexible and adaptable. Because collaboration is a key to innovation and discovery, the physical environment also supports academic and social interaction through: Longevity (a sense of permanence and in quality); Flexibility (accommodate future requirements without major new investment); Interaction (strengthening interdisciplinary collaboration i.e. intellectual and social interaction and dissolving traditional institutional boundaries). Due to the Southern California's Mediterranean climate, outdoor activity occurs virtually year-round on the campus, and the availability of COS is a major determinant of the university life and in the educational experience as well as the visual structure and image. Building a Cohesive Academic Community is derived through a vibrant campus experience, from a sense of belonging to the establishment of cohesive communities, through the physical expressions of both identity and connectivity. Place identity can be derived from a consistent architectural vocabulary and a coherent approach to colour, materials, public space, and landscape. Identity is also facilitated by ensuring that human scale and human comfort are maintained in all sectors of the campus. Movement patterns offers a hierarchical distinction between the rings, radials, and secondary malls; clear definition of space through landscaping, paving, and other site elements; and clear links to perimeter parking structures serving the Core. Pedestrian paths, bicycle trails, bridges and undercrossing, open space corridors, and other linkages establish travel patterns, bring people together, and strengthen a sense of community on campus. Connectivity is also approached by providing opportunities to learn, live, and work within a diverse set of neighbourhoods across a large land area.

6.2.12 SC#13 : UC Riverside (UCR)

The LRDP of UCR is a component of the campus design framework which consists of: Long Range Development Plan (1990 - 2005); Physical Design Framework (2007); 10 Year Capital Financial Plan. The data is mainly collected from the Physical Design Framework 2009/2019 presented by the Office of Planning, Design & Construction (PDC) to the Regents. The PDC mission is equally divided between the responsibilities for the planning, design of the campus and the management of construction following the framework vision. Working as a project team in collaboration with the Capital & Physical Planning, Finance, Accounting, project stakeholders, campus representatives, design professionals, engineers, special consultants and construction contractors to deliver successful scope, scheduling and budget within the context of each capital project. Campus Planning encompasses Capital Projects, Physical Planning, and Environmental Planning supports the Riverside campus goals of teaching, research, patient care, and public service through both long-range and short-term planning for strategic use of campus physical assets. UC Riverside is a multi-site campus, with teaching, research, and public service programs conducted not only at the main campus but also in downtown Riverside through the ARTSblock facilities and in the recently established Palm Desert Graduate Centre in the Coachella Valley.

Through the East Gateway arts district, a sense of place and a sense of being is created using the appropriate formal interface between the UCR campus and the surrounding community and provides the opportunity to refine an important organizing element in the physical design of campus. The Arts District offers many opportunities for presentations, cultural occasions, and the random practice of the Taiko drummers on the steps of the Arts Building at noontime. Siting potential public interface buildings as well as a convenient area for pick-up/drop-offs and a pivot point for orientation and wayfinding provides the elements to be a civic centre or interface for the campus and city communities. In addition, developing visible icons that became sources of community identity regarding commitment to the environment such as the enhancement of natural features (e.g. University Arroyo on the East Campus); and the prominent placement and celebration of physical features (2.g. solar-powered lighting, and the use of photovoltaic and windmills for wind driven energy sources).

The COS concept on the West Campus provides two distinct features that will continue UCR's tradition of generous, distinctive open spaces: a sinuous band of open space, evoking an arroyo or dry wash, following the course of the Gage Canal (which would be piped) and a series of formal east-west malls framed by new academic buildings and linked together by this meandering space. The curving central space (Gage Canal Mall) serve a number of roles, providing a range of gathering spaces, a linear pedestrian and bicycle spine, and a somewhat organic counter - point to the formal grid of buildings, streets, malls and quads. This space could become a showcase for plants adapted to the Inland Empire climate. It could be a "botanical walk" that roots this new campus expansion in a landscape blending environmentally-responsible and pre-settlement plant palettes, fostering a sense of place, and potentially contributing to UCR research activities. The linear mall intersecting the meander of the Gage Canal emulates the Carillon and Library Malls, the original UCR open spaces. The Central Mall (e.g. Carillon Mall) corresponds to the width of its East Campus counterparts and will be framed by four to five story buildings. The campus provides gathering spaces, outdoor classrooms, and impromptu recreation opportunities and look for opportunities to create microclimates to enhance the outdoor gathering experience. Other important COS are internal, shaded courtyards; transitional spaces between academic buildings; the larger, more public malls; and the Gage Canal open space. Related to these are hardscaped or paved plazas near important building entries and in high traffic areas such as outdoor dining facilities. These important ancillary spaces should be accounted

for in the designs of buildings on the West Campus and require careful attention when interfacing directly with signature open spaces and circulation system.

Malls and linear Open Spaces provide an interconnected system of linked open spaces throughout the developed areas of the campus. The most important elements of the pedestrian system will be compatible with the open space, paralleling the Gage Canal (the only meandering circulation element on the West Campus) and the edges of the more formal malls in a rectilinear pattern as found on the East Campus. In the future as the campus grows, more and better pedestrian and bicycle connections will be required to allow convenient and efficient movement throughout campus, particularly from outlying residential areas to the inner Academic Cores.

6.2.13 SC#14 : Point Loma Nazarene University (PLNU)

Point Loma is historically important as the landing place of the first European expedition to come ashore in present-day California. The peninsula has been described as "where California began". Today, Point Loma houses two major military bases, a national cemetery, a national monument, and a university, in addition to residential and commercial areas. Before it served as the PLNU campus, the area was the location of a Theosophical commune run by Katherine Tingley. It became known as "Lomaland". The entrance to the Academy Building was dominated by two massive carved doors that symbolized the Theosophical Principles of "spiritual enlightenment" and "human potential." PLNU places a significant emphasis on campus as a central way for students such as the arts & culture gatherings, outdoor activities (e.g. ice climbing, kayaking, night hikes, backpacking, etc.), and hosts other numerous denominational and local community events. As a primarily residential campus, most students live in the seven on-campus residence halls, as well as on- and off-campus apartment complexes. There is a continuous dialogue between PLNU and the City, the Sunset Cliffo Recreation Council, the Coastal Commission, and neighbours/public to determine feasibility and interest for public sidewalks and campus development. Between 2005 and 2010, the university has spent $406,660 on the preservation and maintenance of the campus historical structures.

6.3 Conclusion of Chapter 6

As recently, the research on student learning has focused on the ‘experience’ of learning *(Bevitt, 2012; Davis, 2012; Peker & Ataöv, 2020; Ramsden, 2008; C. C. Schroeder & Hurst, 1996; Tuan, 1977),* chapters 6 and 7 of this study aims for analysing and bridging the data between the phenomenology of learning space, the real and enhanced experience of outdoor settings from student/user perspective, and the values of their developments from planners or designers perspective. Chapter 6, the first phase of data collection and analysis, is a more general phase used to depict the common design features in multiple development scenarios (interactive, communal, instructive, or energetic COS experience). The second phase in chapter 7 is more detailed with deeper analysis. COS from both chapters were observed using the same methodology to obtain more accurate findings, hence, more justified investment-based assessments.

The cross-case analysis of campus master plan, which is a basic plan for the campus environment as a whole, were conducted in two sections in England, UK (6.1) and California, US (6.2) respectively. Both sections concisely designate the key features and some unique design solutions in order to pursue the development and utilization that form a base for better educational and social experience. Those specific design features/elements that generate more beneficial social and learning environments were reviewed as benchmarks and examined in cross-case analysis.

The wellbeing valuation project of the “Living Campus Plan” was the focus of the MMU case showing a toolkit that was developed and implemented to investigate and capture the social value of the students and community who use and spent time on the campus. The next case reveals an unique development of UoL that is deeply woven to the city of Liverpool, focussing on the three pillars of productivity; people; and place. The last selected case from England shows another masterplan that was developed with an innovative landscape-led approach to inspire learning. Eight responsive solutions were developed based on collaboration with students, staff and the community including: identity, integration, cohesion, growth, positive movement, a sustainable campus, green space, and a learning space.

The same methodology (the three-level design index) was adapted in California cases to reflect the approaches to the landscape and urban design that either encourage or depress students to pass and stay. Analysing and understanding those approaches help detect what behaviour was associated with or anticipated at a locus, what the physical parameters of that setting were, and the description or preconception that people held of the behaviour in that physical setting. It is practically very complicated to compare the best universities in the world (i.e. US & UK), because of their unique system-related differences and the history and various situations surrounding the universities. However, this research has compared some significant universities not in terms of their educational and administrative systems but their campuses with abundant distinctive characteristics considering their quantitative (tuition fees, population, scale/size, COS costs) and qualitative value (university ranking, campus connectivity, SE).

Ch7. APPLICATION ANALYSIS PH#2 : COMPARATIVE ANALYSIS OF THE MAIN-CASES

"Being in bigger interactive spaces encourages expansive thinking, while being in a box of a room encourages box thinking … Sometimes you need to be in a box to concentrate, but to always sit in a little box is a problem."

Dan Huttenlocher, founding dean and vice provost at Cornell Tech.

This chapter examine the two main case studies (UOS & SDSU) more deeper on how the students experience outdoor spaces using the same design index. The index was comprehensively conducted examining the links and characteristics of university status and student data, as well as campus design and experience. The index include raw primary data collected through the field testing filled in (observation sheets). The observation sheets also include data of campus and user characteristics, manual counts showing patterns of use on the plan/map, accompanied by the responses given by randomly selected students. This is followed by cross-case analysis showing the significance of landscaped spaces in campus experience. The case studies involve the collection of qualitative and quantitative data to establish and compare much detailed profile of the site and its context through a process of data collection, field survey and observation analysis. This deeper primary data collection is conducted to understand and reflects design approaches such as the connections to the place, meaning and identity of place, as well as social interaction and emotional connection to community, etc. To such an extent of chapter 6, the COS Experience Score (COS-E-S) is resulted from the three-level database/analysis relating space typology accompanied by costs with the SE. Chapter 7 contains the two focused or main comparative campus cases along with the final comparative analysis among all selected COS, as follows:

- Case study #1 : Site Appraisal of The University of Salford (UOS), England.
- Case study #2 : Site Appraisal of San Diego State University (SDSU), California.
- COS Comparative Analysis.
- Spatial Assumptions from the statistical data analysis

7.1 CS#1 : The University of Salford (UOS)

The starting point for every development is the study of best-case-scenarios (chapter 6) followed by a focused/detailed site appraisal in order to re-examine the COS impacts, features, and values. This part, therefore, focuses on analysing the COS design and experience that represent a first, lasting impression at the University of Salford (UOS or Salf), England. UOS case study is figured out in the next sections through university urban structure and its space pattern, progressing from general university profile to detailed analysis of the COS urban features and values. It will provide a clear outline of the existing situation of the university campus with focus on its selected COS, the current and future developments, and assessing their design, use and costs. The secondary data is collected from the university and masterplan documents as well as other studies such as *(Kazmierczak & James, 2006; Powell & Dayson, 2013).* Both case studies (UOS & SDSU), are typical universities with representative campuses that could be reclaimed as a natural, comfortable and pleasant setting for social interaction and building connections to community.

7.1.1 The City and University of Salford : General Overview & Historical Background

Salford is part of Greater Manchester, a thriving, diverse city-region in the north-west of England. Greater Manchester has one of the largest student populations in Europe, leading to a buzzing, cosmopolitan city. Manchester city centre is 2 miles away of the university's campus and boasts a wide choice of theatres, museums, shops, bars, clubs and restaurants. Salford city centre is also very near and famous for its sport, music, culture, nightlife and shopping. Good transport links around the campus, including train station, bus stations, new electric scooters and facilitating more use of bikes makes it even more easy to link within university campuses, the city of Salford, Manchester and UK.

Figure 31: Historic views: 1884 Meander map; Peel Park campus; Maxwell [47]

The UOS has an exceptional global presence with more than 20,000 students from around the world providing a truly international student culture, and over 3,500 staff members enrolled at 4 schools and 9 departments in 60 acres. The university's campus is spread across three sites: 1) Peel Park, the main and largest campus - contains two schools the School of Science, Engineering and the Environment, and Salford Business School; (2) Frederick Road, adjacent to the Peel Park campus - contains the School of Health Sciences and Nursing; and (3) MediaCityUK, opened 2010 in Salford quays - contains the school of Art and Media in cooperation between the University of Salford and media organizations (BBC).

The Peel Park campus is discussed separately in the next section. Across the railway track is the Frederick Road campus. Like Peel Park campus, it has a green frontage which is owned by SCC but maintained by the University, and the main entry is from Frederick Road. Walking through Allerton square is an abstract

[47] *manchestereveningnews.co.uk*

sculpture Clasp 'the three totem sculptures' (grade II listed), and a seating area 'the Dementia Garden/Hub' - a community involved project which was opened by Christopher Eccleston. Between Allerton building and Mary Seacole is a well-maintained lawn space to soften the hard area. Around the perimeter of the site is a variety of scrubs and trees which create a green noise barrier between the buildings and the A6. In the central atrium of Mary Seacole are formal lawns, flower beds and raised planters containing edible plants, herbs and vegetables. The garden is used and maintained by the Users and Carers' group who work with staff from the School of Health & Society.

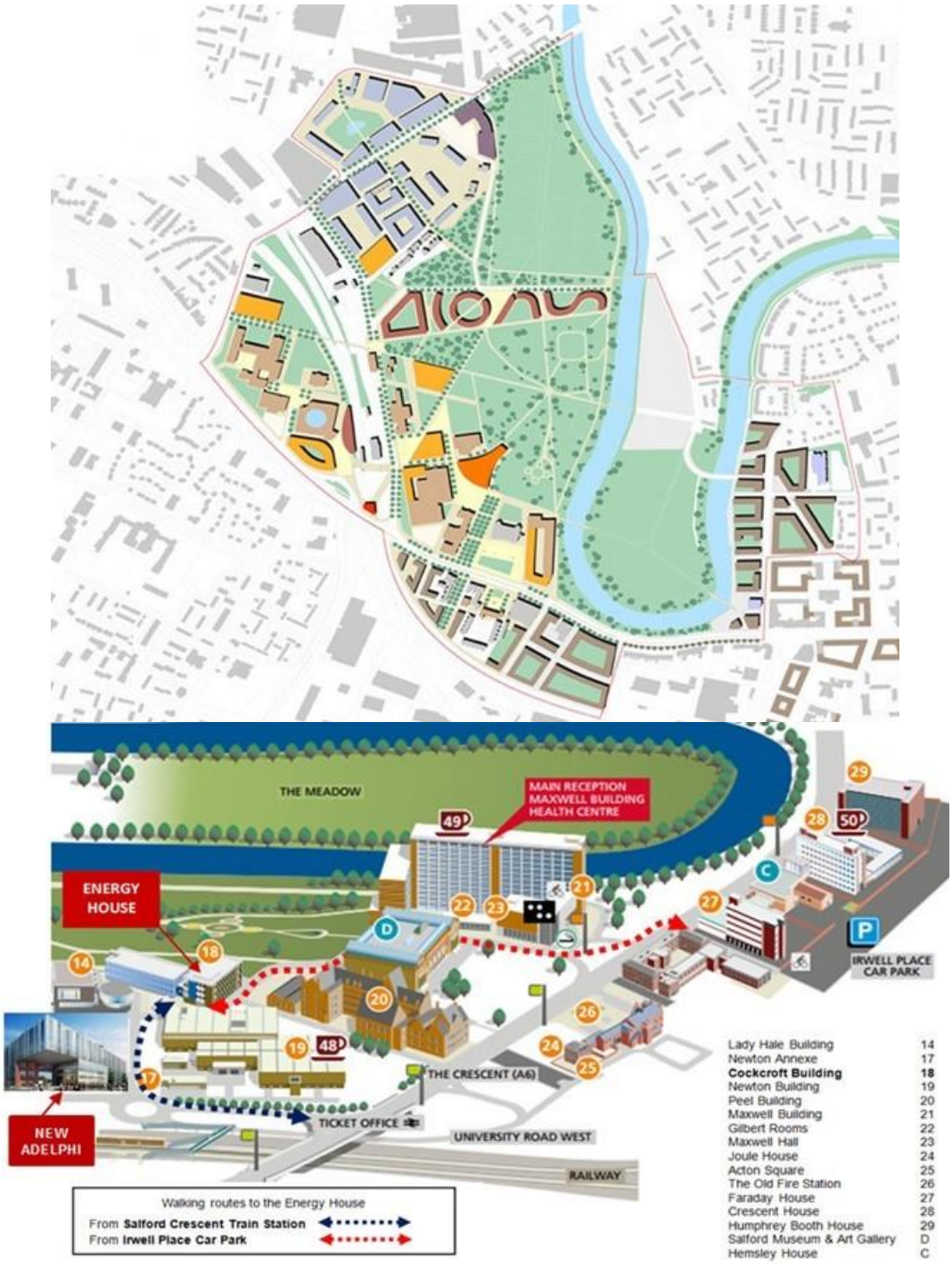


Figure 32: Campus map of the UOS (https://www.salford.ac.uk/about-us/travel)

Figure 33: 2 aerial photographs of the Peel Park & Fredrick Road campus.
1. 2011 (before dev); 2. 2017 (after New Adelphi, Chapman & Housing) [48]

Figure 34: Some landmarks on the UOS.
View from Peel Park, Salford Gallery, New Adelphi & Chapman building (Peel Park); Three totem sculptures (Frederick campus); the MEDIACITYUK campus [4 9]

Salford is the only university to have a base at MediaCityUK, a thriving hub for creative, digital and media organizations, including the BBC and ITV. The facilities at this site match those found in the professional

[48] www.manchestereveningnews.co.uk
[49] https://www.salford.ac.uk/about-us/travel

studios across MediaCityUK. Students have access to a TV newsroom, two HD TV studios, a radio studio, an editing gallery and more.

Informed by the surrounding context, opportunities for high density development of scale exist across the Peel Park Campus Zone. This would take into account the setting of any listed buildings as set out below. The Illustrative Masterplan for this Zone seeks to create an optimum campus volume that reduces university sprawl. The Crescent zone is partially covered by the Crescent Conservation Area and contains a number of Listed Buildings and non-designated heritage assets. Any future proposals would need to be informed by an assessment of heritage impacts in line with 'saved' UDP policy ST15 and emerging heritage policies contained in Chapter 20 of the Publication Local Plan (2020).

The UOS uses LiFE and EcoCampus tools to help deliver and monitor both building a culture of sustainable behaviours and embedding sustainability through collaboration, as two key targets within developing Sustainability Strategy Map for the next 5 years *(Douglas et al., 2008).* The Green Flag award provides a useful framework to assess how well the outside spaces on campus are currently managed and identify opportunities for improvement *(University of Salford Landscape Management Plan, 2019).* The Green Campus Group aims to gain an understanding of how outside spaces on campus are used by staff, students, visitors and the local community, including how they are used for learning/educational purposes to feed into the Landscape Management Plan. The group actively involve users in identifying opportunities for improvements and to collaborate to implement them where possible. They also share information about how developments of the campus will impact on COS, and gain ideas for the Landscape Management Plan and associated action plan (led by the Estates).

The published data on business-university interaction has shown the University of Salford to have more active links in the form of consultancy contracts with Small and Medium-Sized Enterprises (SMEs) as well as non-SME than any other university in Greater Manchester. Below are some crucial, relevant information based on the assessment report of the economic and social value generated by the University of Salford in 2016. The report involves the application of cost-benefit techniques including shadow pricing and the application (where appropriate) of social weights to estimate additional social value. Some of the calculated economic, social, cultural and environmental impacts are shown below. UOS is seeking to maximize value generation, creating a lasting impact by establishing a framework and supporting institutional infrastructure. This achieved by encouraging the creation and development of working partnerships across disciplines and across organizational boundaries to address business, technological, cultural, health, social and environmental issues to create solutions and to generate impact. For instance, the development of the new Industry Collaboration Zones (ICZs).

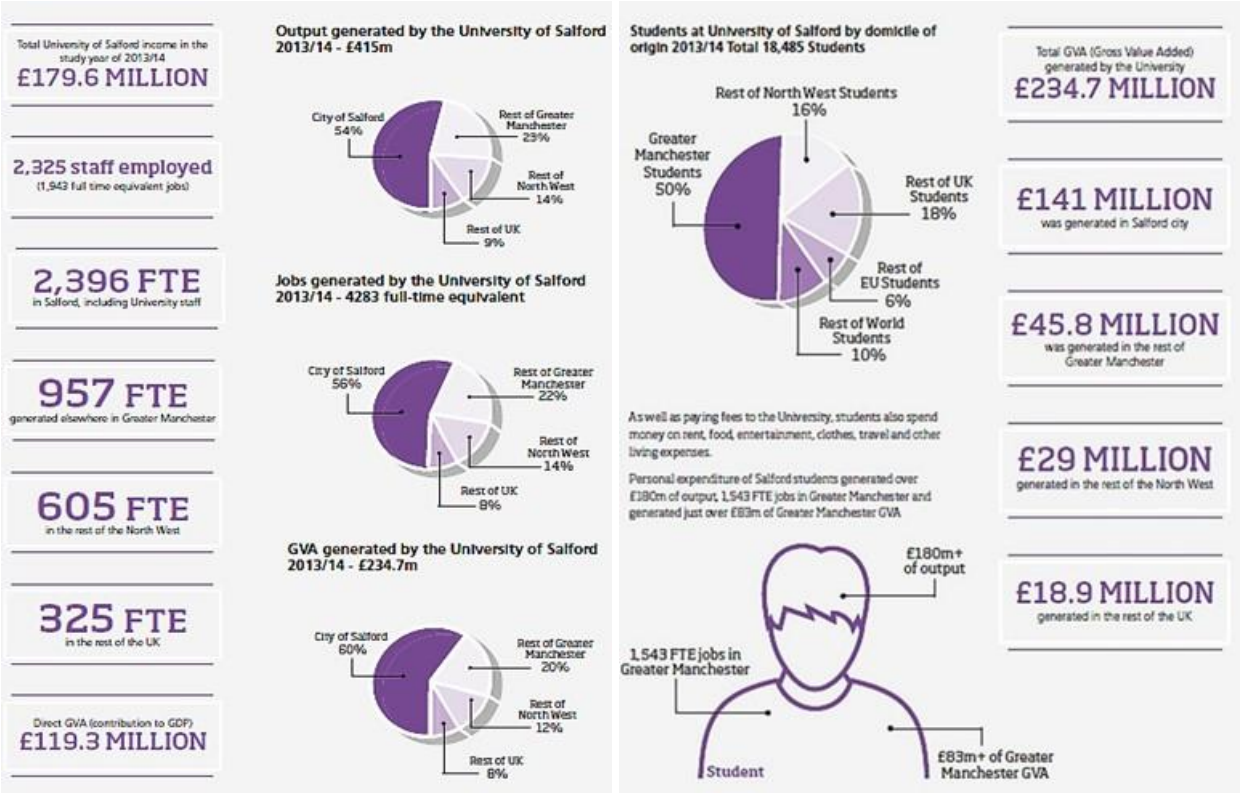


Figure 35: University impacts on jobs, outputs, GDP & student expenses (UOS report, 2016)

The UOS Phase 1 Masterplan has developed a campus wide public realm strategy in 2008 to integrate the various building projects and delivered a high-quality public realm (Douglas et al., 2008). Recently, after the New Adelphi development in 2015, the UOS and SCC have released the first details and still working on a potential £800m masterplan 'The Crescent masterplan', designed by architect 5plus. The Masterplan will involve 240-acre development covering the University's existing campus, areas around the Crescent, Peel Park, and Frederic Road North. This development is intended to mainly improve the public domain and establish strong physical links between the University and the surrounding communities. Across the area, the masterplan outlines opportunities for: 1m sqft of education floorspace; 6m sqft of commercial floorspace targeted at industrial growth sectors; around 2m sqft of public realm, green landscaped routes, and cycleways; 2,500 new homes and apartments. The proposals also include a new hotel and conferencing suite; around 62 acres parkland; a new school; and 2,000 car parking spaces set across a number of multi-storey car parks across the area. A focus on practical learning and links with industry sets the UOS apart from other institutions. Many of the student reviewers seem to have enjoyed their time at the University of Salford, with life on and off campus, the historical Peel Park, and MediaCityUK being particularly popular. The industrial space, due to be delivered at a newly-designated Frederic Road North Industrial Collaboration Zone, will be focused on attracting businesses from the digital, creative, engineering, environment, sport, health, and wellbeing sectors. The vision for this campus is to be Biomedical Health Village; a pedestrian-friendly space with high-quality new developments for health, sports science and wellbeing. The Masterplan proposes to remove older buildings such as Allerton Annex to make way for new developments and an enhanced public realm.

Figure 36: Salford Crescent Masterplan (L-R).

Peel Building, The Old Fire Station, Salford Museum & Art Gallery, the new Conference Centre and the refaced Maxwell Building [50]

5plus was appointed as master planner for the site in June 2017. Salford City Council and the University of Salford have appointed the English Cities Fund (a Joint Venture between Homes England, Legal & General and national urban regenerator, Muse Developments) as development partner to deliver the Crescent masterplan - a £2.5bn, 240-acre major regeneration programme, which will be delivered over the next 10+ years. The members of the public, the staff and students were consulted regarding the Masterplan and were invited to attend drop-in events or to have their say online to share their views on the Masterplan vision. *Director Tony Skipper (2017)* said: "This is a vast area with a lot of existing assets, from transport connections to heritage buildings to green space. Our brief was to unlock this potential to create one city district that will play a significant role in the economic and cultural life of Salford." *Mayor of Salford Paul Dennett (2017)* added: "The City of Salford has attracted billions of pounds of private sector investment in the last decade and delivered nationally important regeneration projects that have brought new industries, new training and development opportunities and new jobs to the city." These combined assets of the city and the university show a huge opportunity for the continued growth of the university linking new educational and enterprise experiences with the city industry, arts, culture, heritage and community.

[50] *https://confidentials.com/manchester*

7.1.2 Peel Park" Campus : Location and Context

The COS chosen for the experimentation is within the University of Salford main campus called the 'Peel Park Campus'. The Peel Park campus extends north and south of The Crescent, taking in the listed elements of the Museum & Art Gallery, to Salford Crescent station and includes green spaces at the Meadows, Peel Park and the David Lewis Sports Ground. Peel Park contains large lecture theatres, study spaces and a range of specialist facilities including wind tunnels, flight simulators and specialist labs, which include an Autonomous and Automated Vehicle Technology Laboratory and the £3 million Bodmer Laboratory, which is packed with cutting-edge technical equipment for students studying science-based subjects. The campus is also adjacent to the historical Peel Park and River Irwell, offering a range of facilities to keep site users healthy. An outdoor gym is situated outside of the Sports Centre and the Sports Centre contains a swimming pool, state of the art fitness suites and offers a range of classes. The David Lewis Playing Fields can be used for football and rugby. There is a University running group and running events take place throughout the year, including the Vice-Chancellor's Fun Run and Santa Dash. Walking and outdoor meetings are also encouraged through the Green Impact program. The Engels' Beard climbing sculpture, in the shape of the beard of German philosopher Friedrich Engels is situated in Chapman Square close to the New Adelphi building, providing an interesting and interactive 16ft sculpture that doubles as a climbing frame and acts as a 'symbol of wisdom and learning'. The artificial boulder features a climbing wall at the front, stairs to the rear and a viewing platform at the top, from which climbers can admire the view across Salford. Living in halls in first year is a popular choice for many students. UOS has two accommodation sites – Eddie Colman and John Lester Courts, and Peel Park Quarter – that are either on, or just a short walk from its campus.

Figure 37: Outdoor seating across Peel Park (at Adelphi Avenue and Chapman Square).

As the university main campus, it hosts many events throughout the year, some aimed at staff or students and many open to all. These include events run by the Students' Union and Welcome Week events for new students. Open Days are held for those interested in learning more about the facilities and life at the University of Salford. Visitors have the chance to hear from academic staff and current students across the range of courses on offer at Salford as well as viewing the campus and facilities. University Day, a celebration of the achievements of staff, is held in June. There are live music and entertainment, a BBQ, Tug of War competition and a variety of fun activities, and the ViceChancellor's Awards. In December 2017, a large event was held to celebrate the 50th anniversary of the University of Salford. There were fireworks and fire performers, rodeo reindeers, ice skating, musical performances and a range of food and drinks.

Figure 38: UOS 50th anniversary at the Peel Park campus *(by researcher)*

As part of the Salford Masterplan a Landscape strategy has been developed, which includes a vision that puts an emphasis on engaging Peel Park with the University. Aspects include extending the park through the campus, creating a biophilic campus and fostering wellbeing throughout the public realm. The new buildings will inevitably put pressure on our outside spaces but as part of the Masterplan they will look for opportunities for new green spaces in our urban environment to help promote learning, wellbeing and healthy lifestyles. An extra 1000 trees along the A6 and around campus are planned to be planted as well as introducing a network of 'rain gardens' to capture and redistribute surface run-off.

7.1.3 Current Public Realm : Pilot Fieldwork, General Potentials and Challenges

After conceptualizing the theoretical framework, the first step of analysis is a preliminary pilot study which was conducted particularly for the 2 main case studies (UOS & SDSU) – supported by subcases among England and California. Preliminary site visits were needed to explore and confirm the campus setting, the classification and selection of the COS typologies, and their design features and associated experiences. The pilot study is to observe, test, and review the variables resulted from literature (theoretical frameworks). The second step of analysis is discussed in the next section.

WELCOME
SEASONAL
BIODIVERSIT

POLLINATOR

Salford
OPEN DAYS 2018
ambition

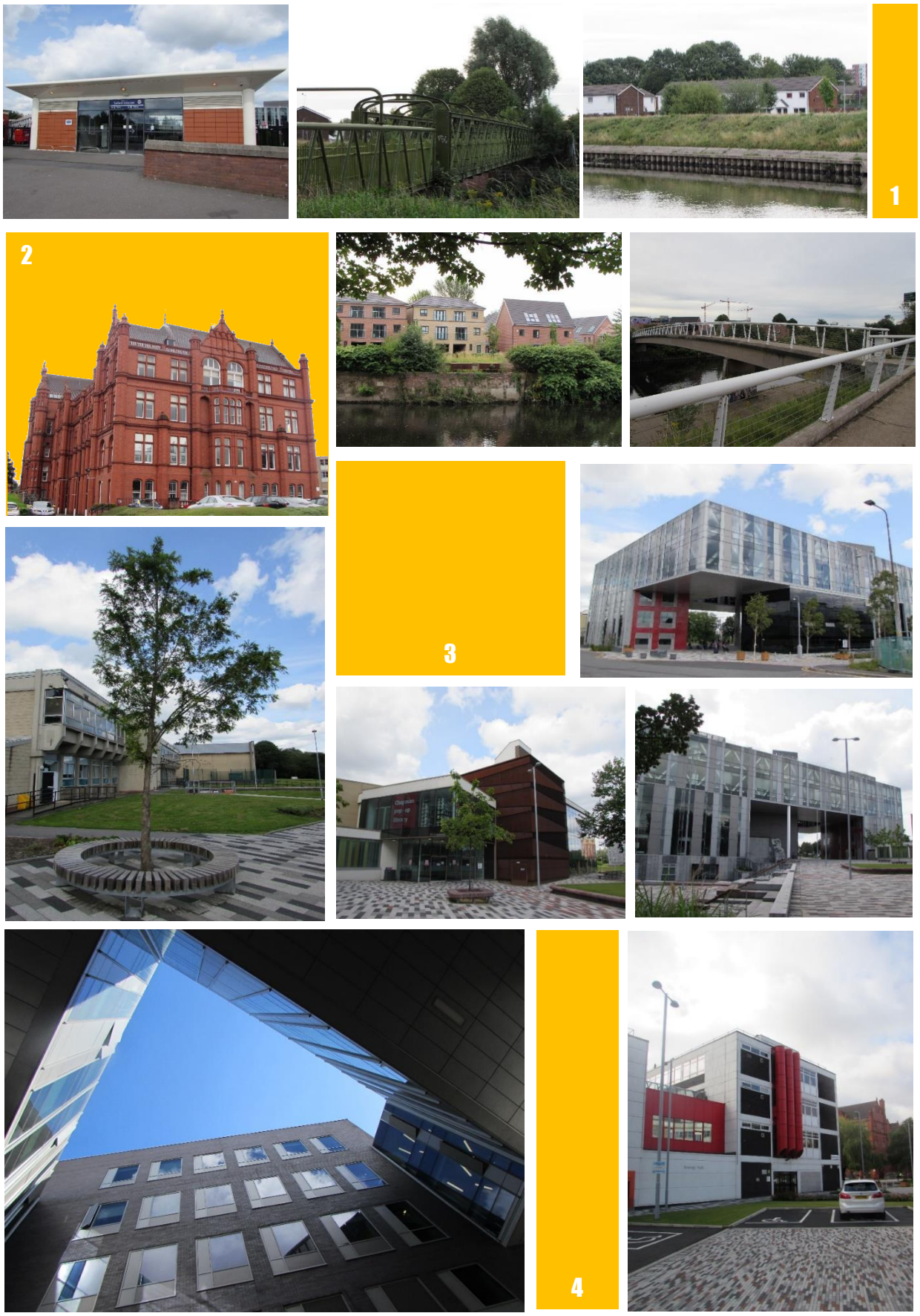


Figure 39: UOS campus potentials: 1. Rich context; 2. Historical; 3. Educational; 4. Accessible (by researcher)

Figure 40: Campus challenges: 1. Style (unattractive receptions); 2. Poor indoor-outdoor interaction; 3. Building yards (front not service); 4. Lack of outdoor Cafes/galleries; 5. Maintenance *(by researcher)*

7.1.4 UOS Site Appraisal : COS Typologies & Observations

The table below summarize the typologies, design features with notes, and counts of the associated uses collected from the field observation of the selected COS. The findings from the previous steps (preliminary observations and interviews) introduced with a deeper understanding of campus outdoor experiences: visually, physically, and socially, and most affected levels of satisfaction. Particular focus to landscaping and Micro-climate conditions such as water feature and shade/shelter; arts-based activities and vertical green walls; design features and student facilitation functions (providing comfortable, natural, meeting places for students to study in groups). Interviews discussion around those specific features were modified after the field observations. Mainly for justification and validation purposes, experts were interviewed from three key relevant fields: 1) Level-A with students' union (students numbers, characteristics, and outdoor experiences); 2) Level-B with professional academics (observing and rating campus design features); 3) Level-C with University Estates (initial rating figures with development costs). In December 2017, initial expert interviews with staff members were conducted to investigate the campus potentials and challenges, and to obtain initial feedback on the toolkit valuation methods. The three interviewees were aware of the underlying value in the campus outdoor perceiving outdoor tangible and intangible benefits, which values may be raised by its design quality. However, no attempts had been made to measure the benefits nor to place a value on them. Level C interviews were very useful in discussing ideas for variables, benefits, values, and methods to measure the value of these intangible benefits. When asked, they said they would be keen to use new valuation methods if they were available. An argument put forward that better recognition and proper valuation method for intangibles may enhance design standards of the built environment. The main concern of the interviewees was the difficulty of weighing such factors.

Table 19: List of the selected COS at UOS - comparing the main features and uses (By researcher)

Campus Experience Score	Area sqm	COS users st/1 hour	Typology of use %			
			Personal %	Social %	Active %	Academic %
COS-1 I Quadrangles : Accommodation Quad I MAP P100						
0.11	9500 m²	1980	20	30	40	10
This quad is located to the north of the central area fronting the residential complex. A huge lawn encircled by recently paved corridors from north, south, and east sides, and the University Road (vehicle access and parking) at its west edge. The lawn is also crossed by linear sand paths each about 2.5m wide. It is open area for diverse activities, yet with its very limited site furniture, it gets only busy on sunny days when students lay down and relax. The flexible/movable decks adjacent to the student union offer seats for academic, social, and personal purposes. The space is currently under development as part of housing project.						

COS-2	Quadrangles : Central Quad	MAP P101				
0.36	900 m²	2200	10	30	60	0

Despite its relatively small size, this central quad is considered successful as a transitional space from what more public use at the main crescent road and the Salford gallery, to more student use where chapman square and the surrounding university buildings and spaces (the central academic campus). Therefore, the quad is mainly used as a passageway, yet is well furnished and decorated with variety of seats, shades, and plantation offering a welcoming environment and encouraging accidental interaction.

COS-2 | Courtyards

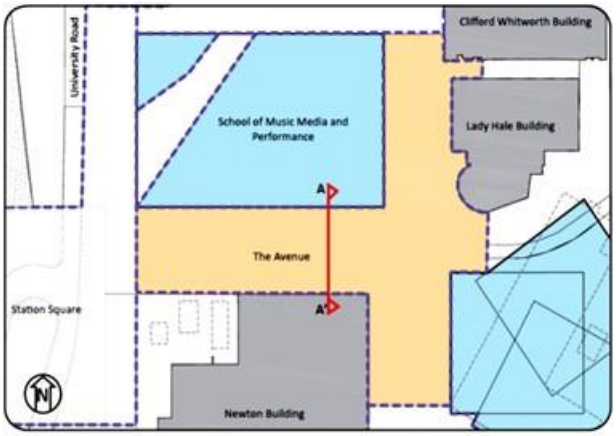
No or very limited courtyards available at the Peel Park campus

Absence of courtyards in UOS is considered a key challenge. Courts are particularly needed in UK weather allowing outdoor classes, informal discussion, and sometimes quiet study and a restful view out from the adjoining classrooms/offices. Courtyards should include flexible elements and perhaps partially shaded to facilitate various gathering and interactions among users and passers. The Clifford Whitworth Library contains a small courtyard with some planters, benches, bird bath and bird feeders.

COS-3-A	Corridors : The Avenue	MAP P102				
1.01	4500 m²	5000	15	35	40	10

The corridors/paths (or pedestrian malls at SDSU) indicates the main circulation areas of the campus. The main UOS corridors are the: 2 primary north/south routes, and 2 west/east routes, allowing universal access for nearly all campus buildings. The Sidewalks/corridors provide practical links to buildings, parking lots and other COS. The major sidewalks terminate at the campus limits with well-defined pedestrian gateways. Additional secondary routes were added as for more campus destinations. Corridors were recently improved with new paving, although lacking more seating and interactive furnishings. Starting from the Station square linking to the central quad from South side and the central plaza from North side, the avenue is considered an important path (recently developed with the New Adelphi project, 2015). This space was part of the new

Adelphi development with a total cost of over £700,000. The design included many visually and physically appealing elements such as the outdoor seats in front of the café, bike shed, the square, security kiosk and bollards with permit access, handicapped parking, and the automobile wooden structure 'EV charging point' a project with the Energy House.

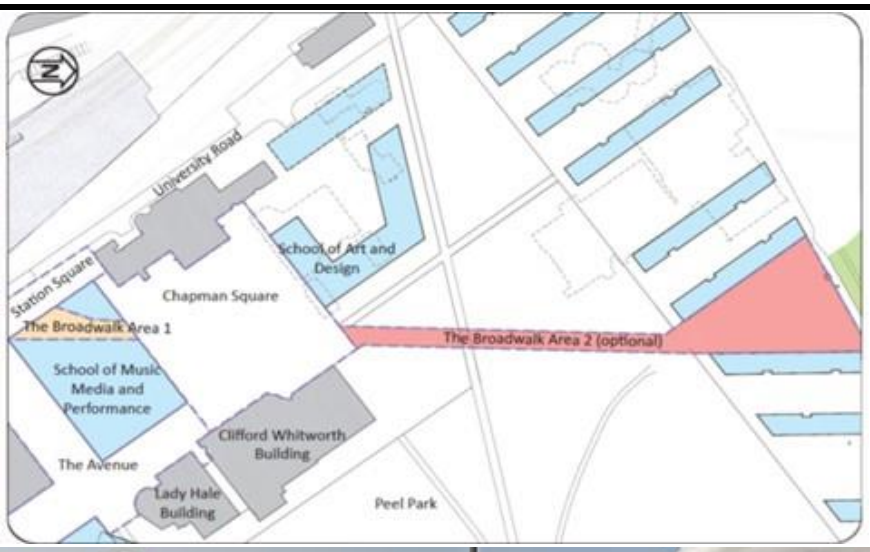


COS-3-B I Corridors : Broadwalk 1 I MAP P103						
0.33	1200 m²	3700	10	40	40	10

Of equal importance is an east-west route that extends from the campus reception (Maxwell building), passing through the campus entry plaza, until Adelphi w/ the access to the university ring road & train station. This is the route, along with the main crescent road, were most first-time visitors' use and see and is (mostly) students' first introduction to the campus. This space was recently developed for a total cost of £141,372.

COS-3-C I Corridors : Broadwalk 2 I MAP P104						
0.72	5100 m²	6500	10	10	80	0

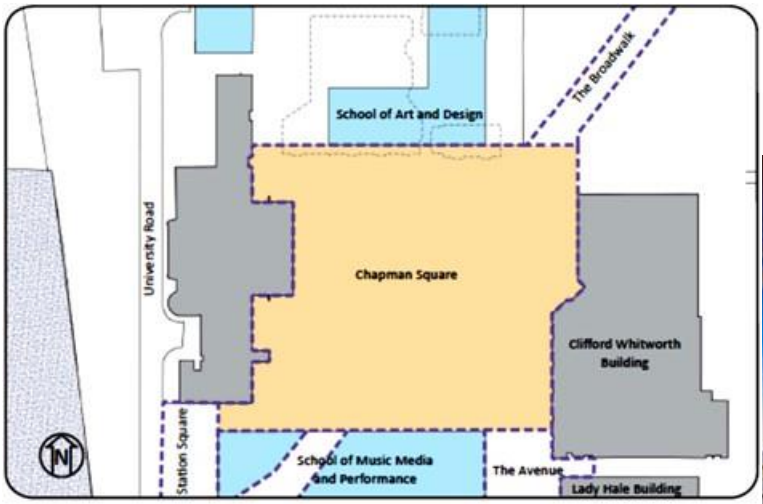
Adequate bicycle parking is provided at corridors near the building entries and in high activity areas. This space was recently developed for a total cost of £530,145.



COS-4 I Central Plaza : Chapman Square I MAP P105						
0.92	8000 m²	6500	15	30	35	20

Moving further through the campus on the Broadwalk, which acts as a spine through the main campus, is Chapman Square. This huge, main/central plaza contains large corridors, green field spaces, raised lawns and trees with seating around and corridors passing through, a climbing sculpture, celebrating Friedrich Engel, and the stepped areas along with the open theatre. Many events, gatherings, and sports take place in this area including University Day, Welcome events and led events. The plaza is defined by the most memorable elements and most used/important buildings of the campus. On the east, is the main (Clifford Whitworth) library, with full access of 24 hours a day, 364 days a year. Subject specific libraries are also available at the university's other sites. After the library comes the Peel Park Quarter which contains the main students' accommodation. Then, at the north comes the Students' Union (University House) with the Atmosphere Bar and Café, hosting regular social events, such as comedy nights and quizzes. Just back of the student union is the sports centre, which features a 25m swimming pool, a spa and sauna, plus air-conditioned gyms. On the south side, the flagship New Adelphi building (opened 2016), which features professional-quality screen

acting studios, voice acting studios, six professional music recording studios with adjoining control rooms, professional photography studios, a gallery space, art and design workshops, and an open plan architecture studio. On the West side is the bookstore library (student commons). The plaza has been found to be the key factor in the evaluation of a campus as is most highly landscaped, mature and encompasses most of the university outdoor activities and/or events. Additional shaded seating and more variety in the space would be an improvement. This big green area is currently under development to add student accommodation with landscape areas that support the many activities. Besides new seating and wood area were added to improve the library appearance. This space was recently developed for a total cost of £1,130,976.



COS-5 I Parks / Fields : Peel Park I MAP P106						
0.58	77800 m²	4750	10	40	40	10

Surrounding historical parks to the East edge of the campus including the Peel Park, David Lewis Sports Ground, River Irwell and the Meadow. In some places around campus, UOS has provided pedestrian bridges to allow accessible transitions to surrounding locations. Greens and lawns can serve a variety of functions, ranging from studying, relaxing, playing, meeting friends, dining, and informal recreation.

COS-6 I Inspired / Private Spaces : Faith-Centre Square I MAP P107						
0.68	250 m²	300	25	70	5	0

Inspired spaces are usually private or very special places that are used by certain users and/or at certain times. UOS lack these very unique type of spaces. To the back of the Faith Centre and running alongside University

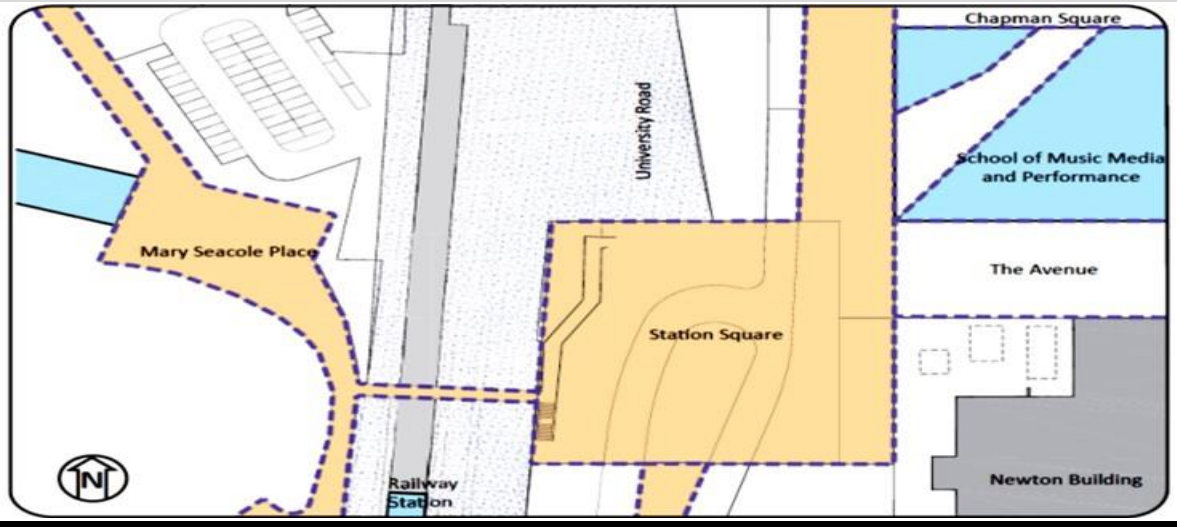
Road is a grassy bank, which is a former canal that has been filled in. The Faith Centre on University Road is comprised of various facilities to meet the faith requirements of all their users. It includes Chaplains Offices, a Chapel, Quiet Room, Social Space and Kitchens, Multi-Faith room, Muslim Prayer Hall and Ablution facilities and meeting rooms. The purpose of the Faith Centre is to support the spiritual wellbeing of students and staff and to increase our understanding of, and respect for religious beliefs and practices. It does so by providing opportunities for members of the University community to reflect, worship, contemplate, teach and learn, read and study, celebrate, mourn, engage in dialogue and interact on a daily basis.

COS-7-A I Entry & Edges : Crescent Entry I MAP P108						
0.57	9700 m²	6950	15	25	40	20

The main pedestrian entrance is in front of Maxwell building, next to a large sculpture of the word Ambition. This allows entrance to campus for large volumes of students coming by bus, private or taxi cars, walking or cycling. Nearby is Maxwell Hall, which has been previously used as a concert venue for bands. This sits next to Salford Museum and Art Gallery, which is owned by SCC, as is the land to its front. The iconic Peel building can be seen from the A6. The entry sequence, including vehicle turn-around and drop-off, the parking, and the entry plazas will be the first impression visitors will have of the campus. It also serves as places for students to meet, see and be seen. A pathway between Peel building and the Museum leads into the centre of campus, via the central memorial garden. Care must be taken to ensure that entry spaces are designed to promote campus identity with welcoming atmosphere through distinctive landscape quality and urban style. Therefore, it should be developed with more places to sit such as seat walls, and generous walkways and paved areas. Although the two standing gates and landmark at Crescent road, more identified, welcoming campus entries are need for the station square as well as the North entries - which can be marked with special landscape design elements such as furniture, lighting and gateway pillars.

COS-7-B	Entry & Edges : Station Square	MAP P109				
0.09	2100 m²	5000	5	5	90	0

The second main entry is from the Salford Crescent station fronting the university ring road with the New Adelphi entrance. There are other secondary entries from the North (fronting the Student Union and sports centre) and east (River Irwell) sides of campus. Although the new Adelphi development is an iconic gateway to the university, the square leading to it physically and visually is deficient in its landscape design.



7.1.5 UOS Findings: Aspects of Student-Space Bonds

This section concludes the UOS case study with the unique opportunities (challenges and potentials). To harness the potential of the university and the area towards greater impacts at the students, a holistic transformational approach needs to be taken to developing the campus proposals. This needs to be coupled with a clear vision as to how and when these proposals will be delivered. As such, below are selected photos classified into two groups: Fig 19 showing different types, characteristics and potentials; and Fig 20 showing some of the campus challenges that can be urbanized to invest in enhancing the SE. From a landscaping and design point of view, to better utilize the COS in and around the campus the main observed challenges were as follows:

- Missing typologies at UOS particularly the absence of courtyards and private (intimate) spaces, which can support the programs of adjacent buildings. As for the main campus entries from the neighbouring communities, the campus would benefit from a stronger entry sequence and sense of arrival on campus. Students also desired more multipurpose spaces (creative, inspired, special, etc.) that allows for diverse, interactive experiences, such as a stage for music and drama; interactive walls or screens; outdoor gallery space; markets, outdoor games such as giant chess sets. These spaces will encourage students to participate in and stay on campus between classes.

- There is a clear need to provide an appropriate University experience for students and staff not only on the academic campus but also at the surrounding unique context (parks, playgrounds, museums, river, cafes, etc). A challenge of the current urban development to both social and physical engagement with the space particularly Peel Park, David Lewis Playing Fields and The Meadows. In addition to the poor adequate levels of comfort that would encourage students to remain in the space. Comfortable, moveable seating is favoured so activities such as group work or socializing could be conducted easily within the space.

- The amount of concrete and lack of shelter or shade particularly at the main piazza does not offer a desirable place for any outdoor activities during rainy days (most days of the academic year). Rather, a need for more green and natural elements (trees, grassy areas, communal gardens, water feature, and vertical garden walls.

- The issues of connectivity, arrival and sense of place also needs to be developed. A particular need to enhance the Salford Crescent Rail Station and the roundabout to improve the arrival experience and improving connectivity within the wider region. It is key that staff and students can access the campus in a safe and secure way and with a welcoming atmosphere.

- Some major central campus buildings such as Lady Hale and the Clifford Whitworth Library make little contribution with the modern campus style (New Adelphi), and whilst having recently undergone significant internal refurbishment, provide a very poor external image of a contemporary library service for prospective visitors and students.

- Most notably, the Newton Building, housing part of the School of Science, Engineering and Environment (SEE) is a low-rise workshop and laboratory building set low into the campus topography and built of concrete blocks and aluminium windows and now clearly showing its age.

- Some limitations to future extensions.

The main observed campus potentials covered topics such as:

- The University estates continue to focus on site design with planners and Salford Council that reinforces student learning and environmental sustainability and on community interface planning that supports economic development and reduces environmental impacts. City planners also expand campus district planning to address a broad array of issues and opportunities. Both university planners and council facilitate collaboration between their institutions and the city/community.

- It was apparent that students are associated with the four different forms of activities: Artistic activity (painting, singing, musical Instruments, photography); Physical activity (inter-varsity sports or fitness); Cultural/Arts (performances, graduation parties, fairs, international or cultural events); and Social activity (students socializing and community). These supports the use of recreational and attractive areas/spots within the campus surroundings and proximity/destinations. The university also supports the use and parking of bicycle as part of its goal to encourage healthy living and sustainability. A campus bicycle-use policy is developed in conjunction with the infrastructure to better accommodate bicycle traffic.

- There are opportunities for more small-scale ground floor leisure uses and retail uses. Also the campus should take advantage of its unique location, by facilitating lower-level access to the watercourse alongside the River Irwell, and enable better pedestrian accessibility to the Meadows and around the River. Such interactions will contribute to improved health and well-being.

- Potential to enhance and better connect the existing parks, open space and river edge. An enhanced visual connection with the surrounding park and the river while building a selective clearance/barrier of vegetation alongside the train side.
- The mixed style between the historical red brick buildings and the new modern buildings and landscape will also add to the visual experience to campus and to the potential future growth in residential. The historic part is characterised by the red-brick grandeur of the Peel Building and Salford Museum and Art Gallery to the north - known as the 'civic gateway', with Fire Station Square and nearby Victorian villas of the Working Class Movement Library located directly opposite to the south.
- To provide active hubs and (entry) gateways of distinctive character from the south (A6) and the north.
- Further north, the campus is largely characterised by student accommodation village, the Students Union Building and the Tom Husband Sports Centre. Here there is a strong community feel with high quality residences set within a green, parkland setting consisting of Peel Park to the east and David Lewis Sports Ground to the north.

7.2 CS#2 : San Diego State University

The second part of chapter 7 reviews the second main case study SDSU from California, US. It sets a comprehensive profile of the SDSU campus and its context (location, area, student profile, dynamic conditions such as weather and temporary/regular events) as well as the typologies of design and use to be compared with the first case study UOS from England, UK.

7.2.1 General Overview, Location and Context

SDSU is the largest and oldest HE institution in San Diego County. As founded in 1897, it is considered the third-oldest university in the 23-member California State University (CSU). The campus contains a diverse mix of architectural styles, reflective of their individual eras of design and construction. The character of the SDSU campus is defined by the numerous physical elements that combine to shape the campus environment. The organization of these elements significantly with these landscape components impacts the perception of the campus environment and the university image leaving the students with lasting experience. The campus establishes a sense of a university community. It is also an integral component of the San Diego community, particularly its retail, housing and recreation sectors. Collaborations with the city support a shared vision beyond the defined campus and engage and impact development in the broader community.

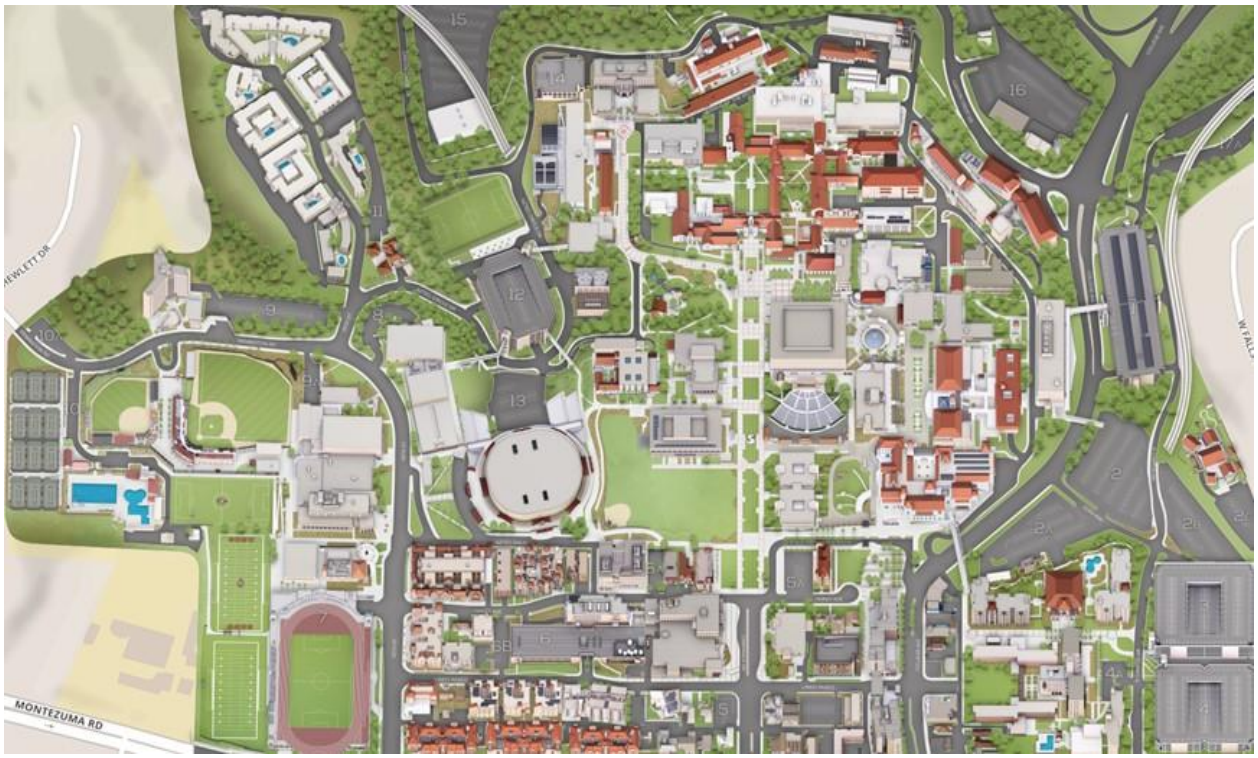


Figure 41: Masterplan of the San Diego State University campus (Kennedy, 2007)

7.2.2 Campus Masterplan: Spotting the design and development of COS

The quality of the COS contributes to the university's ability to attract and retain the best students, faculty and staff. The last masterplan of the SDSU campus was conducted in 2007. It set the standards to protect the historic, unique style while extending and enhancing the character of campus through contextual design. Several developments of some buildings and open spaces have been done after the 2007 masterplan, which have supported the strategic development of even more pedestrian-friendly campus.

The original masterplan and recent developments expanded and preserved the campus through a series of COS created by reducing or eliminating vehicle traffic in the campus core. This approach addressed a goal of minimizing pedestrian-vehicle conflict. Students safety and experiences was also improved by the distribution of parking lots from the campus core and merged along the outer edge of campus, while still providing adequate campus parking within a reasonable distance from destinations throughout campus. Examples of recent developments were the new student union building (2009) along with the great and main pedestrian mall (2011) and developing the plaza in front of the railway station (2013). These thoughtful integration of new buildings/spaces within the existing campus fabric was designed based on careful consideration for the scale, proportion, form, material and proximity of the existing campus buildings. At the academic/central SDSU campus, 60% intensity of the COS areas, density of 26 student/ m2, 29& is the total area of green spaces, 16% is the total area of shaded areas, there is about 260 seats (480 Seat/km2). See appendix (05) for the SDSU some sample schedules of the manual counts done during the site observation.

Campus greens, entries and gateways play an important role in defining the campus landscape and shaping the image. These areas create impressions and convey a high-quality image of the campus. They also serve an important role in vehicular and pedestrian circulation and the relationship between a moving vehicle that enters campus to a parked vehicle on campus to an individual utilizing a pedestrian walkway to reach a campus destination.

The pedestrian malls are designed to facilitate a safe and enjoyable experience and should encourage social interaction on campus. They include features that complement the campus landscape and create a unique atmosphere. The campus also encourages bicycle and boarding use considering the importance of safety and convenience for riders and pedestrians. Street intersections are designed to provide well-defined crossings.

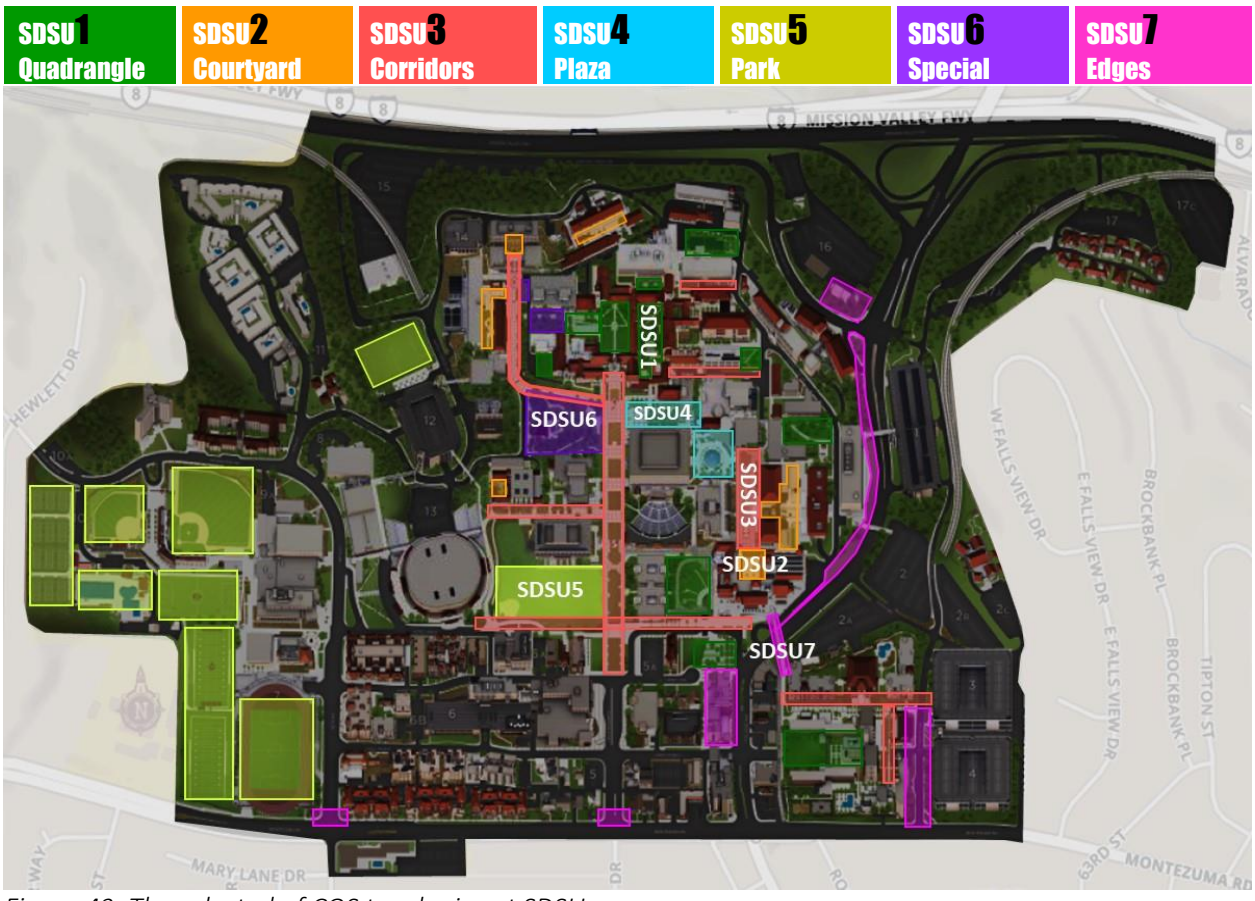


Figure 42: The selected of COS typologies at SDSU campus

Table 20: List of the selected COS at SDSU - comparing the main features and uses (By researcher)

Campus Experience Score	Area sqm	COS users st/1 hour	Typology of use %			
			Personal %	Social %	Active %	Academic %
COS-1 SDSU-1 I Quadrangles : Hebner Mediterranean Garden						
0.99	3750 m²	5920	20	37	25	18

This quad is one of three very significant/common quads next to each other. They are often a major hub for students. The quads are mostly a green area, a lawn, that is surrounded by the neighbouring pedestrian routes. They are typically significant crossing routes for pedestrian circulation. Quads, due to their large size, are able to accommodate a great amount of traffic. They are meant to be accessible, safe, and accommodating to a variety of users. This particular quad has further settings that makes unique. An outdoor (ecological) garden project has been added as essential part of this quad. This small garden that is accessible for certain students/staff but is viewable for all users. The quad offers a variety of flexible and fixed seating - over 200 seaters by 32 arm benches (4 seaters), 8 crx benches (9 seaters), 3 mrx benches (3 seaters) - with classic water fountain at its south west quarter. It also has 10 very large and old trees offering shade-protection and for other environmental benefits.

COS-1 SDSU-2 I Quadrangles : Banana Quad						
0.92	3500 m²	5150	15	40	35	10

Within a campus there are also spaces between buildings that are not tied specifically to a building. Recognized as "common turf," these areas may be of larger scale and are accessible to everyone. Such spaces include parks, streets, or plazas.

Adjacent (to the west) of the Hebner quad is the Banana quad. These rectangle spaces with medium sizes (about 3500 sqm) offer both environments: accessible very busy pedestrian routes during the 3 peak times (and/or between lessons), and quiet, enclosed (semi-private) place for students to sit and gather, relax or study.

COS-2 SDSU-3 I Courtyards : Goldberg/Aztec Union

0.81	4170 m²	1250	18	33	22	27

This recently added Aztec Union building was added with one of the most key spaces on campus: Aztec courtyard. Despite its relatively minimal space, this court design is able to create a successful series of public and private spaces. Such flexible and variety of spaces with physical design features gives students several different opportunities to socialize and experience different activities and events. Over 75 flexible seaters (15 tables, 60 chairs, 15 lounges), 23 plant box, 97 large trees, 2 palms, over 120 different lights (10 wall mounted, 40 at stairs, 270 octagons, 35 spots, 3 for ramps, 8 floor lamps, etc), 20 signs (4 traffic, 12 guides, 4 advertisement), 16 CCTV in different locations, and other design features to support/facilitate such opportunities. The courtyard is more private in comparison to common turf spaces (quads) and is not as accessible to outdoor main circulation. However, this particular courtyard hosts many academic and community events and activities. Part of the Aztec building, the courtyard is surrounded by a key pedestrian route from west side and a huge ramp on the east side. As such, being located on the edge of the campus, this courtyard is also considered as a key entry linking the bridge (SDSU-10) and the Transit Plaza (SDSU-11) from outside and the Campanile Mall (SDSU-6) from inside. This "core" of the Aztec complex, surrounded by the arcades from all four sides, is immediately visible upon entry into the building and provides views and an attractive visual and interactive space for those inside the building.

COS-2 SDSU-4 I Courtyards : Student Services East

0.32	770 m²	1700	45	30	20	5

Another courtyard nearly fully shaded surrounded by arcades and particularly serve the east student services. Different from the Aztec court, this courtyard offers more private/quiet area as well as shelter from the sunny weather. Students however demand more seating areas in this space.

COS-3 SDSU-5	I	Corridors : Centennial Mall				
1.12	12800 m²	24000	9	28	38	25

The Centennial and campanile Mall are the two main vertical axis of the campus provides the primary paths of circulation across campus. With these outdoor walking paths, students are able to easily access the neighbouring buildings (major buildings on campus) as well as the other COS. Due to its huge linear form, more people are also able to receive a daily experience with nature. The Centennial mall, as a primary path of circulation, many events are incorporated, as well as a channel for students to activate and receive other energetic benefits. It has many outdoor hardscapes that are furnished for use; such as for gathering and interaction. In addition to the linear path along the campus mall, over 50 large trees and native and dense planting, nearly 400 sittings (benches, lounges, chairs and tables, stages), living walls, over 35 different 24 lights, 24 signs (6 traffic, 20 guides 8 advertisements), and water features are used to create a natural, interesting and comforting Arizona environment. The use of decomposed granite/concrete, coloured tartan (for boarding and cycling), and offset planting helps reduce glare; therefore making it a cooler environment.

COS-3 SDSU-6	I	Corridors : Campanile Mall				
1.45	7000 m²	15480	13	38	23	26

This campus mall also represents a major pedestrian corridor that connects students to the major university buildings and other COS. It is the most developed type of space of those selected, not only used as a walking route between buildings, but a key setting for socializing, events, eating or waiting, and as a space for ambulatory patients. Because of its size, landscaped grounds may tie together several buildings to form a campus-like environment. Therefore, a variety of landscapes may be incorporated to serve all types of users. The cost of maintenance is potentially high, however, and spatial relationships may lack cohesiveness.

COS-4 SDSU-7 I Central Plaza : Sycamore Plaza						
0.68	5700 m²	15050	13	20	40	27

Similar to a quadrangle, a plaza is an outdoor space bounded by multiple buildings. The Sycamore Plaza is an empty square area, a hardscaped space at a crossing of several pedestrian paths that provides a large space for gathering, community interaction, and circulation. At the heart of the plaza is 8 seating area (152 seaters) shaded by large trees. Beside the shading large trees, there is a shaded arcade adjacent to the library, and 6 rows of shaded bike racks. The plaza's users expect the establishment of more comfortable settlement units for the plaza to be more liveable, usable, lively, and above more, remarkable and appealing as the typical central plaza of most campuses. Some of these expectations are the arrangement of the spaces for group uses; adding water features, art work and using aesthetic materials, the quality improvement of the lighting elements and increasing their number; changing the materials of hard floors; more comfortable sittings; the establishment and the good maintenance of the site elements; forming facilities for the disabled people; the establishment of commercial units like canteen, café, etc.; and the arrangement of multi-purpose activity areas. The absence of these elements in the space or their presence in bad condition shows that the quality of the space is "bad". Therefore, these expectations should be evaluated in order to have plaza of high spatial quality.

COS-5 SDSU-8 I Parks / Fields : ENS Playfield						
0.26	12150 m²	560	5	10	64	21

Like a campus green or lawn, this COS is a large field grass (Bermudagrass) area with 50 m² dense planting area at its edge. The field is open to public and all students during daytime. However, they are typically reserved for recreational activities even at night times, and may not be located in prominent areas of the campus.

COS-6 SDSU-9 I Inspired / Private Spaces : Plaza Scripps Terrace						
2.12	8500 m²	2680	24	40	19	17

This COS is considered the most spacious type of outdoor spaces on campus for many unique reasons. Its full natural environment (forest-like environment) with a reflecting pond and contemplation garden. The pond, landforms, stones, sittings, wood crossing bridge and wild animals (turtles) are exceptional features whose natural form provides extent, leisure and relaxation for one's mind. The green foliage of the vegetation adjacent to the pool and over 80 large trees are maintained throughout the space in order to keep the garden and pool reflections a calm environment. For climatic reason, overhangs, planting and natural breezeways are coordinated to create a cool and shaded place. Visual connection to the outside and a wide overview to the greenery seem to be extremely attractive for students. These design strategies are relaxing to the mind, and contrast and help support the activities surrounding this plaza.

COS-6 SDSU-10 I Entry & Edges : Aztec Centre Bridge (South gate)						
0.31	800 m²	5270	10	10	80	0

The Aztec building provide a transitional space between the public community and the private campus environments. A visitor's impression of SDSU is formed as they experience the Aztec building and bridge, and the significant campus landscape clearly seen in the transit plaza. The bridge not only serve as the main entrance particularly for students coming from the south parking and student accommodation across the college avenue, but is also iconic element which is crucial for promoting clear visual access to the campus. This occurs at both day and night times, with over 100 lights surrounding the bridge structure. Such iconic gateway highlights entry among the edges and serve as the formal transition between campus and the surrounding residential and street/parking area, welcoming thousands of students on a daily basis.

COS-6 SDSU-11 I	Entry & Edges : SDSU Transit Plaza					
0.51	3300 m²	3360	12	28	60	0

There are some minor entries from the east and west sides but the main entries to the SDSU campus is from the south. The Architectural elements that instil a sense of Arizona environment will enhance this primary entry. Cafes, benches and seating areas, floor patterns, plantations and the green area, and placement of signage highlight and distinguish this entry both day and night times. The plaza is visible to visitors and contribute to the life and activity (cycling and boarding) of the streets and walks surrounding the campus. It is also designed to encourage interaction as meeting and gathering places before, during, and after the academic day. SDSU campus edges create a positive, consistent identity and a sense of campus placemaking.

Table 21: Comparative COS-DI of the main case studies - UOS & SDSU *(By researcher)*

Factor	UOS	SDSU

San Diego State University (SDSU) - www.sdsu.edu

Level 1 - University	City & Location	Salford, Greater Manchester, England Salfrod Cresent train station 2mi East : Manchester city center 1mi West : Salford Shopping center	San Diego, California, US 15-min drive of downtown San Diego, the Pacific Ocean, and the mountains.
	Boundaries	The central Peel Park campus is bounded by: - NORTH: Entries-gateway, students accomodation, Peel Mount, Devis Lowes Sports Ground. - EAST: Peel Park & River Irwell. - SOUTH: Main entry & Cresent Road/A6, university administration (Old Fire Station & Crescent House & Christchurch Corner). - WEST: Railway & services followed by Fredrick Road campus.	SDSU campus at Montezuma Mesa is bounded by: - NORTH: Mission valley freeway & Adobe Falls (natural edge). - EAST: College Ave & parking lots. - SOUTH: Campus main entries, Transit centre, retial shops & cafes, students accomodations. - WEST: Parking & several sports complex (Viejas Arena, Aztec recreation centre, Lowr Aztec Bowl, Sports Deck, Peterson Gym, Tony Gwynn Stadium, Softball stadium, Tennis centre, Aztec Aquaplex).
	Landmarks	- River Irwell - Peel Park (openned 1846 - the world's first Public Park) - Salford Museum and Art Gallery (1850 - the first unconditionally free public library in England) - Peel building (1896) - Old Fire Station (1903 - now used for UOS conference events) - Maxwell Building (1959) - Three totem sculptures (1966 by William Mitchell - Front Courtyard of Allerton Building) - Cockcroft Building (1966) - Clifford Whitworth Library (1971) - Salford Crescent railway station (1987)	- Hepner Hall. 1931 - the university logo) - Aztec Sculpture. 1937 by artist Donald Hord) - Cal Coast Credit Union Amphitheater (1941) - Campanile Park (Scripps Terrace - 1968) - Malcolm A. Love Library (opened 1971) - Viejas Arena at Aztec Bowl (1997) - Aztec center bridge (2003) - Conrad Prebys Aztec Student Union (2015) - Native and Indigenous Healing Garden (2019)
	Year Founded	1850 Pendleton Mechanics' Institute 1896 Salford Technical Institute 1921 Royal Technical College 1956 College of Advanced Technology 1961 Salford Technical College 1967 the University of Salford *(THE World University Rankings)*	1897 first formation (normal school) 1921 (San Diego State Teachers College) 1950s (San Diego State College) 1970 (named SDSU) *(Education.sdsu.edu/about/coe-history)*
	A1. Type	Research (2) / Postgraduate Public / 4 year programme 4 Colleges & 9 Schools (over 219 bachelor, 123 MSc & 11 doctoral)	Research (1) / Undergraduate Public / 4 year programme 7 Colleges (over 96 bachelor, 80 MSc & 21 doctoral degree programs)
	Uni land /km²	2.05 km² - 0.65 Km² (160 acres / 65 hectares)	2.95 km²
	A6. FT UG students	16,670 *(HESA 2018/19)* No of staff 1,035	28,828 *(USNEWS 2018/19)* No of staff 1,035

	A7. Selectivity %	22.19% & 62% *(Studentcrowd.com, 2018/19)* #38 UK highest acceptance rate *(StudentCrowd, 2018)*	35% (NCES 2018/19)
	School community	Salfordian	Aztec
	A8. Ranking 2019	#119 World University Rankings *(THE)* #65 Academic ranking of world universites *(Shanghai)* #113 best university in the world *(Guardian)* #1 Fastest growing university in the North West #5 in the UK #1 Student satisfaction in Greater Manchester.	#140 in National Universities *(USNEWS)* #801-1000 *(QS Global World Rankings)* #275 US College Rankings *(THE Rankings)*
	A9. Fees/input & Budget £	UK tuition & living: 9,250 / 10,308 Int tuition & living: 17,300 / 10,308	Instate & total : 5,470 / 21,635 Outstate & total : 14,145 / 30,400
		Endowments : £ 49 m (1% of income)	Endowments : £ 214 million
		Budget : £ 188 million Economic output £316 million (£319 million Total Greater Manchester GVA) Reseasch expenses £533 million	Budget : £ 653 million *(the 2018/19 budget allocations and 2017/18 and 2016/17 actual expenditures)*
Level 2 - Campus	A2. Campus Setting	Urban / compact	Urban / compact
	Enclosure	Open (see level of openness) North - 8 Highway; East - Parking; South - Mopntazema road & accomodation; West - Athletics & parking	Open (see level of openness) North - Park & services ; East - Peel Park & River Irwell; South - Crescent road & administartion & services; West - Railway & services
	Scale	Large	Large
	A3. Age	1850 Mixture (Historical, Moderate & New) Master Plan Revision approved by the Board of Trustees: 1967, 1971, 1973, 1975, 1977, 1981, 1983, 1984, 1985, 1987, 1988, 1989, 1990, 1998, 1999, 2001, 2011, 2015, 2017	1897 Mixture (Historical, Moderate & New) 1960 Visionary masterplan 1970-71 SU, staff house, sports hall & refectories 2004 Salford Unitary Development Plan 2014 Crescent Development Framework 2012-16 New Adelphi development 2017 Crescent Masterplan by 5plus architects 2020 University Estate Masterplan Refresh
	A4 & A5. Areas	0.23 km² (with Peel Park, accomodation, admin) 0.1 km² central campus *(By researcher 2018)*	University land 900,000 m² Central campus 144,000 m² *(By researcher 2019)*
	Visit	60 ti @ 240 hrs	70 ti @ 240 hrs
Urban Indicators	Student Experience	- Implement a wellness toolkit via Counseling & Psychological Services & Economic Crisis Response Team (ECRT) to support student mental health and basic needs. - Develop a service delivery model to increase capacity to meet the unique needs of all students. - Open new multidisciplinary space (wellness hub) to support SE basic needs initiatives. - Develop a university infrastructure that fosters and sustains regional partnerships with schools, coleges, communities, organizations. - Invest in campuswide technological and professional development support as the foundation for a coordinated campus approach to advising, teaching, and co-curricular support services.	- Biomedical Health Village; a pedestrian-friendly space with high quality new developments for health, sports science and wellbeing. - New state-of-the-art collaborative workshop and laboratory space at the new School of Computing Science and Engineering. - Green initiatives like planting an extra 1000 trees along the A6 and around campus and introducing a network of rain gardens to capture and redistribute surface run-off. - The placemaking plan: Maximise the campus assets of some key areas including 'Rail Connectivity', 'Peel Park and Meadows' and 'Heritage Buildings'. Investment across areas such as sport, social and student learning buildings.
	COS Diversity	cos1 (1) : cos2 (0) : cos3(3) : cos4(1) : cos5(1) : cos6(1) : cos7(2)	cos1 (1) : cos2 (1) : cos3(1) : cos4(1) : cos5(1) : cos6(1) : cos7(1)
	Shade	5.8% [7,000 / 121,000 sqm]	18.8% [27,000 /144,000 sqm]

	Openness	55% access to surroundings	70% access to surroundings
	Privacy	Semi-public	Semi-public
	Density st/ m²	0.8 student/m²	0.68 student/m²
	Grenness %	72% [87,000 sqm)	28% [41,000 sqm)
	Connectivity	350 int/km²	500 int/km²
	Below, intangible design indicators are more deeply discussed and compared whenever possible (legibility, permeability, adaptability, accessibility, integrative, social) along with behavioral patterns.		
Ref	UG only - 2018/19	*Universities UK; The Complete University Guide; Studing in the UK (UKuni)*	*NCES (National Center for Education & Statistics); Data US; SDSU Facts 2018/19; USNEWS*

7.3 COS Comparative Analysis

This section presents the Excel graphs showing the comparison results of each of the 7 COS typologies. There are 2 graphs in each typology. The first compares the 10 spatial analysis referred as the 'inputs', while the second graph compares the rates of the 3 performance scores referred as the 'outcomes'. The x-axis lists all the campus open spaces in each typology (table 12 shows the full list for all the 7 typologies – for full names and the excel sheets see appendix 11). The y-axis shows the measurement rates either percentages as in the first graphs, or a scale out of five as in the second graphs.

7.3.1 COS1 Typology : Quadrangles/Quads and Gardens

Within this typology, nine COS have been observed and analysed. Four COS are from the 2 main cases (COS1-SDSU1, COS1-SDSU2, COS1-UOS1, COS1-UOS2), three COS from two US subcases (COS1-USD1, COS1-USD2, COS1-SCU1), and two COS from two UK subcases (COS1-UoL1 & COS1-TUOS1).

Among the analysis of campus quadrangles, the greenery ratings are relatively high (above 50%). These percentages have one exception of 35% at the COS1-UOL1 as provided with over 60% of paved circulation paths. The vegetations or dense planting are considered the highest at the two gardens (COS1-USD2 & COS1-TUOS1) with are also the top shading percentages (35% & 45% respectively). Vegetations are also used for environmental and aesthetic purposes. As for the COS1-USD2 (Bishop Maher Garden), the frequency and intensity of use is considered low compared to other quads, although achieving high percentages in the design features. These results are due raised floor level of the COS from one side and enclosed from the other sides which made it very private space used mainly for the Bishop Maher buildings. This isolated type of space is however needed in campus for students who need to relax or study in a quiet environment.

Depending on their locations, the lawns are usually surrounded (from one or more sides) by high frequency routes linking important destinations. It is also noted that all quads were encircled by buildings from two or more sides (above 50%) except for the central quad at UOS (COS1-UOS2). This quad is bounded from one side only by the Peel Building, while all other sides are open and surrounded with pedestrian and vehicle routes. This most accessible and viewed quad make it the highest frequency of use (1.05) above all other quads – yet this conflicts with its duration of stay. The intermediate duration rating (0.16) still considered of high rank as designed with variety of special seating, plantations, and providing the highest amounts of intersections (1.44) in this relatively small space. This finding shows the importance of both

location and the level of COS openness/privacy which sometimes clashes the frequency with durations of use.

Overall, the three top ranked quads are COS1-SDSU1 (0.94), COS1-SCU1 (0.91), and COS1-SDSU2 (0.89) which are well designed fostering students to sit at the lawns or around them (high seats & Ds scores) and/or used for recreational purposes while also providing healthy environments at low initial and running costs. The lowest total rank is the vacant green area at UOS with limited tress and seating at its corridors. This quad is recently under development for an accommodation project. The quads with built and natural seating and extensive site furniture received the highest experience ratings with higher than the standard quads used only for circulation. These findings might convince, stimulate, or guide policy makers to integrate more greenery in the campus environment. The table below presents descriptive statistics and results of the qualities of design and use for the selected quadrangles. These tables are shown and discussed in each of the seven typologies.

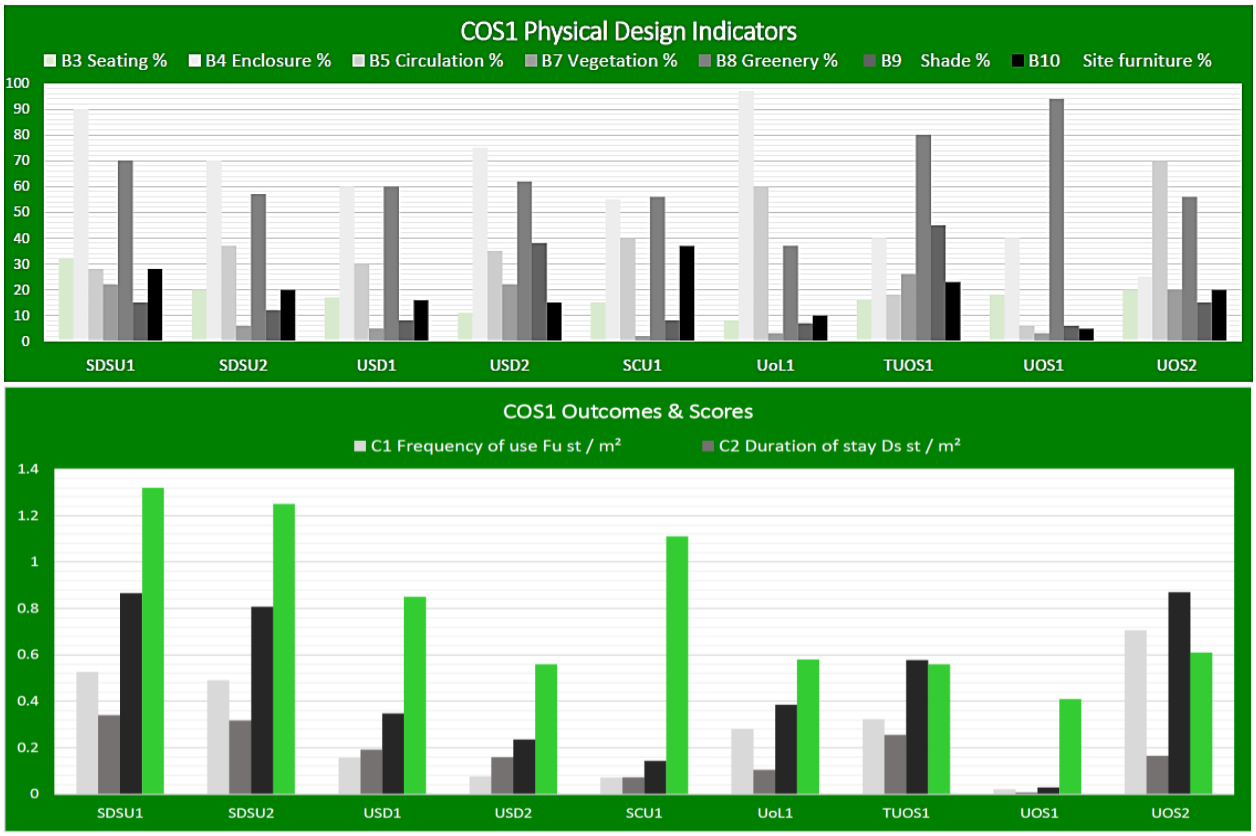


Figure 43: The comparison graphs of the quadrangles (COS1) at 9 different COS. 1st graph is comparing the 10 spatial analysis (inputs%). The 2nd graph compares the rates of the 3 performance scores (outcomes/5).

7.3.2 COS2 Typology : Courtyards and Building (front/back/side) Yards

Five COS have been examined within this typology as follows: COS2-SDSU3 & COS2-SDSU4 from the main case; COS2-UCI1 & COS2-POM1 from two US subcases, and one UK subcase (COS2-TUOS2).

All courtyards are almost bounded by one building from all sides and their entries are through the that building or from relatively small openings. The paved floors are a common feature among them with the exception of the firth court (COS2-TUOS2) which has 73% lawn. This particular square lack shield from the rainy weather conditions and poor interaction with the building as most courts do – hence its lowest rates of intensity of use. On the other end, the recently developed Aztec/student union space at SDSU achieved the top performance rates among all other COS. This is not just because of its location after the campus

main entry, but also because its flexible equipment (e.g. seats, shades, lights, water, plant boxes) where it serves students socializing and meeting, eating and chatting, studying, playing and continuously supports various events. Taken as a whole, the costs, intersections (levels of integration), hard floors, and amounts of flexible fixtures of the courtyards are relatively higher than in quadrangles yet both typologies obtained similar performance rates. This similarity comes from the close characteristics of both topologies.

These different types of buildings yards act as verandas to accommodate a sense of transition place in that users feel apart from pedestrian traffic and more public uses. Comfortable seating should be provided particularly at these spaces, as longer durations of stay have been observed at this typology of COS. Seating arrangements should also permit students to meet and talk as a group. It is surprising that outdoor tables are rarely provided on many campuses and not considered as useful furniture for study use. To stare out to the open space may spread the study with short breaks/rests.

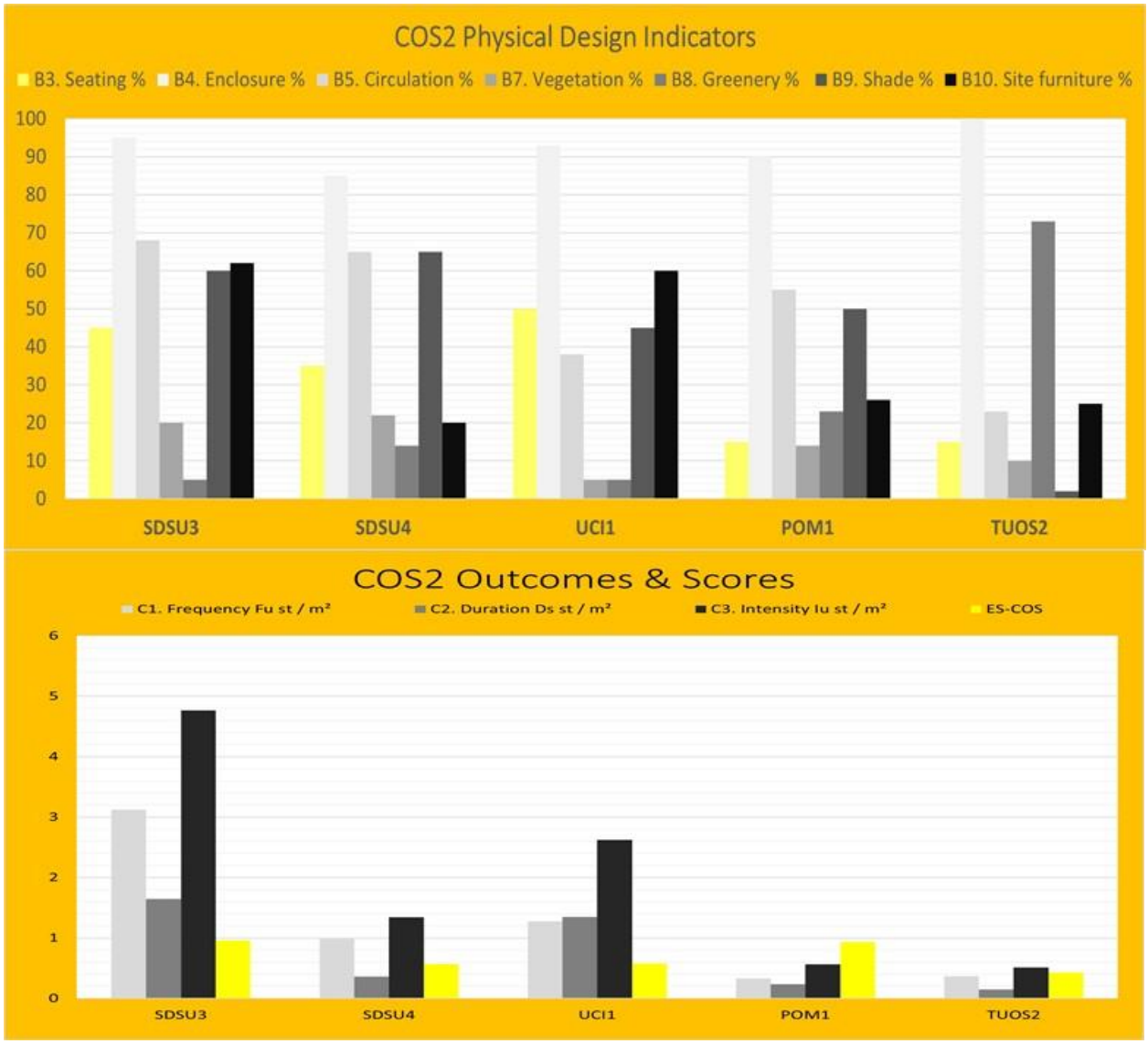


Figure 44: Showing the comparison results of the courts (COS2) at 5 different COS. 1st graph is comparing the 10 spatial analysis (%), while 2nd graph compares the rates of the 3 performance scores (/5).

7.3.3 COS3 Typology : Pedestrian Circulation Routes (Pedestrian Mall)

The most selective typology with 10 COS examined. Five COS are from the 2 main cases (COS3-SDSU5, COS3-SDSU6, COS3-UOS3, COS3-UOS4, COS3-UOS5); four COS from four US subcases (COS3-USD3, COS3-UCSD1, COS3-UCR1, COS3-CHAP1); and one UK sub case (COS3-MMU1). Indeed, circulation routes shares

big portion of all campus typologies with the highest rates of frequency of use particularly the axial or central corridors linking the heart of the campus. Even other typologies who have high rates of frequency is because they contain core corridors within their boundaries. For this fact, planners prioritize the circulation criteria and try to continuously add and renovate values within the walking experience.

The concept of pedestrian malls was familiarized into campuses, replacing the standard corridors, with better landscaped environments continue to nurture activity while contributing to the commercial, social and leisure experience. The observed design details common to these pedestrian malls were enormous including public art, fountains/water features, and an urban furnishings palette of ornamental light poles, bollards, benches, kiosks, tree grates and tree guards. Light poles may also support banners and hanging baskets, while free standing planters and, on occasion, moveable chairs and tables are familiar features.

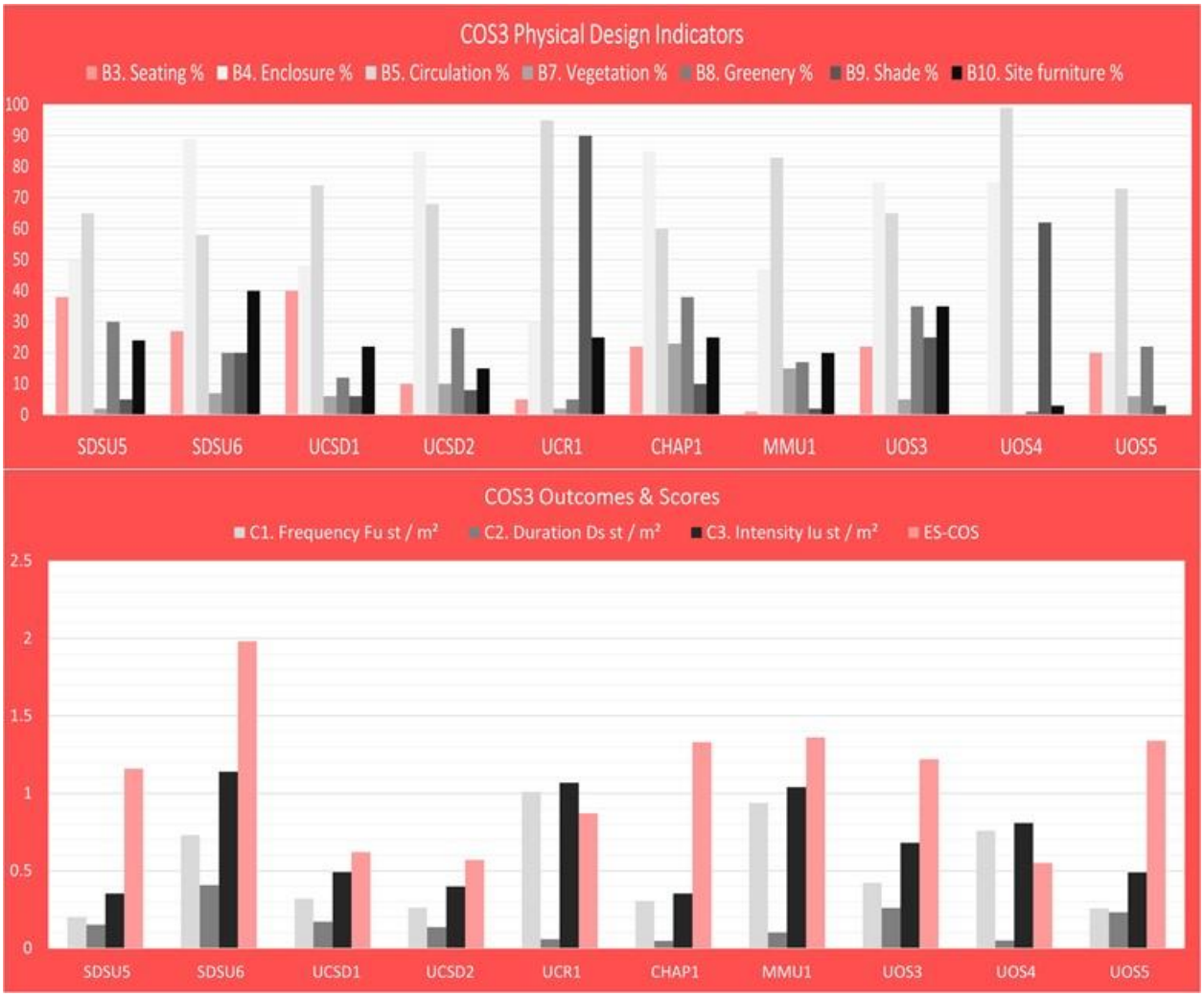


Figure 45: Graphs showing the comparison results of 10 path corridors (COS3) . 1st graph is comparing the 10 spatial analysis (inputs%). The 2nd graph compares the rates of the 3 performance scores (outcomes/5).

7.3.4 COS4 Typology : Central Plazas

Within this typology, nine COS have been observed and analysed. Two COS are from the two main cases (COS4-SDSU7, COS4-UOS6); four COS from four US sub cases (COS4-STAN1, COS4-UCLA1, COS4-UCR2, COS4-CHAP2); and two COS from two UK sub cases (COS4-TUOS3 & COS4-MMU2). The central plaza is usually not just the largest and the most used COS on campus, but also in the majority of cases the collective representation of the students that reflects university's identity and the communities' cultural background.

As can be seen from the analysis graphs, the value distribution of numbers of intersections, seating, shade, and site furniture are very correlated with the intensity of use. The two highest EX-COS scores not just amongst the central plazas, but above all other typologies of COS, were the COS4-USD3 & COS4-UCLA1 (both 1.99). They both share the greatest percentages of seating (32% & 52%), number of intersections (1.42 & 1.67), percentages of decorative and shading vegetation (18% & 14%), and percentages of the quality and quantity of the natural and built site furniture (68% & 70%).

The Sycamore Plaza at SDSU has the highest numbers of users crossing but at the same time the lowest duration of stay. It was determined that the quality of the landscape design features (such as sitting elements, bins, ground covering, lighting and sign elements, water features, quality of green and vegetation areas, shade or shelter, monuments, billboards) in the plaza was in bad condition. Especially the seating areas are observed as bad quality because of their uncomfortable concrete or wood structures and the monotonous arrangements. This finding is despite the fact of this important space located on the heart of campus linking the two main axis (pedestrian malls) and surrounded by important buildings. Many other central plazas have similar characteristics of open, largely paved areas with hard seating areas around such as Revelle plaza at UCSD, Stanford Main Quad, and the UCLA Bruin Plaza. Although having the lowest EX-COS ranks, these four wide-open plazas hold high frequency rates and offers opportunities for great and continuous events such as the farmers market at SDSU which runs every Wednesday of each academic week and students really enjoy it. Hence, these plazas rely on variable and changeable occupations rather than fixed designs, which contributes to other levels of collaborative and innovative experiences.

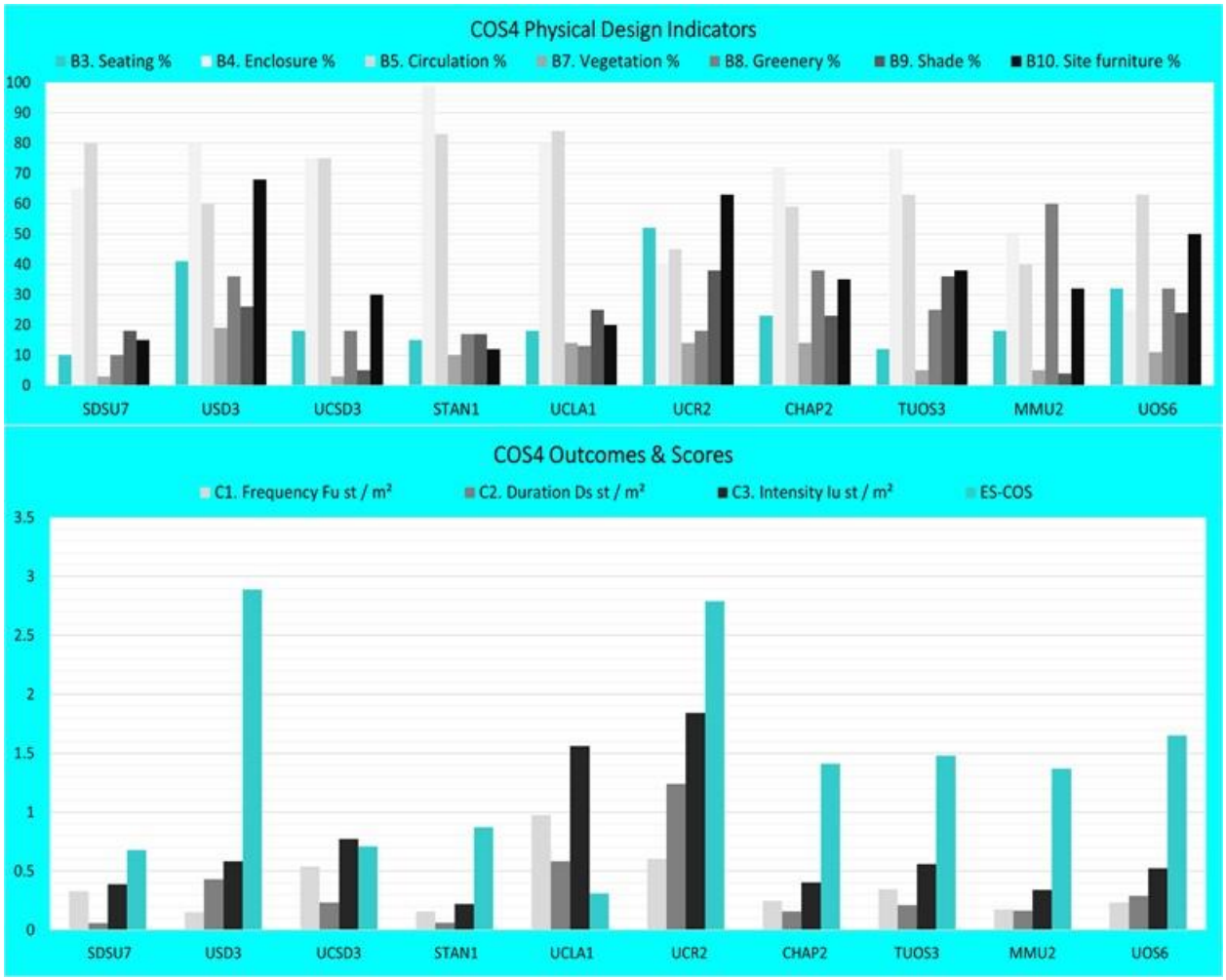


Figure 46: 2 Graphs showing the comparison results of the 10 central/campus plazas (COS4) – 1st graph is comparing the 10 spatial analysis (inputs%) and the 2nd graph compares the rates of 3 outcome scores.

7.3.5 COS5 Typology : Parks and Fields

Within this typology, eight COS have been evaluated. Two COS are from the two main cases (COS5-SDSU8, COS5-UOS7); three COS from three US sub cases (COS5-UCLA2, COS5-UCI1, COS5-SFSU1); and three COS from three UK sub cases (COS5-UoL1, COS5-UOM1, COS5-MMU3). By its nature, many university/public parks are not fully utilized, barely used or unevenly used. This is due to various reasons either for the culture of the university and community or for some deficiencies that are mainly related to their layout design, site organization and their physical characters (landscaping & site furniture). Therefore, within those parks, some universities develop some sports areas or playgrounds, children areas, significant seating areas arounds ponds or other attractive sceneries. For example, the university estates have recently developed the seating and children areas as well 3D football pitches at the peel park at UOS. This development has great impacts and noticeably increased the intensity of student and community use.

The large size and non-visibility between parts of many parks (due to the obstruction of physical elements such as trees and monument) would make observations inaccurate. Therefore, those parks (such as Wilson and Jamis steps, Aldrich park, and Peel park) as well as other large COS are subdivided into subspaces, bounded by some clear or physical edges.

Certainly, the highest rates of greenery are seen at this typology, whether parks or fields. However, the percentages of the vegetation, shade, and seating areas stand relatively high at parks while they have low rates at fields and the enclosure is the only high feature. Another common difference is the sizes and forms – which is usually exact sizes and formal (rectangular) forms at fields while variable sizes and free (organic) forms at parks.

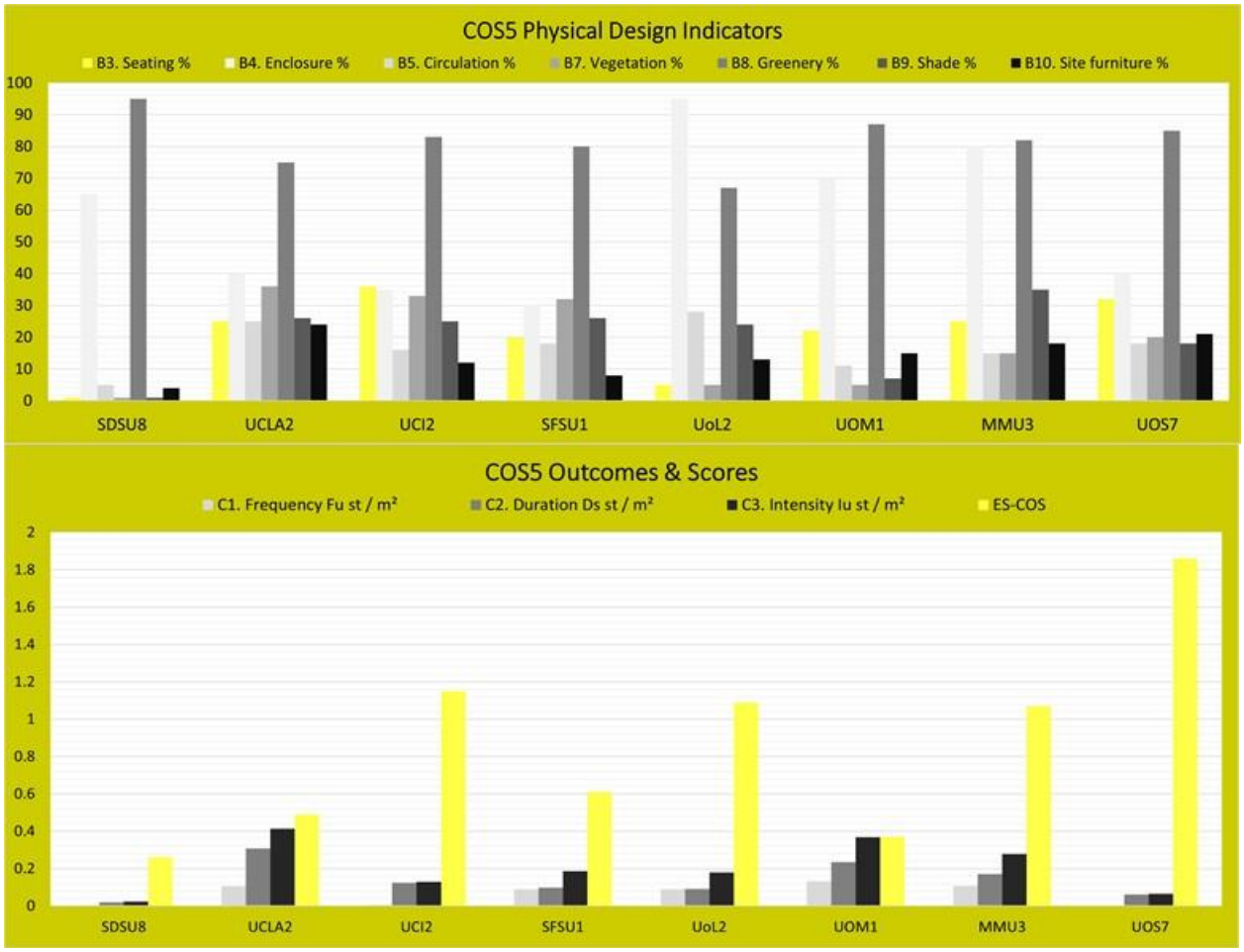


Figure 47: Graphs showing the comparison results of the 8 parks/fields (COS5). 1st graph is comparing the 10 spatial analysis (inputs%). The 2nd graph compares the rates of the 3 performance scores (outcomes/5).

7.3.6 COS6 Typology : Special or Inspired Spaces

Within this typology, seven COS have been evaluated. Two COS are from the two main cases (COS6-SDSU9, COS6-UOS8); and five COS from five US sub cases (COS6-UCSD3, COS6-USD4, COS6-UCR3, COS6-USC1, COS6-PLNU2). The data from observations and manual counts used for all COS typologies was taking at the 3 peak times of the normal academic day – morning, lunch and evening – which might slightly differ from university system to another. The only exception of this rule was at this typology (COS6) where observation time was based on their peak use even if this time was not the peak time selected for that university. For example, the time of manual counts at the faith centre (COS6-UOS8) was selected during the Friday pray which is not necessarily running into the lunch time throughout the academic year. A more obvious example is the observation times selected for the Challenge Course (COS6-UCSD4) based on times of the scheduled courses and/or randomly during significant student performs at this space.

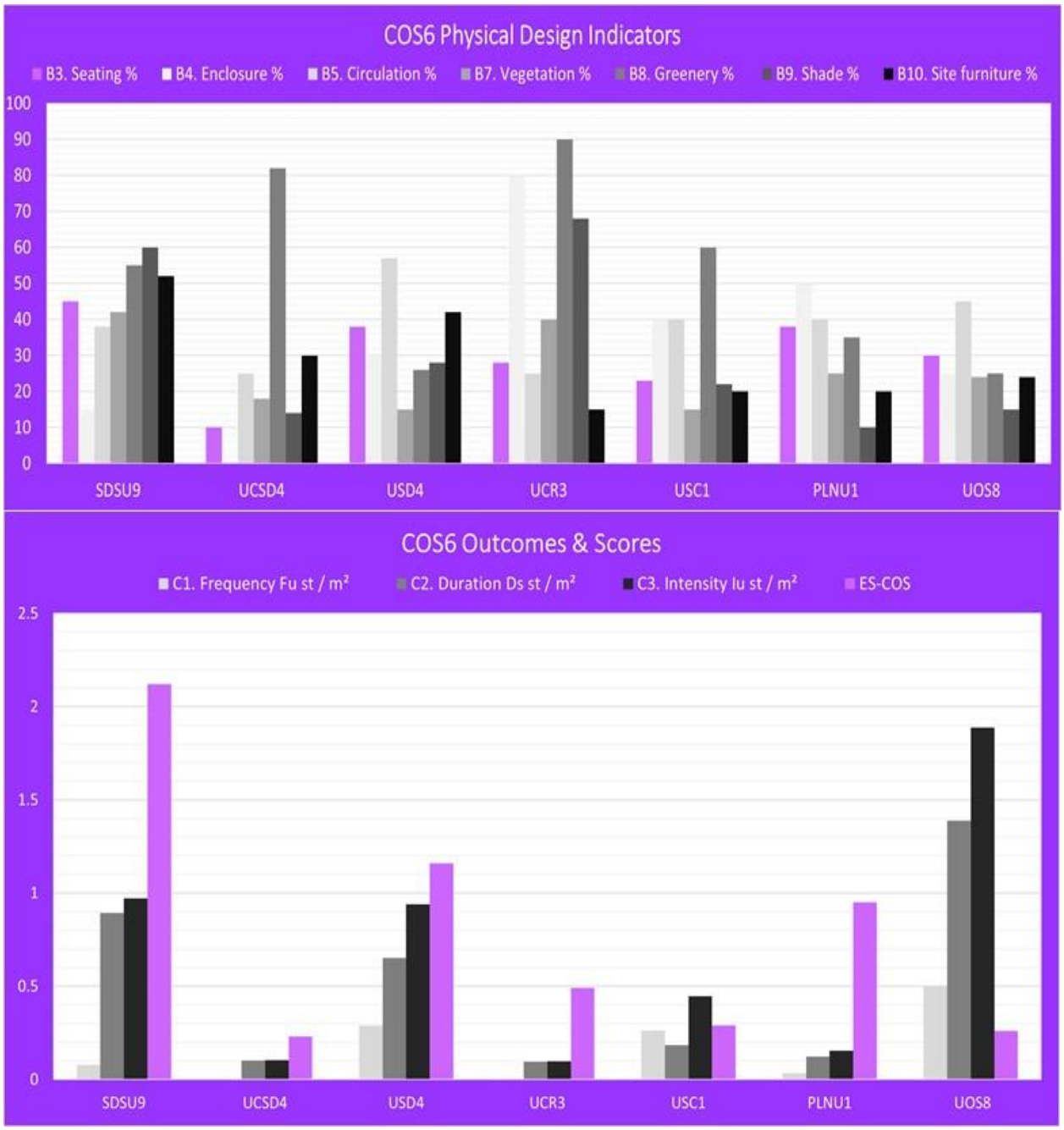


Figure 48: 2 Graphs showing the comparison results of the 7 special spaces (COS6) . 1st graph is comparing 10 spatial analysis (inputs%). The 2nd graph compares the rates of the 3 performance scores (outcomes/5).

7.3.7 COS7 Typology : Entries & Edges

Within this typology, seven COS have been evaluated. Four COS are from the two main cases (COS7-SDSU10, COS7-SDSU11, COS7-UOS9, COS7-UOS10); and three COS from three US sub cases (COS7-UCB1, COS7-STAN2, COS7-USFCA1).

The most typology that has significant values between the design and use indicators – followed by the central plaza. This is affected by each university planning theme, how the first and lasting image would be. All universities aim to create entrances that give pleasure and proud to their students and appreciate the community and public but in different means. Some universities plan their boundaries with huge, landscaped parks/lawns such as the oval at Stanford and the Lone Mountain Gate at USFCA. Others use symbolic and historical landmarks within large corridors to be as much seen and used as possible such as the Sather Gate at UCB and the Crescent entrance at UOS. In spite of the wide interest in this typology, the most deprived areas still suffer from low quality and poorly maintained COS (e.g. station square COS7-UOS10) when compared to affluent areas.

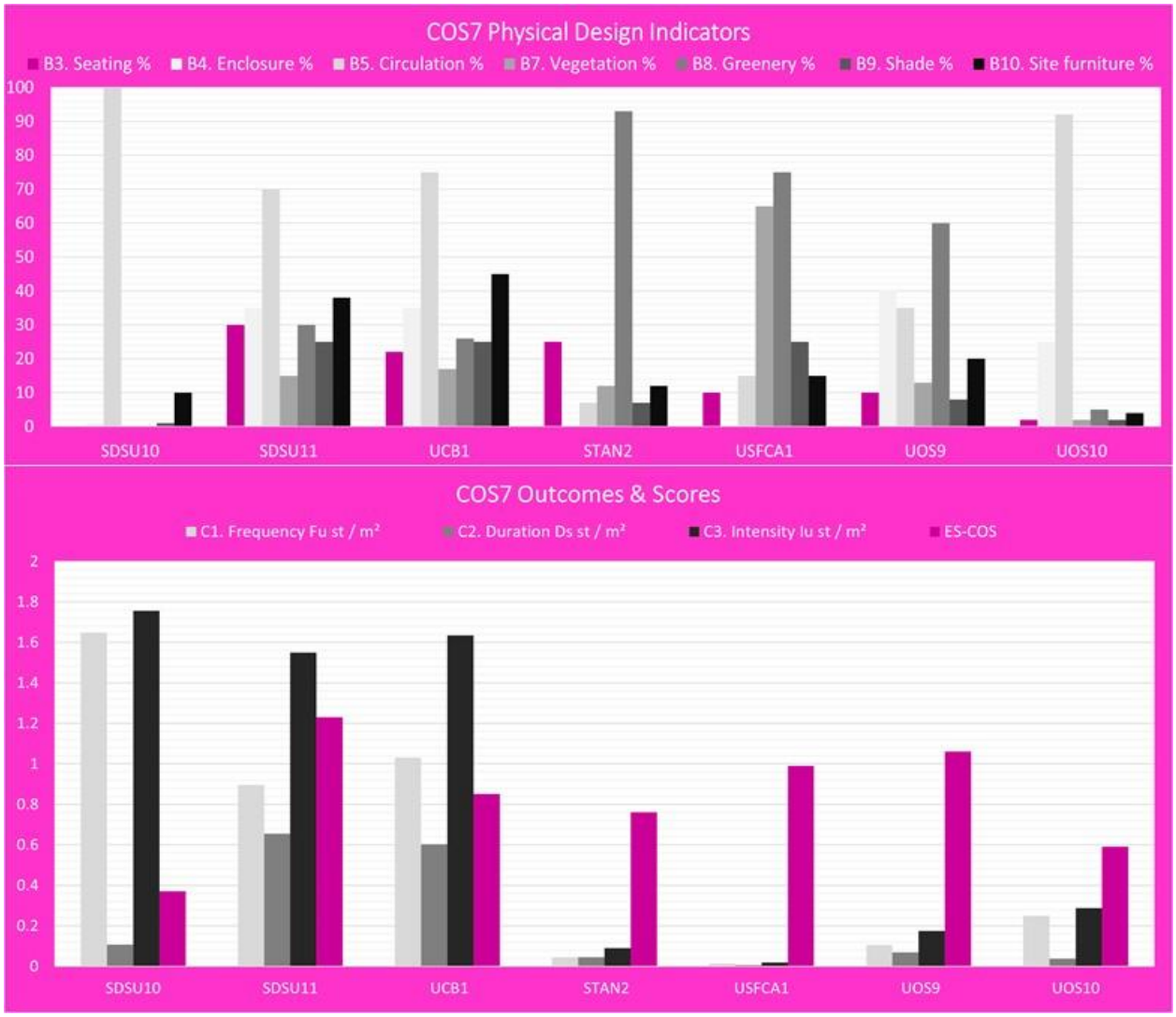


Figure 49: Graphs showing the comparison results of 7 entries & edges (COS7). 1st graph is comparing the 10 spatial analysis (inputs%). The 2nd graph compares the rates of the 3 performance scores (outcomes/5).

7.4 Spatial Assumptions from the Statistical Data Analysis

To identify the individual characteristics and universal elements of the COS, the nexus between the selected indicators of design, use and value have been analysed and compared, replying to questions like: What are the characteristic COS on the campus?; What are the elements or the spaces that give the campus its personality and individuality?; What are the spaces where students cross more or choose to stay and gather?; What are the important spaces and/or physical features for the university (the ones that should remain or the ones that need redevelopment)?; Which elements improve or disrupt (positive or negative impact) the COS and student experience?

In this section, the process of data analysis started with the statistical calculations to measure the relationships between the variables of all COS typologies (as precisely explained in the methodology) followed by separate observation counts and notes of each COS typology. Four types of statistical analysis are used for the analysis and comparison of all COS typologies as explained below.

7.4.1 The Correlation Analysis (Coefficient)

Used to measure how much one variable is linearly associated or correlated with other variables. This spatial correlation is a statistic used to provide a measure of various patterns of movement and social behaviours.

As the table below shows the highly significant variables in red colour, the significant variables in orange colour, and the rest in Gray colour are weekly correlated (not significant). The most correlated (highly significant) variables with the C2 (duration) are ordered as: B6, B10, B3, B9, then finally B2. Those variables are directly proportional while B8 has the only inverse proportional correlated value.

Table 22: Correlation coefficients between the variables

	A5	A6	A9	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	C1	C2
A6	0.32														
A9	0.52	-0.48													
B1	0.16	0.09	-0.04												
B2	-0.18	-0.32	0.23	-0.32											
B3	0.19	0.02	0.09	0.69	0.19										
B4	0.03	0.01	-0.01	-0.17	-0.02	0.03									
B5	0.00	0.11	-0.09	0.34	0.20	-0.16	0.09								
B6	-0.10	-0.24	0.16	-0.29	0.54	0.57	0.10	0.15							
B7	0.05	-0.09	0.21	0.22	0.12	0.29	-0.27	0.38	0.12						
B8	-0.00	-0.08	0.05	0.38	-0.30	-0.06	-0.17	-0.91	-0.36	0.37					
B9	-0.05	0.00	-0.01	-0.09	0.18	0.27	0.16	0.12	0.31	0.29	-0.20				
B10	0.00	0.02	0.11	-0.12	0.62	0.65	0.11	0.12	0.71	0.09	-0.29	0.34			
C1	-0.03	0.35	-0.28	-0.32	0.16	-0.04	-0.00	0.66	0.25	-0.27	-0.65	0.18	0.25		
C2	0.004	0.20	-0.14	-0.18	0.33	0.64	0.09	0.12	0.73	0.14	-0.36	0.38	0.66	0.41	
ES-COS	-0.22	-0.23	0.03	0.24	0.63	0.43	-0.04	0.08	0.34	0.10	-0.13	0.06	0.58	-0.03	0.18

\+ Direct proportional

Significant (P-value less than .05)

\- Inverse proportional

Highly significant (P-value less than .01)

7.4.2 The Partial Correlation

The table below shows the most effective variables (partially correlated) on C2 are ordered as: B6, B10, B3, B9, then finally B2. Those variables are directly proportional while B8 has the only inverse proportional correlated value.

Table 23: Partial correlation coefficients between the variables

	A5	A6	A9	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	C1	C2
A6	0.60														
A9	0.82	-0.66													
B1	0.32	-0.46	-0.22												
B2	-0.27	0.11	0.26	0.27											
B3	0.11	0.11	-0.07	0.69	0.19										
B4	0.08	-0.01	-0.06	-0.09	-0.00	0.03									
B5	0.17	.000	-0.17	-0.06	.005	-0.20	-0.08								
B6	-0.02	-0.35	0.02	-0.18	0.07	.016	-0.08	0.06							
B7	-0.12	0.16	0.25	0.02	0.08	0.11	-0.28	.014	0.12						
B8	0.09	-0.01	-0.16	0.08	-0.05	-0.19	-0.11	-0.88	-0.36	0.30					
B9	-0.04	-0.12	-0.05	0.08	-0.06	0.02	0.23	0.03	0.31	0.36	-0.05				
B10	-0.05	0.36	0.24	-0.24	0.23	0.15	0.05	-0.02	0.71	-0.23	0.11	0.24			
C1	0.05	0.26	-0.13	-0.11	0.13	-0.24	-0.19	0.17	0.22	-0.06	-0.08	0.12	0.06		
C2	.173	.140	-.288	-.096	-.032	.154	-.069	-.337	.520	.169	-.367	.133	.134	.316	
ES-COS	-0.10	-0.29	-0.10	0.33	0.18	0.14	0.01	0.17	-0.26	0.09	0.10	-0.22	0.52	-0.08	-0.08

\+ Direct proportional

Significant (P-value less than .05)

\- Inverse proportional

Highly significant (P-value less than .01)

7.4.3 The Regression Analysis

The regression analysis is a statistical technique used to investigate and model the relationship between variables so that the variable can be predicted when examined in another setting. As such, if C1 represents the dependent or response variable and A5, A6, … B10 represent the independent or predictor variables, then the best subset multiple [51] linear regression equation (significant coefficients) of C1 is

C1 = - 0.403 [52] + 0.000014 A6 - 0.00547 B3 + 0.00715 B5 + 0.269 B6 with R^2 = 58.9%

The coefficient of determination R^2 measures the closeness of fit of the regression equation to the observed values of the response variable. It is the proportion of variation explained by the independent variables. As the R^2 increases (till 100%), as the best fit obtained. This equation can be implemented in other settings to predict the values of C1. The coefficients can be interpreted as, for example, as the points of intersections (B6) increases by 1 unit (1 point/100 m^2) as c1 increases by 0.269.

[51] *Multiple regression in the equation means that more than one predictor variables with one response variable. Simple linear regression occurs when there is just one predictor variable.*

[52] Constant term representing the intercept in case of simple linear regression

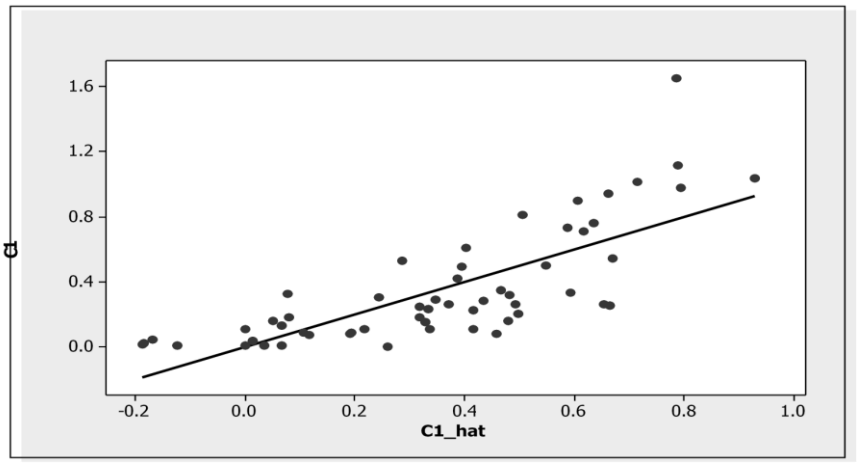


Figure 50: Scatterplot of the observed values of C1 vs fitted values.

There are only four significant predictor variables. This is resulted from the best subset regression equation of the response variable (C1) versus the 13 predictor variables with significant coefficients.

While there are 5 significant predictor variables (A6, B3, B5, B6, B8). This is resulted from the best subset regression equation of the response variable (C2) versus the 13 predictor variables with significant coefficients is:

C2 = 0.000014 A6 + 0.00536 B3 - 0.00502 B5 + 0.482 B6 - 0.00532 B8 with R^2 = 84.2%

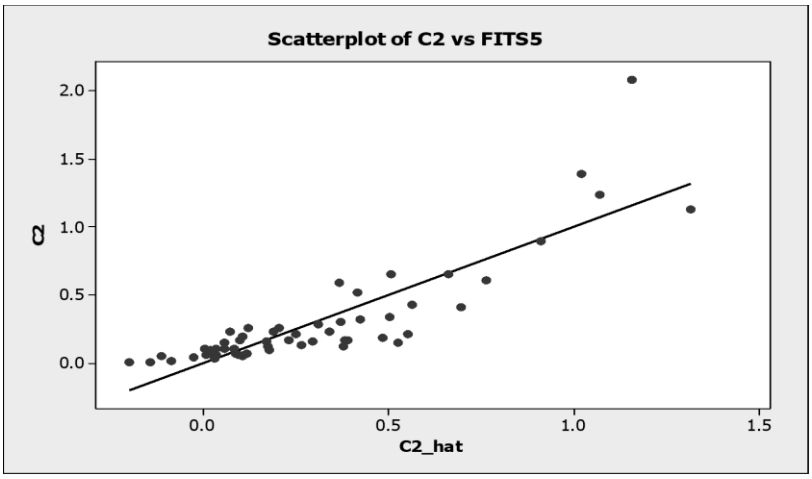


Figure 51: Scatterplot of the observed values of C2 vs fitted values.

The best regression equation for the variable Density (De st/m²) = 0.0000596. Registered students - 1.084; Enclosure % - 1.138; Green %

The best regression equation for the variable Duration Du = 13.8 - 16.7 3. Seating area %

Regression Analysis: Cos versus A6, B3, B5, B8

The regression equation is ES-COS = - 0.000018 A6 + 0.0243 B3 + 0.0107 B5 + 0.00629 B8 with R^2 = 80.5%

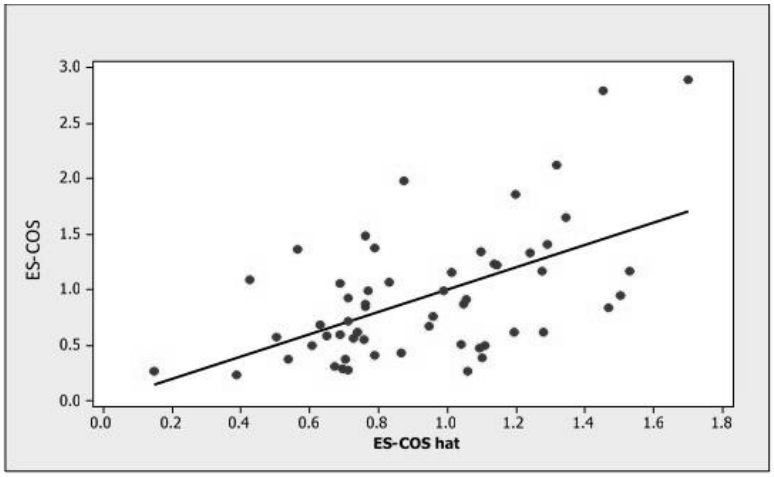


Figure 52: Scatterplot of the observed values of ES-COS vs fitted values.

7.4.4 The Canonical Correlation Analysis

As mentioned, this test provides a linear relationship between the variables. The model below lists all the variable the way they are examined.

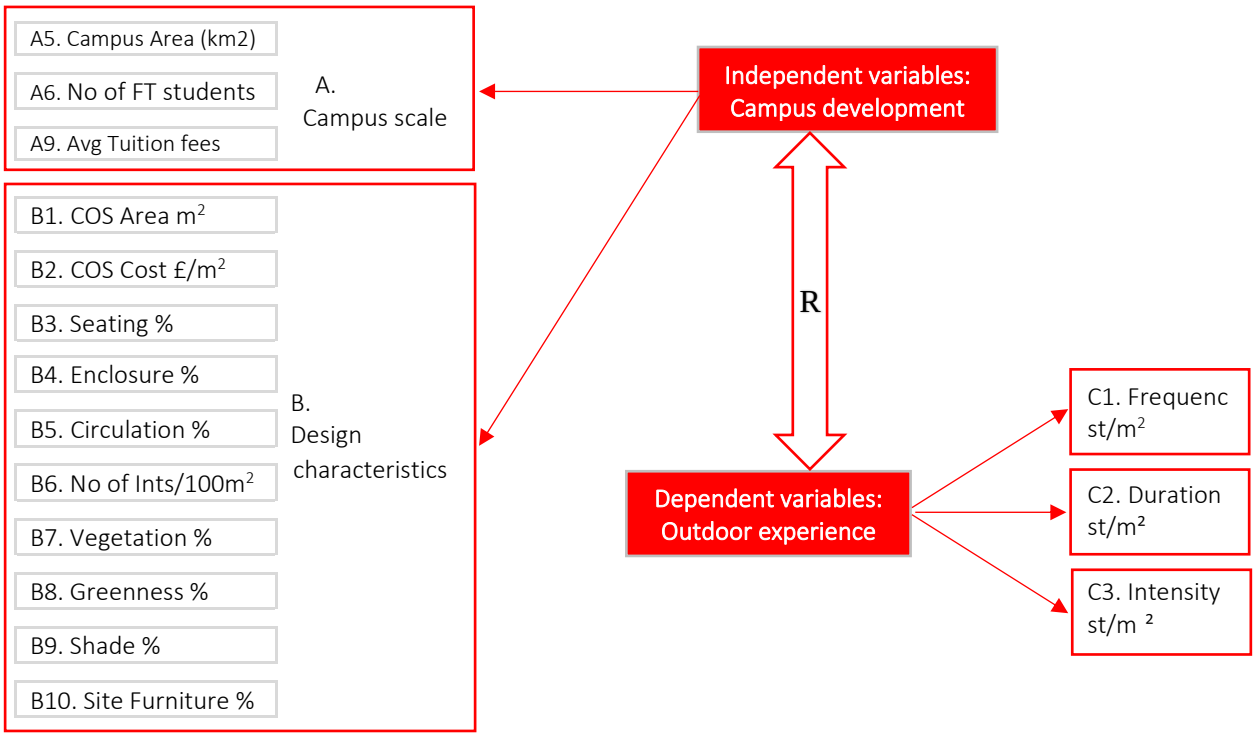


Figure 53: The canonical correspondence model used for the CCA
A. General Classification (description of university/campus setting); B. Design Variables (Qualitative & Quantitative); with C. Evaluation rates indicating the COS experience/performance

Whether there is a relationship between the landscaping elements and the space performance was reassessed via the following statistical methods and was determined as a direct-way positive relation which are explained than summarized in the table below. The first set shows the highest correlation between the 2 pairs determined by finding the linear combination of the matrices. The pairs of linear combinations are called the canonical variables (C.V.). The C.C. measure the strength of association between the two sets of variables through their C.V. The first canonical variables determining the impacts of C2/Ds are as follows:

U1= -1.0829 A5 + 0.0 A6 + 0.0 A9 + 0.0 B1 - 0.0014 B2 - 0.0098 B3 + 0.0036 B4 + 0.0331 B5 - 0.9989 B6 - 0.0100 B7 - 0.0271 B8 - 0.0008 B9 - 0.0089 B10

V1 = - 0.4434 C1 + 3.0968 C2; with canonical correlation r1 = 0.918 (very Strong & Significant)

The pair of linear combinations having the largest correlation among all pairs are determined and uncorrelated with the initially selected pair. The maximization process works stepwise, determining orthogonal canonical functions with descending canonical correlation values. The maximum number of canonical functions is determined by the number of variables in the lowest dimension data set. The significance of the relationship between the canonical variates of each canonical function is tested using Bartlett's v2, which is estimated as (corresponding canonical variables determine the impacts of C1/Fu):

U2= - 0.1514 A5 + 0.0 A6 + 0.0 A9 + 0.0 B1 - 0.0057 B2 - 0.0337 B3 + 0.0057 B4 - 0.0175 B5 - 0.6211 B6 - 0.0019 B7 + 0.0056 B8 - 0.0101 B9 + 0.0164 B10

V2 = 2.9134 C1 – 0.6884 C2 ; with canonical correlation r2 = 0.7679 (very Strong & Significant)

Table 24: Summary of the correlation analysis between the variables in the 1st and 2nd group sets.

Variables		A/B_i & C_i Corr (U_1/ V_1, $A_i/B_i/C_i$)	1st Set RANK	A/B_i & C_i Corr (U_2/ V_2, $A_i/B_i/C_i$)	2nd Set RANK
General Classification (Scale & Position of the University/Campus)					
A5	Campus Area (km^2)	-1.0829	Direct - Moderate	- 0.1514	Direct - V week
A6	No of UG students	0.0	No relation	0.0	No relation
A9	Tuition fees	0.0	No relation	0.0	No relation
COS Design (quality & quantity of the physical design features)					
B1	COS Area (m^2)	0.0	-	0.0	Direct - Weak
B2	COS Cost (£/m^2)	- 0.0057	Inverse - Weak	- 0.0057	Direct - V Week
B3	Seating area (%)	- 0.0337	Inverse - Weak	- 0.0337	Direct - V strong
B4	Enclosure (%)	0.0057	Direct - Weak	0.0057	Direct - V Week
B5	Circulation (%)	- 0.0175	Inverse - Weak	- 0.0175	Inverse - Weak
B6	Intersections /100m^2	- 0.6211	Inverse - V strong	- 0.6211	Direct - Weak
B7	Vegetation (%)	- 0.0019	Inverse - Weak	0.0019	Direct - Moderate
B8	Greenness (%)	0.0056	Direct - Weak	0.0056	Direct - Moderate
B9	Shade (%)	- 0.0101	Inverse - Weak	0.0101	Direct - Weak
B10	Site furniture (%)	- 0.0089	Inverse - Weak	0.0164	Direct - Weak
COS Output (evaluation rates)					
C1	Frequency of use - Fu	-0.4434	Direct - V strong	2.9134	Direct - V week
C2	Durations of stay - Ds	3.0968	Inverse - Weak	- 0.6884	Direct - V strong

The CCA shows that the most influencing and closely associated to the variable C1 is the number of university registered students (A6) variable to U1. Followed by, in order, the higher percentage of circulation (B5), then the Green (B8) and Campus area/size (B1) with approximately equal importance. While C1 (Frequency of use) is the most important variable to V1. These results suggest that students who study in bigger scale universities with higher COS density report better outdoor experience and fewer costs of developments compared with their peers studying in small-scale universities.

In the 2nd set of CCA, B3 is the most influencing and closely associated to the variable Y2. Meaning that the Seating area (B3) is most closely associated with the student's duration of stay at a certain space. Followed by, in order, the percentage of Green areas (B8), Vegetation areas (B7) and number of Intersections (B6) with approximately equal importance. While C2 (Duration of stay) is the most important variable to V2.

There are two important points about these results that add to the previous literature. First, the effect size of the impact of design of COS seems to be comparable to that of the classification or scale of the university campus known to correlate with better student experience, while costs of development did not seem to have significant correlation. For example, if we consider two COS development, one costs £1,000 more than the other, and within the same campus, it is predicted that the more area designed for seating will increase the student interaction, which is one way of enhancing the student experience on campus. Interestingly, however, that prediction could turn out to be wrong if the less seated space has more green and vegetation (trees and shrubs) areas. This does not indicate, however, that paying more costs in developments are not beneficial. This study only shows that saving money on outdoor space on campus may be more beneficial than saving money on university buildings (indoors) or in other public spaces. Future studies need to address this possibility more thoroughly.

The three best experience areas (ES-COS value over 2) are 2 central plazas; the Colachis Plaza (COS4-USD3), Student Commons & market street (COS4-UCR2), followed by a special space; the Plaza Scripps Terrace (COS6-SDSU9). These spaces are centralized, visually exposed, accessible, and well connected to the other areas of the campus and adjacent to the main campus axis. Therefore, they are highly considered with the best quality and optimum quantity of the urban and landscaping design features. However, these scores indicate the overall ratings after being normalized to the scale and position of the university/campus. As such, these COS are not necessarily boasting the highest impacts on the students experience.

A composite score (ES-COS) was developed using the mentioned formula in the COS design index. The correlation analysis and ranking scores reveals the matches and gaps within campus type, or context, and/or of each COS typology. The top frequency rates are found at the linking steel bridge at SDSU (1.65) with above 30,000 students passing through the academic day, followed also by three corridors in three other campuses. The three top rates of durations are seen in COS typologies of special/inspired spaces (COS6) and the central plazas (COS3). The 3 dimensions with highest direct proportional (correlated) to each other are B6 (Intersections), B10 (site furniture), C2 (duration). While the 2 most inversely proportional variables are B5 (circulation) and B8 (greenery).

Table 25: The top 5 ranks amongst the variables of the 3 scales/levels of evaluation.

Variable		1st	2nd	3rd	4th	5th
A3	Age	UOM - 1824	TUOS - 1828	UOS - 1850	SCU - 1851	Chapman - 1861
A4	Univ land	STAN - 33.1	UCSD - 8.66	UCI - 5.97	UCB - 4.99	UCR - 4.86
A5	Camp area	STAN - 1.01	UCLA - 0.95	UCI - 0.63	UCB - 0.57	UCSD - 0.56
A6	Students	UCLA - 40,428	UCB - 40,174	USC - 36,487	UCSD - 34,979	SDSU - 28,828
A7	Selectivity	STAN - 5%	POM - 9%	USC - 16%	USB -16%	USLA - 16%
A8	Univ rank	STAN - -3	UOM - 9	UCLA - 17	TUOS - 22	UoL - 27
A9	Tuition fees	SCU - 39,750	STAN - 36,240	USD - 36,050	USFCA - 35,970	POM - 33,305
B1	COS Area	COS5-UOS7 77,800	COS5-UCI 61,000	COS7-STAN2 18,000	COS5-UCLA2 17,500	COS4-STAN1 12,900
B2	COS Cost	COS7-SDSU10 210	COS6-SDSU3 180	COS7-UCB1 175	COS5-UOS7 158	COS7-UCLA1 150
B3	Seating	COS2-TUOS2 52	COS4-STAN1 50	COS1-UOL1 48	COS2-SDSU3 41	COS5-UOL2 40
B4	Enclosure	COS2-TUOS2 100	COS4-STAN1 99	COS1-UOL1 97	COS2-SDSU3 96	COS5-UOL2 95
B5	Circulation	COS7-SDSU10 100	COS3-UOS4 99	COS3-UCR1 95	COS7-UOS10 92	COS4-UCLA1 84
B6	Intersections	COS2-SDSU3 1.87	COS2- UCI1 1.75	COS2-POM1 1.72	COS4-UCR2 1.67	COS6-USD4 1.57
B7	Vegetation	COS7-USFCA1 65	COS6- SDSU9 42	COS6-UCR3 40	COS5-UCLA2 36	COS5-UCI2 33

B8	Greenness	COS5-SDSU8 95	COS1-UOS1 94	COS7-STAN2 93	COS6-UCR3 90	COS5-UOM1 87
B9	Shade	COS3-UCR1 90	COS6-UCR3 68	COS2-SDSU3 66	COS2-SDSU4 63	COS3-SUOS4 62
B10	Furniture	COS4-USD3 68	COS4-UCR2 63	COS2-SDSU3 62	COS2-UCI1 60	COS6-SDSU9 52
Avg COS users/hr		COS3-UCB1 36070	COS3-UCSD1 26500	COS3-SDSU5 25680	COS3-SDSU6 20480	COS4-UCSD3 15750
C1	Frequency	COS7-SDSU10 1.65	COS6-SDSU3 1.11	COS7-UCB1 1.03	COS3-UCR1 1.01	COS7-UCLA1 0.98
C2	Duration	COS2-SDSU3 2.08	COS6-UOS8 1.38	COS4-UCR2 1.24	COS2-UCI1 1.12	COS6-SDSU9 0.89
C3	Intensity	COS2-SDSU3 3.18	COS2-UCI1 1.93	COS7-SDSU11 1.89	COS7-SDSU10 1.76	COS4-UCR2 1.68
	ES-COS	COS4-USD3 2.88	COS4-UCR2 2.79	COS6-SDSU9 2.12	COS4-SDSU6 1.98	COS5-UOS7 1.86

The table below shows the "statistically significant" correlation between the COS experience and those elements who gave a high rating to their quality of design. These findings indicate that these elements of design (number of intersections, then seating and site furniture) have higher impacts on the performance of students than the other elements who are less significant or did not show any relationship such as the size area and cost of the COS.

X_i	A_5	A_6	A_9	B_1	B_2	B_3	B_4	B_5	B_6	B_7	B_8	B_9	B_{10}
Corr(U_1, X_i)	-0.05	-0.13	0.07	0.14	-0.38	-0.73	-0.06	0.03	-0.83	-0.22	0.28	-0.3	-0.73

From these correlations, the second variate A6 (No of students) in the set of Xi's is most closely associated with the C.V. U1 i.e. A6 is most important variable to U1. Followed by, in order, the variable B5 (circulation), then the variables B3 (seating) and B9 (shading) with approximately equal importance.

Similarly, the correlations between V1 and C1, C2, ES_COS are given in the following table:

Y_i	C_1	C_2
Corr(V_1, Y_i)	0.2170	0.9886

Besides, the second variate C2 in the set (C1, C2, ES_COS) is most closely associated with the C.V. V1 i.e. C2 is the most important to V1 then C1.

The correlations between U2 and X1, X2 , …, X11 are given in the following table:

X_i	A_5	A_6	A_9	B_1	B_2	B_3	B_4	B_5	B_6	B_7	B_8	B_9	B_{10}
Corr(U_2, X_i)	0.17	-0.3	0.39	0.39	-0.06	0.36	0.02	-0.84	-0.13	0.26	0.74	-0.22	0.04

From these correlations, the third variate X3 (Seating area) in the set of Xi's is most closely associated with the C.V. U2 i.e. X3 is most important variable to U1.Followed by, in order, the variables X8 (Green %), X7 (Veg %) and X6 (Intersections) with approximately equal importance.

Similarly, the correlations between V1 and C1, C2, ES_COS are given in the following table:

Yi	C1	C2
Corr(V1, Yi)	0.9762	0.1505

Moreover, the second variate Y2 in the set (Y1, Y2) is most closely associated with the C.V. V2 i.e. Y2 is the most important to V2.

7.5 Limitations and Conclusions for the Data Collection and Analysis

Chapters 6 & 7 shows and compares findings analysis of the university, campus and COS planning and design, among sub and main cases in England and California. They examine various types of campuses and campus planning concepts, looking for lessons that can be applied to improve the SE. Crucial to the development of an enhanced SE through campus design is an evaluation of the site's existing and potential design qualities. It should be noted that most campuses particularly in the US began with a comprehensive plan to guide physical development. Many campuses adhered to their plans as they developed over time. Data analysis and interpretation from both contexts consist of raw data structured in tabular form. Based on the literature discussed earlier, the COS qualities from the three key fields were identified in their relative frameworks (the three-level design index) including: 1) General information about university systems and ranks, university grounds/scales, and size by space and enrolments; 2) Campus types and forms, landscape design features, and typologies of use (descriptive formal/informal learning and social activities); 3) finally calculating, ranking and correlating the variables of the three levels of COS design which is split into two parts: first, scoring and ranking the COS features of design, use, and value; second, these analysis are also correlated using four statistical tests.

Now that the creation of each framework has been developed, however briefly, defining the major benefits, observed elements, and distinctive qualities and characteristics of each type of COS design and use, and how they contrast with one another and with a typical campus environment. The specific qualities being used are included and identified in the overall framework lit 3/3 (ch4 section 4.3) and are implemented in table 23 (chapter 7 section 7.2.2). The qualities are used not only to describe the current status of the university and physical features of the campus, but also highlights the impacts of specific design qualities on SE. Emphasizing the impacts is by understanding how the individual components (that which make up the characteristics of an experience-based COS) relate to one another, which then provide additional depth to university mission, student performance and satisfaction, as well as investment potentials. These implies the lessons that a good college campus can teach us about the design of other campuses. They also serve as a reference to identify the design recommendations laid out in the next chapter.

While several public and private universities are referenced, the focus on how the two main case studies (UOS & SDSU) embraced campus deign for achieving and responding to students needs and expectations. These two universities are important as case studies for their similarities as much as their differences are deeply analysed and compared in chapter 7. Despite important historical and structural differences, both universities have or are adopting design models that facilitate SE along with multiple, seemingly competing alternatives. Both are committed to the success of all students, and have transformed their efforts to be continuously responsive to the new spectrum of challenges facing HE.

The UOS campus plan realizes the arrangement of buildings with spaces created between them. The use of COS for circulation, study, relaxation, and aesthetic pleasure is continuously considered and developed in various ways. The Peel Park and other campus greens are among the most recognizable and memorable campus spaces as well as thoughtful incorporation of utilities and infrastructure. The Peel Park campus provides settings for classes, special events, recreation and contemplation. It also reinforces the high-quality values and vision of the university, with the support of campus art providing a seamless and universally attractive campus landscape. Similar to UOS campus, the SDSU campus is not only in need of

huge regeneration, but also one with equally huge potential. While UOS is closer to the city centre with an urban city (walkable and inner-city neighbourhoods), SDSU regenerates a suburban area, becoming both a city gateway as well as a great place to live, work, and entertain. The student population of both universities can boost their communities or the city.

As for the Risk Mitigation Strategy, a possible weakness of the case study methodology is the objectivity and the vulnerability of this method to being shaped by the researcher's own interests and perspectives *(S. Becker, Bryman, & Ferguson, 2012).* To address this concern, it is important to consciously retain as much of an objective perspective as possible throughout the study. It is also important to remain aware of those challenges identified by *S. Becker et al. (2012)* as, for instance, the large quantities of data which might be gathered, especially that drawn from interviews with informants, and the research skills required in overcoming the complexities of precisely analysing, revealing and capturing neutral and representative participant views. Working with other research teams specialized on campus planning and student social topics at later stages is not considered but might also have been valuable.

Ch8. DISCUSSIONS, CONCLUSIONS, AND CONTRIBUTIONS : THE A-B-C INTEGRATIVE ASSESSMENT

Successful master planning is the key to creating great places. A clear, considered masterplan developed by professionals and local people together can lead to the physical, social and economic revival of places.

(Cabe, 2008)

The last chapter of this research includes a summary and discussion of the main findings of all the three-phases, read as a build-up of evidence that relates to and quotes different parts of the thesis. It also includes description of the limitations of study and the future research projects that can be initiated based on the theoretical framework of this dissertation. In this respect, data collection, analysis and discussion will be conducted with an understanding of, and in accordance with, well prescribed practices as presented in a range of research methodology. Initial research questions are revisited, and considerations are given to how research on the value of experience-based COS design could be taken forward. Drawing the final conclusions and its methodology along with the recommendations will contribute to knowledge. Conclusions are mainly recapping the following:

- The statistical and observed data collected from California & England campuses are succinctly explained with a comparative approach, and end up with a clear set of guidance on how to judge the quality and investment needed in the COS. This reports the final process of synthesis by comparing the main research findings in relation to those of the literature and research reviews.

- Design-Experience-Value Assessment, as a build-up of evidence of ranking and reflecting the responsiveness of the university campus particularly applicable to its spatial configuration and its overall COS-E-S (Intensity & cost).

8.1 Research Summary

This study establishes the inter dependence between space design and its occupation by revealing how many students perceive and react (negatively or positively) upon particular COS typologies and design features. This method of assessment supporting informal learning outdoor place by both; encourage more investments, and prioritize investments with greater impacts on SE. The study not only relate well with several studies *(Abu-Ghazzeh, 1999; Acker & Miller, 2005; Aydin & Ter, 2008; Farag et al., 2019; Felsten, 2009; Gorgati & Savid-Buteler, 2016; Greene & Penn, 1997; Gulwadi, Mishchenko, Hallowell, Alves, & Kennedy, 2019; Hajrasouliha, 2017; Hanan, 2013; Hipp et al., 2016; Ibrahim & Fadzil, 2013; KARACA, 2020; S. S. Y. Lau et al., 2014; McFarland et al., 2008; D. G. Oblinger, 2006; Rached & Elsharkawy, 2012; Skärbäck, 2013; Yaylali-Yildiz et al., 2014; Yaylali-Yildiz et al., 2020; Yıldız & Sener, 2003; Y. Zhang, 2006)* which verified that the design of a campus space affects its users' behaviour; but it also shows how the amount of users who pass or stay at what times (frequency and duration of utilising the place) may also reshape or attach different function/purposes to a designed space. The typology and frequency of use is also attached or normalized to the university position and scale (value) to justify a development that whether succeed or fail to yield social and economic benefits. These benefits were indicated through observing, rating, and correlating the elements of design and landscaping improvements of the outdoor physical environment, along with the frequency, duration, and intensity of use (overall Experience Score of the selected COS / ES-COS) as indicators to contribute to the SE (social interaction, engagement, creativity, environmental awareness, etc.), while realizing their values and hard financial costs normalized to the size, scale and level of the university. Assessing and inspiring more and better use of COS will ensure that the proposed design developments will receive greater prominence in future decisions and inspire more confidence. Additionally, empirical assessments and decisions of the COS universal elements and individual characteristics will lead greater impacts and benefits to the campus design. To gain a deeper understanding of the above summary from the students' perspectives as the ultimate customer as well as the university as the owner, the following research questions are reflected from various perspectives.

Table 26: Summary of the research questions, aims, methods, and conclusions

How far does investing in campus urban design development impacts the student experiences ?			
	Educational / University Perspective	Place Design & Use Perspective	Value - Investment Perspective
Questions / problem	- What are the highest (most used) and the best (most popular/valued) outdoor practices within university campuses?	- What are the links between the COS typologies and its spatial features with the SE ? - What are the most spatial features that contributes to the SE ? - Which spaces, with what improvements, would have the greatest impact on SE?	- How can we rank/score COS developments to their impacts for improved SE, from an investment perspective? - How to ensure that the COS design developments promote to the university customers (SE), and keep them coming back for more ?
Aim & Objectives	- To define university outdoor practices and outline models of social behaviour and informal learning. - To outline an array of HE (educational profiles, rankings, university pressures and impacts).	- To describe and compare the various typologies of campus design and practices. - To capture with evidence the value of quality design that potentiates SE by reviewing and comparing different typologies of COS developments. - To analyse and correlate the design factors and student experience, considering the university status.	- To grade/rate the matches/miss-matches and evaluate the links between the configurations of design, practice, and value (validated valuation and balanced correlations). - To develop recommendations that establish a nexus between different configurations of COS and potential impact on SE, considering university status/position.

Methods & data	Systematic reviews of theories, concepts & university docs. Ranking status, scale and size, annual fees, budget, etc.	Secondary: Masterplan analysis. Primary: observational methods adapted from Jen Gehl & Jane Jacobs. Empirical data collected from California & England campuses with a comparative approach : General and detailed profiles of sub and main case studies including info as: scale, size, history, spatial configuration, frequency and duration of use, and ES-COS (ranking scores)	Statistical analysis, ranking scores, validation interviews of methods, data collection and analysis. Excel spreadsheets for the Ranking scores along with 4 Statistical tests.
Conclusions	Phase A: University general profiles	Phase AB: Indicators/Measures for typologies of COS design, use and costs.	Phase ABC: Recommendations for students (education), planners (camp design) & value (investors)

8.1.1 Student-Centred COS

What is the highest and best use of open spaces on campus today?

To answer the research first question, the researcher quantitatively indicates the quality and quantity of use value using observation methods. Highest use reflects the frequency of use and best use reflects the typology and impact of use. The makeup of both use values is attached to and covered in the Level-1 Educational Perspective, which conceptualize SE within the scope of the outdoor physical environment (outdoor practices and related models of informal learning and innovation in university campus). Driven by competition (for reputation, staff and students) in an international marketplace, in order to produce locally embedded variants of global HE models. After scanning and skimming many universities particularly at the two selected locations, these methods were appraised at some leading and typical universities, those who known to provide fertile ground for world-changing research, ideas and future thinkers and trailblazers. Comparing those expressive universities, shows the amounts of similarities between or connections with or distinctiveness of the reviewed campus master plans (the challenges, objectives, and recommendations related to outdoor SE). To recognize the current status of each university, a general profile was reviewed and compared providing information about the type of university and campus, size, scale, settings and ranks of the university.

Given the current issues and research with the university performs, there remains a need for better exploring the use of students out of class within the campus landscapes. Campuses can be high stress environments due to the potentially rigorous curricula that students might engage. They are environments that are highly susceptible to "information overload." With much of the work and time spent indoors, the outdoor campus landscape remains crucial to mediating the psychological and emotional rigors that students must endure. Increasing exposure to outdoors particularly natural and green/landscaped environments is proven to mitigate the stress and improve student well-being on campus. However, students' frequency and condition of use of all campus outdoors or for specific COS typologies varies according to many factors rather than just the campus design. This can be due to mainly the nature of the urban and cultural context, for the weather conditions, and/or sometimes for educational purposes such as students mode and year of study. However, from the use analysis of all observed campuses, students usually gather the most at the food and beverages areas (over 50% of all other campus spaces), followed by corridors and central plazas (both over 30%) than the other campus spaces. Active engagement (rather

than passive)[53] was observed as one of the most beneficial uses, when students are engaged in an active participation. It was also noted that promoting the walkability experience was a shared objective in all typologies of COS, while promoting a learning environment is only needed in certain COS typologies particularly at COS2 (courts) or the COS6 (inspired spaces). This finding indicates that campus planners may not fully treat the physical campus as an asset to enhance learning, or there are fewer known physical interventions at the campus level that can address this objective. A greener campus can provide a more pleasant vigorous experience, increasing the frequency of use and enhancing the quality of use. For example, a 15-minute walk across parking lots and unplanted sidewalks can be undesirable, while a 15-minute walk across a green campus can become a pleasant daily ritual that increase the probability of walking and biking.

Assessing the links and gaps between the typologies of design/form with the typologies of use by its function have raised some potentials and challenges. For better and wider research impacts findings and results, such methods and assessments need to be conducted at the most significant and universal (internationally recognized) campuses. Indeed, both UK & US have the top-ranking universities, most popular, with greatest impacts on students and society (social and economic, besides the research and teaching performance), all with richest history of campus planning and design. At these universities, when students look for a university to attend, probably consider factors like the location, ranking, reputation, faculty and degree programs. But is university wealth and campus design are considered to affect directly or indirectly one or more of the above key factors? Although the wealthier/better the university planning the more convenient facilities are likely to be, but to what extends do better facilities have greater impacts on SE? These questions - within the scope of the next/second research question - are answered by seeking the "Experience-based Campus" through the content analysis of over 20 significant university campuses in UK (England) and US (California).

8.1.2 Experience-Driven Design

What are the most prominent COS design factors that evoke the true experience of students? Or, Which spaces - with what improvements - would have the greatest impact on SE?

To evaluate a campus urban design, 7 urban qualities and 10 physical features were measured and compared in 56 different COS in England and California. These measurable dimensions were considered to test their relationship to the desired outcomes quantitatively. The desired outcomes are what reflects the students individual or personal needs and expectations – 'the true experience of students'.

The Main findings of this phase was the amount of benefits the England & California campus design can learn from each other's experience. Studying these two most significant contexts also point to certain threats and opportunities for campus planning and design practice. Only on the 2 main cases studies (UOS & SDSU), the seven urban dimensions were compared on campus level (layout, sociability, diversity, integration, connectivity, meaningful, user comfort, aesthetic). On the COS level, the percentages of 8 of the 10 physical features (seating, enclosure, circulation, integration, vegetation, greenness, shade, and site furniture) were compared in all 56 COS. The COS area and cost were also roughly calculated to indicate its scale and value. Using statistical equations, the frequency, duration, and intensity of use were calculated based on the data of observation and manual counts.

[53] *Passive engagement is where users may enjoy spaces without having to be actively involved (aesthetic COS), while active engagement represents a direct experience with a place and the users (experience-based COS).*

The Level-2 Urban Perspective show the significance and practicalities of renovating campus outdoor spaces that provide a prospect for the entire educational campus. This part concluded with an analytical tool as a means to appraise the campus outdoor design qualities consisting of 8 key aspects (e.g. connectivity with the wider urban area and its needs, size and population of campus or the development area, etc.). It facilitates in-depth investigation and looking at the outdoor corporate campus: siting, planning and the relationship between campus and community; promoting innovation, collaboration and connectivity; as for later looking at the student behaviours associated with or anticipated at a particular setting; the physical parameters of that setting; and whether positively or mutually influence innovation. Campus design and planning literature from the campus planning discipline, which is produced largely by architecture professionals (see key references box). Level-2 aimed at measuring the main physical variables of campus design indicators (spatial support) that bring the most satisfactory experience. This required deeper identification of the selected campus spaces at more detailed context including the multiscale, macro (1-10 km) and microscale (less than 1km) analysis and identifies validated "best practices" patterns and methods of observing students (using, applying, reflecting, sharing outdoor experience). For example, if the landscaping was ranked to be cost-effective, were students also satisfied with the attractiveness of landscaping? For example, comfortable, moveable seating were favoured so activities such as group work or socializing could be conducted easily within the space. The amount of concrete/grass with a lack of shelter or shade that does not offer a desirable place for outdoor activities.

It is important to understand that with an instrument of this type, focused primarily on obtaining a snapshot measure of use or experience, that the "why" questions will not be fully countered. The ranked COS could be highlighted in campus tours and marketing materials to reinforce what current students appreciate about the campus. Besides, in many cases, cities and towns are becoming increasingly expectant of, and reliant upon universities to represent and promote their own urban interests at regional, national and international levels *(Constantinides & Stagno, 2012).* Wiewel and Perry note that, 'The urban location and centrality of universities to nature and wellbeing of cities means that cities and countries can be expected to turn to their universities as part of strategies to respond to the new challenges and opportunities' *(Wiewel and Perry 2008:304).*

Literature research revealed that the prominent features of the SE were socialization and personal development. Students should participate in activities with colleagues' groups or in independent activities, in order to enhance this experience. When examined in terms of activity types, the most observed activities made on COS are classified into four groups: personal (reading, relaxing, using mobile), social (talking/chatting, eating/drinking and group meeting/studying), active (playing, running, cycling), and programmed activities (any scheduled activities such as events, tour visits, community, outdoor speech, etc). During the observation, activities for socialization were determined to be predominant. That supports the findings of the studies by *Reiss et al. (1994) and Harris (1995),* which argue that socialization is the most important experience needed for students. In all typologies of COS, it was observed that not only the seating but also other spatial components like steps, edges, walls and railings were used. As such, while designing and detailing these components must be taken into consideration. Spatial components and equipment must be designed in a way that can afford students activities like sitting, lying and talking in groups. These findings support *Woolley and Johns (2001)* finding that spatial futures like edges, steps, railings, seating affords being active and various activity patterns. Well-designed COS are created for students, their relationship with the environment, their chances to become socialized and their skill-development levels improve and increase. These are the main reasons why university estates, public and private sectors are encouraged to invest in such campus developments.

At the beginning of the research, it was accepted that the most important SE was for socialization, and they needed suitable spaces for their active, energetic lifestyles. With observations, it became possible to understand which activities students engage in on different COS with different preference levels, which spaces support the activities that meet the student's psychosocial development and which spaces have their shortcomings.

For the potential of an experience-based COS, it should support places not only in which students want to be, but also places in which students are motivated to be involved in a mixture of activities (whereas students need quiet, interaction, play, etc.). This will only happen in places and with elements of design elements that are accessible, comfortable and facilitate habitable environments for all students. Elements like the quality and preservation of the COS, the reliability and functionality of its design, the physical features, site furniture and the aesthetic qualities all contribute to sending a message to the users of the place. These latent physical variables are measuring the degrees or the amounts of benefits the campus or students can gain. For example, multiplying/expanding the number of intersections (variable B5) support opportunities for accidental or unexpected interaction among students and/or with academics. Utilizing mobile furnishings and technology allow a more shared approach to interact rather than fixed design elements like amphitheatre and seating which support non-natural separation among academics and students. The addition of simple and comfortable seating not just in central plazas but also in corridors where academics and students are likely to meet is another way to support and encourage higher levels of interaction. In general, COS with compact areas or zones, along with defined enclosures, better designed with landscaping and urban fixtures, and are suitably located with its function, have a higher rates of experience scores. High experience scores can be seen in several ways according to the typology of the COS use; livable/active, social/welcoming, quiet/relaxing, etc. For example, it has been proven a path or corridor can be more livable or active (higher experience scores – outcome variables) when the quantity and quality of circulation, shade and site furniture are enhanced (high design scores). As such, each typology of space design needs one or more typology of use. Typically, the more typologies of use encompassed in a COS, the higher the scores and the more experience-based. Yet, this is not always the case particularly at inspired or special spaces where it focusses on certain typology/ies that may conflicts with other typologies of use. For example, in a quiet/scientific courtyard or an outdoor living lab, higher levels of enclosure and vegetation are needed rather than the amounts of circulations and intersections points which encourages the social interaction. I.e. for this particular place to be successful it should mark high scores in levels of dense and decorative vegetation, while scoring low rates in circulation and intersection points.

Although important factors, the tested models did not show any significant association between the COS area, cost, and enclosure and the outcome variables (Fu, Ds & Iu). These factors have to be rated separately and subjectively more than the rest of factors. Although all variables are tested for the validity and reliability, the possibility of a substantial measurement errors as a contributing factor for the observed results is likely. However, the fact that these factors have truly no significant association with the outcome variables is also possible in some contexts.

One of the interesting findings of this research is that although greenness and circulation are negatively correlated to each other (inverse proportional), both are positively associated with the outcome variables and directly or indirectly controlling for the other campus qualities. Meaning that both well designed circulation and greenness not just encourage more frequency and duration of use, they also impact the amounts and design of other physical factors of the COS. The flooring/materials, forms (structured, organic, linear), patterns, and amounts of the circulation areas can either enhance or weaken the effects of the

other COS physical factors (intersections, seating, furniture, vegetation, etc.). Also the balance between the amounts of circulation and green areas can distinguish between formal/structured (small amounts of both for more private and seating area), informal/student life (mix of both), or natural (100% green) COS.

This finding can shed light on a classic debate among campus planners and economics about the disputation of the quality and quantity of use. The results show that campuses must have a fair amount of both the frequency of use and the duration of stay to get a high-ranking score. However, it also shows that the campus planning needs to support various typologies, some are public or private, some should support high only or low only frequencies and/or durations, hence, some will hold high scores while others must have low rates in either frequency or durations of use. Isolated or hardly accessible spaces with low frequencies are needed for students seeking quiet or private spaces to study. While go-to and public spaces need to support more, various activities and be linked to their adjacent urban areas and facilities. As such, central plazas have significantly higher mean scores than quadrangles and parks also have slightly higher rates than special spaces.

Although COS areas show no significance with the outcome variables, small compact COS have significantly higher mean scores than large (sometimes undefined) COS. For instance, the small compact COS: Central Quadrangle and faith centre at UOS (COS1-UOS2 950m² & COS6-UOS8 250m²), the Aztec Union (COS2-SDSU3 1000m²), Studio Art Hall (COS2-POM1 550m²) and the bridge (COS7-SDSU10 800m²) have relatively high rates of Intensity of use (Iu): 0.87, 1.89, 3.19, 0.32, 1.76, respectively. Similarly, large COS areas are the Peel Park (COS5-UOS7 77,800m²), Aldrich Park (COS5-UCI2 61,000m²) and the Stanford Oval (COS7-STAN2 800m²) have relatively low rates of Intensity of use (Iu): 0.06, 0.13 & 0.09, respectively. Such findings prove that the smaller the COS and the more cost-effective elements/designs is used the higher the rates of the outcome variables. This influence of COS area/size and cost on the design and use of campus is also validated through the walk-in interviews as students prefer smaller/compact spaces. Indeed, other physical design indicators has no or less influence on the SE than these two indicators (area and cost).

8.1.3 Value-Based COS

How to ensure that the COS design developments promote to the university vision from an investment perspective – achieving best value for money ?

Universities offer a lot more than just a textbook for students to learn and succeed in the workforce and the entire life. Indeed, the content is very much influenced by the context/environment as it can support excellence, enhance collaboration, and help broaden the range of students' skills and experiences. The environment is one factor to help attract and retain high-calibre staff and students. As such, answering the above question concludes the assessment framework for the 3-level design (student-centred, experience-driven and value-based) of the campus physical outdoor environment. This question can be asked in several ways. One more general question could be: how to achieve the best value for money? A more defined question is: which improvements of new campus development are of the most importance to provoking innovative SE? The idea is always seeking investments for the design of COS that can yield to and provide multi-attractive points of innovative experiences for students and the wider community - as present and potential customers *(Guilbault, 2018)*. Certainly, in order to prioritize specific criteria, it is important for the university to create a basic policy for the campus that responds to this and to promote the upgrading and diversification of the educational and social environment, as well as working to achieve the intensive, effective allocation of space. For example, to help promote learning, wellbeing and healthy lifestyles; green initiatives can be considered like introducing a network of 'rain gardens' to capture and redistribute surface

run-off. It became clear from the literature review that although campus planning and design have received extensive attention in the profession in recent years, this field is understudied in academia.

To answer this question, the main variables derived from the literature were integrated using statistical and correlation analysis, compared within different contexts, and finally rated. For example, education as a proxy for university profile (such as the dummy variable for the type, age, and rankings of the university); the campus size area and the total number of FT undergraduate students as a proxy for the scale of the university; the percentage of availability of physical design features as a proxy for the quality of campus urban design; costs and budgeting rates as a proxy for the university value and resources; and observation methods used for measuring the COS capability of use. From corelating these factors, the quality and quantity of physical design features have significant association with the student's satisfaction. For example, a dense vegetation (quantity) might not be desirable if not designed properly (quality) and is likely to have negative use values. Similarly, large continuous grassland patches or water patches enhance students' positive responses. These relationships explains the fact that, although it is hard to imagine that one student decides not to continue his/her education solely due to the campus qualities, it is much more likely that a green, urban, and livable campus provides such an enriching experience that students are convinced to pursue their education against all the potential pressing issues (financial, academic, etc.).

Integrating the 2 mentioned levels would be impractical if not compared to costs (quantitative measures). Therefore, level-3 reviews different methods of measuring costs of COS developments. Level-3 the business/investment perspective looking for the value identification and listing (economic, social and environmental) to identify a range of costs and benefits associated with the physical campus/development features and the improved experience outcomes. This 3-level toolkit will be adapted for different campus types as well as the range of stakeholders involved in the process and the value that theoretically accrues to each. An advance search query to contribute toward innovative investment features and values and providing practical guides. Might be useful also looking to, whenever possible, the committee structure overview that allows for an analysis for the involvement of the stakeholders and the channels of dialogue between them. Also looking at the Masterplan and Estates strategy: the facts and figures about the university estates and their vision to support current development. Also covering a review of the baseline information, site appraisal, review of current and proposed campus planning and developing a proper understanding of the design principles and parameters. This links to campus outdoor-specific innovative plan and outdoor space settings as most meaningful and inspiring to users, university, and the city. The overpaid elements that are less satisfactory and/or not or miss/used by students will be highlighted for possible refurbishment or replacement. It was proven that the assessment of the campus environment can be a powerful aid in strategic decision-making *(Enz & Thompson, 2013).* As such, this is critical assuming the university decision makers and campus planner need to prioritize the improvements required to invest in. New campus trends are more and more looking for satisfactory and productive student experiences and supporting the 'life giving' mixed-use elements in developments.

The study proves that the universities in the California have higher intensity rates not just because of the reputation of their institutions and weather conditions in general; but also due to the design of campus and its facilities, more particularly and most importantly, places that encourage and increase integration and innovation among students. The age of the campus development is also key factor. COS that was recently developed had greater experience ranks when compared before and after development or with other spaces within the same campus. As such, assessing and improving in these elements of landscaping and design is more feasible and provide more return on investment than the other factors. However, in California even older developments when campus planning was following certain established formal

typologies still have very high rates of use such as the main case study SDSU and most of the University of California campuses *(Pelfrey & Cheney, 2004).*

The quality of campus accommodation and other campus facilities (surrounding parks, sports, transportation, etc.) is not considered separately within the selected campuses, but in the reviewed master plans, certain qualities were highlighted that are in/directly impacts the campus central/academic core. For example, larger student housing within or close enough to the campus core encourage more and better use from students who find it more convenient to walk or bike to major destinations on campus more frequently. Campus design should also consider, enhance, and merge the experiences of both students who live in and out campus by offering welcoming, relaxing, interesting, and connecting spaces. Yet, investment wise, campus planners should plan for more students to live and use more spaces on campus, when the quantity and quality of experience is even more capable to observe, examine, and enrich.

8.2 Recommendations for the Design and Development (Placemaking) of COS

Although there are studies related to outdoor spaces, this study contributes to the concept of quality criteria relevant to the outdoor experience in the university campus. This section discusses the recommendations for developing more beneficial environment of the COS so that they can be used effectively to improve the SE. Following are some recommendations based on the problems identified.

8.2.1 Recommendations on the Assessment and Methods

This study enabled the development of a sequential assessment tool - based on literature in the UK and US regarding fields of campus planning (e.g. strategic planning documents and financial assessments) and urban design. Developing and validating the assessment is to strengthen the University campus environment in order to better serve students, faculty, staff, alumni and visitors. As implementation of these assessments moves forward to achieve an experience-based university campus, leaders are challenged to think not of the singular project, but of the future of the campus as a whole. The COS fabric is made up of numerous physical components, as listed in the previous table. The construction of these features and how they relate to one another all impact the SE and so the university's image. The successful implementation of the assessed campus will require a continued commitment by university administrators to adhere to the planning principles and recommendations of the masterplan. The result of this commitment will be a transformed campus environment that reflects the high-quality values of the institution.

In order to support both the multidisciplinary nature of a place-based campus outdoor space plan and the search for related innovative outdoor activities, comprehensive literature is deemed and analysed of existing support from the three main relevant research areas/resources and phases. This study values the COS as positive or successful/beneficial when various actions are supported and gradually enhanced (most times need management) such as: standing around, gathering, eating, chatting, relaxing, playing, studying, stopping, passing through, looking around. Techniques for spurring these actions and leading students into enriched experiences of the campus space include establishing objects that meet the student's needs, expectations, and satisfactions. As such, indicators to evaluate the COS experience are observed and selected according to the criteria measuring the plaza's features of being connected/accessible or isolated with levels of privacy (B4 & B6), compact or large and formless (B1 & B4), rich or basic with indication to its

value (B2 & B10), social and interactive or quiet (B6-10), comfortable and relaxing or active and entertaining (B5-B10). As such, the rates of the elements of physical design have lower values, the COS users may consequently take the lowest experience value.

For the campus experience scores to be verified and generalized, the methods are examined among 17 universities in California, US and 4 in England, UK. This first comprehensive examination of the built environment measures relevant to physical activity has demonstrated a great deal of progress over the past decade. Measures of diverse environmental and social variables are available that use multiple modes of assessment. Yet most can be considered first-generation measures, so further development is needed. Numerous challenges were identified and require deeper analysis in the incorporation of the three categories: education, design, and investment. Variables repeatedly unrelated to outcomes or with other variables can be deleted to produce more updated second-generation measures. Measurement gaps were identified for all three categories of measures.

The case studies strategies show that universities are very much part of their wider flows. Despite such potentials and some well-designed contemporary buildings around a network of new public spaces, challenges are the isolation from its historical location (Canal/Peel-Park), lacking homogenous theme, and the failure to integrate advanced, interactive features leaves the development feeling lifeless, unresponsive or ineffective to inspirational performance. Analysing these cases encourages well designed mix of levels of privacy and enclosure, green and vegetation areas, circulation and seating areas, shaded intersections and transitional spaces, social and arts-based activities. Such diversity and physical design features will facilitate the chance of spontaneous interactions between students and contribute to place identity, attachment and sense of community.

8.2.2 Recommendations for Campus Planners

One of the biggest challenges facing campus planners is the predictability of the master plans.

The concern here is how to design developments that offer people travel choices that are widely accessible and meet the needs of everyone. The Masterplan/Layout is a major influence on how students choose to experience the campus. In the past, the planning of campus development has been dictated primarily by the formal geometries regardless of amount and typology of experiences needed or anticipated. To innovate this tendency means designing with all possible forms of experiences in mind, to create attractive, lively, safe and interesting places. Furthermore, campuses may lose their distinct character and identity if designers only adopt generic recommendations set by the government, HE, and/or university guidance. As such, campus planners can develop the most successful campuses when keeping, developing and regularly assessing the elements of uniqueness and sense of place in their master plans, while simultaneously following the common models of practice. Strong personal and academic identity are both promoted by creating such meaningful campus environment. For example, COS that are located along the campuses main axis have distinctive meanings to students, specially to the new visitors and first-year students who mostly occupied them *(Hanan, 2013)*. Also observed and proved by studies *(Ghorbanzadeh, 2019; Gutierrez, 2013; Neary et al., 2010; Scholl & Gulwadi, 2015; Y. Zhang, 2006)*, the spatial configuration such as shaded sitting areas and iconic landmarks to the axis creates distinctiveness and sense of place to students.

Indeed, as typologies of COS varies according to their design ad use, different stakeholders are likely to have very different motivations, perceptions, and not fixed in time. An academic staff or students may have a very different perception of what makes a good campus environment, from the university states or a

developer charged with its upkeep and its added value/s. In this regard, a broad range of stakeholders are involved in making, using and managing campus developments. The significance and level of stakeholder involvement in the planning process are majorly determined by the planner and the nature of the planning model being taken. During physical and design-based view, the professional planner could best know what sorts of unfit or fit physical environments for the experience of students.

Campus planners should also aim to strengthen the campus life through the development of centres of activity, including mixed use, commercial retail, and cultural and recreational facilities that promote social interaction on campus and bring the off-campus community onto the campus. As well as preserving symbolic parts on the campus, such as historic buildings, rivers/lakes, and landmarks, it is important to develop COS that will create a sense of charm and warmth (place-making). Place making can be developed through the use of both distinctive individual characteristics and universal elements of the campus. For example, according to students needs and a distinctive university vision, meaningful COS vary from the forms/areas of courtyards, the historical vs modern style and forms of landscaping, the design and amounts of circulation and green areas, etc. Additionally, cultivating plants and trees (universal) that will show the campus to its best advantage in all four seasons. It is also worth mentioning that there are highly universal elements that give the COS a certain individuality and create the sense or support the use/s it needs. Accordingly, it is vital to seek these out - on different scales (COS, campus, adjacent and similar contexts) - and make a list of them so that they can be re-assessed before and after developments. The list can include towers/gates or landmark entrance space, avenues of trees, pocket parks, a spacious footpath, symbolic central plazas, distinctive landscapes and the proportions of the spaces formed by these as a whole, and many other elements found in each campus that characterize its individuality as points, lines, planes, as well as its use/experience. Re-assessment is to assure that such historical or distinctive elements hold or conform to the educational, social, and investment values used for the vision/development.

Create rhythms in the campus structure, with prototypes of courtyards or compact quieter areas giving way to occasional focal points. Key focal points in main plazas/squares and gateways should be marked with landmarks and/or other distinctive landscaping. The most important interchanges or nodes should serve as focal points and/or gateways to the campus (e.g. main junctions, roundabouts, footpaths, etc.) which should be marked by a change of or larger and diverse uses.

8.2.3 Recommendations to the University Estates and Management

A quality design and a space management and investment for quality experience-based campus development can, and should, go hand in hand. Managing the space use and its development is essential part of the Investment. For COS to be developable and well cared for students particularly, they must be economically viable, well managed and maintained. The responsibilities of management (and maintenance) does not only include to continuously valuing and supervising the COS, but also understanding the HE status and students backgrounds/culture, the market considerations of investors, ensuring long term commitments, defining the fitting mechanisms and seeing this as part of the design process. As such, public/government bodies such as CABE are established to encourage policymakers, and help local planners apply national design policy and advise developers and architects, persuading them to put users' needs first.

Depending on the scale and scope of the campus, the management and design team should comprise a matrix of COS typologies, uses and anticipated impacts/values. The management and supervision are a key part of ensuring the physical and social quality of the campus environment is maintained. Design proposals

should also be worked up with community feedback and ongoing student and staff involvement – who are being able to weigh up the pros and cons of different scenarios (Technical information must be made user-friendly and robust). These and more information should be used as the basis for the university states (quantity surveyor) to assess costs and to ascertain values and feed into the investment appraisal. They weigh the social and economic considerations (existing and new markets, local and regional impact, costs, values, gap funding and funding availability, etc.) against the design specifications and existing assessments. Designs are only successful and practical if considered in relation to the several investment parameters – mainly using Social Return on Investment, Cost Benefit Analysis and/or other suitable economic/financial assessments.

Furthermore, ensuring flexible design enough to respond to future changes and introducing new approaches in students and community use, lifestyle and demography. For example, as the typologies of design and use varies, the preferences of students who use the space also fluctuates. Some students prefer to play outdoors on campus during weekdays/ends but need privacy when eating or studying while others use campus spaces to socialize/interact and/or study with more colleagues. In this case, the campus needs to provide a variety of interlinked and visually connected spaces and with their surroundings. Open space networks are often more useful (higher frequency and longer duration) than isolated and unrelated landscape elements. They not only serve to organise larger campuses but also create linkages to existing building and spaces, and the wider city landscape (linear parks, playing fields, greenways, cycle routes, natural streams, etc.). Such connectivity and accessibility are fully realized managing and supervising the design vision such as how to get around by foot, bicycle, public transport and the car - and in that order (controlling circulation and movement patterns). In all preferences, this means observing and encouraging a distinctive response that arises from and complements to the design setting. This applies at every typology and every scale - the corridor, the court, the plaza, the quadrangles, parks, etc. In general, for places to be well-used and appreciated, they must be managed to ensure safe, comfortable, varied, attractive, and distinctive and offer variety, choice and fun. Managing such mixed-uses and forms of COS will create stimulating, enjoyable and convenient campus that meet a variety of demands from the widest possible range of students, amenities and community.

8.3 Research Limitations

In some cases, constraints of space, of time, or scope of the research have limited the researcher possibility to fully include and/or examine all the variables (impacts, benefits, costs, etc.). There particular relevant matters the research methodology shall not cover.

Data availability: Although data on institutional characteristics are diverse and relatively accessible, very little information on the built environment characteristics of university campuses is available. Information about the quality and quantity of landscaping is not fully covered in the university documents or the campus masterplans, and therefore, was always compared with the site observations. Also the data from and about the environment and its ecological systems were excluded for scope and time limitations. However, this study provides a theoretical framework for analysing normative dimensions of campus form, testing the validity of these dimensions requires more research on measuring outcome variables (e.g. livability, sustainability and learning outcomes). Therefore, the study relied on measuring the frequency and durations of experiencing the COS based on observations from the provisional visits selected during peak times.

Choosing the peak times could differ from season to season, location to another, so not necessary an exact reflection of the real-life experiences throughout the students' years of study. Despite this concern, the use of manual counts, recordings and sometimes interviews provide a practical possibility to compare multiple stimuli conditions with estimated statistical rates *(ElMorshedy et al., 2018; Ghorbanzadeh, 2019; Stage & Manning, 2015).* Also the use of observations and statistical tests in this study were believed to be the most suitable methods to achieve the research objectives *(Abd Razak et al., 2011; Cosco, Moore, & Islam, 2010; L. Johnson & Castleden, 2011; Lombard et al., 2010; van Nes & Yamu, 2017).*

Sample limitations: Due to limitations of time and resources, data collection particularly from the sub cases were collected in relatively small time-scale samples, producing a restricted snapshot of one selected typical university for the detailed insight into many educational-architectural-business variables and day-to-day practice in different university campuses in England and California. For example, the durations of visits at the California universities were limited (from a total of 3 hours to about 14 hours). Besides, to meet rigor and trustworthiness 'best-practice' SE associated with a number of space improvements, thick, rich/deep data was achieved at the main case studies. A relatively small numbers of interviews are intended which may not reflect the huge diversity students and stakeholders both in numbers and in their individual perceptions and visions. This might have resulted in selection bias, which accordingly may have lowered the representativeness of the results. The researcher is however ensuring to select a considerable student sample and then validated by the holders of knowledge and expertise in the selected university, community and city. Moreover, the physical indicators and measures of the campus design and use are fully validated by and compared with previous studies. As a consequence, the measurement used in this study provides an accurate representation of well-designed and/or well experienced COS. This is also due to the large and variable sample in this study, with observations discussed and validated by several interviews, and so the assessment errors and bias are believed to be minimized.

Design and Context limitations: focusing on experiences related to university and/or can be categorized as informal learning activities, as it is unfeasible to identify all design qualities influencing all SE (mentally, spatially, socially, etc.). Besides, although this study considered contextual factors, in order to cover all types of contexts several other factors should be reviewed considering the many specific, complex and multi-level community and university culture, missions, visions, budgets, etc.

8.4 Research Significance and Value of the Study

To counter demand characteristics, the study followed a systematic review of a between subjects of relevant literature. At all 19 universities similar collecting methods were used, and data was collected on paper versions of observation sheets and using the COS-DI (appendices 7, 8 & 11 shows some typical examples). Significantly, the study was commissioned because of a lack of outcome and performance-based campus evaluations which may limit or suppress investments in campus design. The research, therefore, demonstrates a design-based assessment strategy for the achievement of satisfactory campus outdoor environment and positive student outcomes. It developed a campus rating system using a quantitative mechanism for accurate unbiased scores and correlation analysis.

The campus rating is mainly based on criteria that can be measured to examine their correlations to and impacts on SE. The criteria present integrative evidence base across academia-university, campus urban and landscape design, and costs-value. Exploring those relationships between campus design and the desired (SE) outcomes, such as the students' health, integration, wellbeing, and other experiences gives campus planners fresh insight into the possible consequences of their design actions. As such the study

suggest that most campus planners have reached a shared, though unstated, normative theory in their practice. So one of the key study contributions is providing a theoretical framework to study campus form through the lens of practitioners.

In addition, quantifying dimensions of campus design can inform university estates and campus planners about the norms of COS typologies in different university types and contexts. For example, the percentage of circulation or green areas in a quadrangle of one campus can be compared to the mean value of these variables in the selected typical universities. As such, planners can use such methods and results to help in the overall arrangement of campus layout, the locations, scale/sizes, amounts and design of COS topologies, the choice, detailing and encouragement of memorable places. Outdoor space as form-giving elements is so far arranged through historic symbolism and aesthetic qualities, and with no reference to how these spaces might be perceived, valued and used by students. As such, an experience-based valuations of the landscape and environment-behavioural elements need to be involved from the start of campus design to support full and best use of the outdoor space for studying, relaxation, contemplation, socializing and entertainment of students. Only in this case, campus design can contribute not only to a unique connection to appealing circulation, service and open space schemes, but more important to the student overall experience (To create campuses fit for students). It can also reveal deficiencies in the design of a proposed place development, and these can then be addressed before time and resources are expended particularly on large scale investments.

8.5 Future Research Opportunities

A university campus is a part of, yet different from a city, a neighbourhood, or a block. With deeper and more collaborative research, universities will reconsider their position locally in society and city, and globally, taking on extensive reorganizations and expansions of their physical structures. Yet describing and analysing the investments on campus designs should be different from other roles of the built environment. This study, for the first time, is an attempt to examine the links (matches and mismatches) between the dominant indicators of campus urban design, students educational & social experience, and the university position/value. The proposed 3-phase theoretical framework can be developed and implemented into different university campuses. This is to be even more valuable and beneficial when considered with the impacts and influences of environmental and green practices. Understanding the links and filling the gaps will better inform academics, campus planners and university states about the potential challenges and opportunities. In addition, finding the suitable assessments and its results can be addressed not only on the scale of campus spaces, but also on the impact of university interventions on the surrounding neighbourhoods and other urban spaces of the city.

Ch9. 9. REFERENCES

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Ch10. APPENDICES

10.1 Appendix (01) : Effective reading lists

Table 27: List of typical textbooks in the fields of urban design & planning - recommended at US & UK universities (Collected by the researcher)

	Title	Author	Year
1	City Planning According to Artistic Principles	Sitte, Camillo	1889
2	Garden Cities of To-Morrow	Howard, Ebenezer	1902
3	The City of Tomorrow and its Planning	Le Corbusier	1924
4	The Image of the City	Lynch, K	1960
5	The Death and Life of Great American Cities	Jacobs, J	1961
6	Townscape	Cullen, G	1961
7	The Architecture of the City	Rossi, Aldo	1966
8	Design with Nature	Mc Harg, I	1969
9	Life Between Buildings: Using Public Space	Gehl, Jan	1971
10	A Pattern Language	Alexander, Christopher	1977
11	A New Theory of Urban Design	Alexander, Christopher	1987
12	Collage City	Rowe, C & Koetter, F	1978
13	Urban Space	Krier, R and others	1979
14	The History of the City	Benevolo, L	1980
15	The Social Life of Small Urban Spaces	Whyte, W	1980
16	A Theory of Good City Form	Lynch, K	1981
17	Responsive Environments : A Manual for Designers	Bentley I. et al	1985
18	Finding Lost Space–Theories of Urban Design	Trancik, R.	1986
19	Space is the Machine	Hillier B	1987
20	Emerging Concepts in Space Design	Broadbent G	1990
21	Making People-Friendly Towns: Improving the Public Environments & Cities	Tibbalds, Francis	1992
22	Urban Design: the American Experience	Lang, J	1994
23	The City Assembled	Kostof, Spiro	1996
24	Design of Urban Space	Madanipour, A	1996
25	Suburban	Duany, A, et.al	2000
26	Urban Design Compendium	Llewellyn Davies	2000
27	Urban Design Guidance–Urban Design Frameworks, Dev. Briefs & Master Plans	Cowan. R	2002
28	Public Places Urban Spaces: The Dimensions of Urban Design	Carmona, M and others	2003
29	Designing Cities: Critical Readings in Urban Design	Cuthbert, A (ed)	2003
30	Urban Design: Methods and Techniques	Moughtin, J. et al	2003
31	Urban Design–Street and Square	Moughtin, C. et al	2003
32	Recombinant Urbanism: Conceptual Modelling in Architecture, Urban Design&City Theory	Shane D.G	2005
33	The Urban Design Reader	Larice, M & Macdonald, E	2007
34	The Endless	Burdett R & Sudjic D	2007
35	Everyday Urbanism	Chase, John et al	2008
36	Cities for People	Gehl, J.	2010

Scanning a list of 508 relevant references has led to a classification as per the 3 main research themes.

Table 28: Key resources for data analysis on UK & US university students' *(Collected by the researcher)*

1	UK resources: The Higher Education Statistics Agency (HESA); The National Student Survey; 2014 Research Excellence Framework; The Higher Education Funding Council for England (HEFCE); Scottish Higher Education Funding Council (SHEFC); Higher Education Funding Council for Wales (HEFCW).
2	US resources: National Centre for Education Statistics (NCES); NSSE research background: Student involvement (Astin 1984); Deep vs surface approaches to learning (Marton and Saljo 1976); Quality of effort (Pace 1984); Seven principles of good practice (Chickering and Gamson 1987)
3	CBI/Pearson (2014). Gateway to growth: Education and Skills survey.
4	HEPI, HEA (2014). The HEPI–HEA Student Academic Experience Survey.
5	Further details and case studies on university- employer collaborations: UKCES/UUK (2014) Forging futures.
6	BIS (2014) Estimating the effect of UK direct public support for innovation.
7	Limitless learning – Creating adaptable environments to support a changing campus by O'Nell (2013)
8	House of Lords (2013) Persuasion and Power in the Modern World; BIS (2013). The Wider Benefits of International Higher Education in the UK.
9	National Research Council. (2012). Education for Life and Work: Developing Transferable Knowledge and Skills in the 21st Century. J.W. Pellegrino and M.L. Hilton (Eds.), Committee on Defining Deeper Learning and 21st Century Skills, Centre for Education, Board on Testing and Assessment, Division of Behavioural Sciences
10	World Intellectual Property Indicators 2013, www.wipo.int/export/sites/www/freepublications/en/intproperty/941/wipo_pub_941_2013.pdf
11	Approaches to Learning; a guide for teachers by Jordan, Carlile & Stack (2008)
12	Exploring conceptions of learning through the creation of flexible learning spaces by Weaver (2006)
13	Adelman, C. (2006, April). The Propaganda of Numbers in Higher Education. Paper presented at the annual meeting of the American Educational Research Association, San Francisco, CA.
14	Pedagogy & Space - Aligning Learning & Learning Environments by Fisher (2005)
15	Amelink, C. T. (2005). Predicting Academic Success Among First-Year, First Generation Students. Unpublished Ph.D. diss. Virginia Polytechnic Institute and State University.
16	Zhang, Y. Knowledge Form and University Architecture: An Investigation of the Evolution of Chinese University Architectural Forms from the Perspective of Education. Ph.D. Thesis, Huazhong University of Science and Technology, Wuhan, China, 1 April 2005. (NOT AVAILABLE)
17	Community College Survey of Student Engagement (CCSSE). (2004). Engagement by Design: 2004 Findings. Austin, TX: Author.
18	Integrated models of educational effectiveness by Scheerens (2003)
19	Hu, S., and Kuh, G. D. (2002). Being (Dis)Engaged in Educationally Purposeful Activities: The Influences of Student and Institutional Characteristics. Research in Higher Education, 43(5): 555- 575.
20	Bean, J. P., and Eaton, S. (2000). A Psychological Model of College Student Retention. In Reworking the Departure Puzzle: New Theory and Research on College Student Retention, edited by J. M. Braxton, 73-89. Nashville, TN: University of Vanderbilt Press.
21	Berger, J. B., and Milem, J. F. (2000). Organizational Behaviour in Higher Education and Student Outcomes. In Higher Education: Handbook of Theory and Research, Vol. 15, edited by J. C. Smart, 268-338. New York: Agathon.
22	PISA 2000 & OECD 2001
23	Saupe, J. L., Smith, T. Y., and Xin, W. (1999, May). Institutional and Student Characteristics in Student Success: First-Term GPA, One-Year Retention and Six-Year Graduation. Paper presented at the annual meeting for the Association for Institutional Research, Seattle, WA.
24	Hurtado, S., Milem, J. F., Clayton-Pedersen, A. R., and Allen, W. R. (1998). Enhancing Campus Climates for Racial/Ethnic Diversity: Educational Policy and Practice. The Review of Higher Education, 21(3): 279-302.
25	Schroeder, C. C., and Hurst, J. C. (1996). Designing Learning Environments that Integrate Curricular and Co-Curricular Experiences. Journal of College Student Development, 37(2): 174-181.
26	Anaya, G. (1996). College Experiences and Student Learning: The Influence of Active Learning, College Environments, and Co-Curricular Activities. Journal of College Student Development, 37(6): 611- 622.
27	Interactive museum exhibits as tools for learning by Feher (1992)
28	American Association for Higher Education. (1992). Assessment Principles of Good Practices. Washington, DC: Author.
	Christie, N., and Dinham, S. (1991). Institutional and External Influences on Social Integration in the Freshman Year. Journal of Higher Education, 62(4): 412-436.
29	A model of creativity in organizations by Amabile (1988)
30	Seven Good Educational Principles in Undergraduate Education by Chickering and Gamson (1987)
31	Astin, A. W. (1985). Involvement: The Cornerstone of Excellence. Change, 17(4): 35-39.
32	Student involvement - A developmental theory for higher education by Astin (1984)
33	Aitken, N. D. (1982). College Student Performance, Satisfaction, and Retention: Specification and Estimation of Structural Equation Model. Journal of Higher Education, 53: 32-50.

Table 29: List of key references in urban design and Master Planning *(Collected by the researcher)*

1. Whyte W, The social life of small urban spaces, The Conservation Foundation, Washington DC 1980
2. Campus: An American Planning Tradition by Paul Venable Turner (1984)
3. Cooper-Marcus & Wischemann. Campus outdoor spaces (1990)
4. Dober, R.P. Campus Design; John Wiley & Sons, Inc.: New York, NY, US (1992)
5. Steve Harrison and Paul Douris, "Re-Placing Space: The Roles of Place and Space in Collaborative Systems," in conference proceedings for the ACM Conference on Computer Supported Cooperative Work (CSCW–96), Cambridge, Massachusetts, 1996, pp. 67–76.
6. ODPM. Urban Task Force, Towards an urban renaissance (1999)
7. Norberg-Schulz (1984, 2000)
8. DETR & CABE By Design. Urban design in the planning system: towards better practice. (2000)
9. Llewelyn Davies, EP, Housing Corporation, Urban design compendium (2000)
10. Strange and Banning's Educating by Design - for the importance of the physical campus in person-environment interaction. (2000)
11. Wates, Nick, the community planning handbook: how people can shape their cities, towns and villages in any part of the world, Earthscan, London (2000)
12. Thomas Telford. By design, better places to live (2001)
13. DETR, Planning: delivering a fundamental change. Planning Green Paper (2001)
14. Billingham J and Cole R, The good place guide – urban design in Britain and Ireland, Batsford, London (2002)
15. CABE. Design review - Design Quality Indicators (DQIs), London (2002)
16. Thomas Telford. Urban Design Group, Urban design guidance (2002)
17. ODPM, Sustainable communities: delivering through planning (2002)
18. ODPM, Sustainable communities: building for the future (2003)
19. CABE et al, Building sustainable communities: actions for housing market renewal (2003)
20. CABE, Building sustainable communities: the use of urban design codes (2003)
21. CABE, creating excellent buildings: a guide for clients - contains references and checklists for evaluating detailed design proposals for individual buildings and sites. London (2003)
22. Office of the Deputy Prime Minister, creating sustainable communities: making it happen. Thames Gateway and the growth areas, ODPM, London (2003)
23. ODPM, Planning and compulsory purchase bill (2004)
24. Jiang, H. Research on the Formation and Design Theory of University Forms. Ph.D. Thesis, Tongji University, Shanghai, China, 1 September (2005) (NOT AVAILABLE)
25. Xu, Z. Research on University Structure Evolution and Planning Methods in Urban Community Environment: Taking European, American and Chinese Universities as Examples. Ph.D. Thesis, Tongji University, Shanghai, China, 1 January (2006) (NOT AVAILABLE)
26. Space as a change agent (Learning spaces) by Oblinger (2006)
27. Gumprecht, B. (2007). The campus as a public space in the American college town. Journal of Historical Geography. 33(1). 72-103.
28. Chen, X.T. The Evolution of Chinese University Campus Forms. Ph.D. Thesis, Tongji University, Shanghai, China, 1 January (2008) (NOT AVAILABLE)
29. McFarland, A.L., Waliczek, T.M., Zajicek, J.M. (2008). The Relationship Between Students Use of Campus Green Spaces and Perceptions of Quality of Life. Horticulture Technology, 18, 196-319
30. Affordance and the perception of landscape by HEFT (2010)
31. Open space sequence by Harplin (1969-2010)
32. Leal Filho, W. About the role of university and their contribution to sustainable development. High. Educ. Policy, 24, 427–438. (2011) (NOT AVAILABLE)
33. RUDI (Resource for Urban Design Information): www.rudi.net
34. Urban Regeneration Companies website: www.urcs-online.co.uk
35. Design Council 2011, Design for Innovation, http://www.designcouncil.org.uk/sites/default/files/asset/document/DesignForInnovation_Dec2011.pdf
36. Speake, J., Edmondson, S., Nawaz, H. (2013). Everyday Encounters with Nature: Students' Perceptions and Use of University Campus Green Spaces. Journal of Studies and Research in Human Geography 7.1. 21-31.
37. Making space for an improved student experience (2014). Provost CAR/FAR funding prioritizing renovation projects submitted by faculties.
38. Torina Wilson, 2018. Design Guidelines for Activating Outdoor Spaces of University Campuses
39. Matloob, F. A., & Alsoofe, H. H. (2018). Performance of Outdoor Physical Character of Kirkuk University Campus. Sustainable Resources Management Journal. 3 (1) 01-29 http://doi.org/10.5281/zenodo.1154261
40. Pezeshkpoor, Z. (2020). The role of movability on campus outdoor furniture.

Table 30: Significant value/investment-oriented studies & decision related data *(Collected by the researcher)*

1	*Ribalaygua Batalla, C.; Garcia Sanchez, F. Creating a Sustainable Learning District by Integrating Different Stakeholders' Needs. Methodology and Results from the University of Cantabria Campus Master Plan. In Engaging Stakeholders in Education for Sustainable Development at University Level; World Sustainable Series; Filho, L., Brandli, L., Eds.; Springer: Berlin, Germany, 2016; pp. 3–20. (Not available)*
2	*Universities UK, 2015. Efficiency, effectiveness and value for money.*
3	*HEFCE, 2015. Research to assess the nature and annual value of student start-ups.*
4	*Practical implementation of an educational makerspace by Kurti & Fleming, 2015.*
5	*HEFCE Higher Education-Business and Community Interaction Survey (HE-BCI) 2013–14.*
6	*BIS, 2013. The relationship between graduates and economic growth across countries, a report by NIESR.*
7	*World Intellectual Property Indicators, 2013. www.wipo.int/export/sites/www/freepublications/en/intproperty/941/wipo_pub_941_2013.pdf*
8	*Managing the University Campus: Information to support real estate decisions by AC Den Heijer, 2011.*
9	*Davis, 2010. Participatory design for sustainable campus living. In Proceedings of the CHI'10, Atlanta, GA, US.*
10	*CABE, 2005. Physical Capital How great places boost public value, London: CABE*
11	*Johnstone, 2005. Fear and Loathing of Tuition Fees: An American Perspective on Higher Education Finance in the UK. Perspectives: Policy and Practice in Higher Education, 9(1): 12-16. Pace, C. R. (1990). The Undergraduates: A Report of Their Activities and College Experiences in the 1980s. Los Angeles: Centre for the Study of Evaluation, UCLA Graduate School of Education.*
12	*Macmillan, 2004. Designing Better Buildings, London: Spon Press*
13	*Bishop, J. H. (2004). Money and Motivation. Education Next, 4(1): 62-67.*
14	*Heller, D. E. (2004). The Changing Nature of Financial Aid. Academe, 90(4): 36-38.*
15	*Twigg, C. A. (2003). Improving Quality and Reducing Cost: Designs for Effective Learning. Change, 35(4): 22-29*
16	*Pearce D (2003) The social and economic value of the built environment, report to nCRISP, London: CRISP.*
17	*Richard Saxon (2003) CBE JCT Povey Lecture, RIBA, 29 October 2003*
18	*Thomson D, Austin S, Devine-Wright H and Mills G (2003) Managing value and quality in design, Building Research and Information, vol 31, no 5, 2003, pp 334-345.*
19	*Spencer N and Winch G (2002) How buildings add value for clients, London: Construction Industry Council Strategic Forum for Construction (2002) Accelerating Change, London: Strategic Forum.*
20	*CABE, 2001. The value of good design: how buildings and spaces create economic and social value*
21	*Carmona etal, 2001. A bibliography of design value, London: Bartlett School of Planning, UCL (www.cabe.org.uk).*
22	*Davis Langdon and Everest (2001) Buildings that work for your business: building premises to enhance performance, London: Institute of Directors/Director Publications Ltd*
23	*Loe E (2000) The value of architecture – context and current thinking, London: RIBA Future Studies*
24	*Treasury Task Force, 2000. How to achieve design quality in PFI projects. Well-being through construction in Finland, Helsinki: VTT (www.vtt.fi/rte/dms/tuotteet/wellbeing2003.pdf).*
25	*Worpole, 1999. The Value of Architecture – design economy & architectural imagination, London: RIBA Future Studies.*
26	*Heerwagen, 1998. Design, Productivity and Well-being: what are the links? Paper presented at the American Institute of Architects Conference on Highly Effective Facilities, Cincinnati, Ohio.*
27	*Male et al, 1998. The Value Management Benchmark: a good practice framework for clients and practitioners, London: Thomas Telford National Audit Office (NAO) (March 2005) Improving Public Services through Better Construction London ISBN 010293245X and (ten case studies) 01029325449 www.nao.org.uk/pn/04-05/0405364.htm*
28	*Practice and principles by Drucker, 1985.*

10.2 Appendix (02) : List of significant UK University Campuses

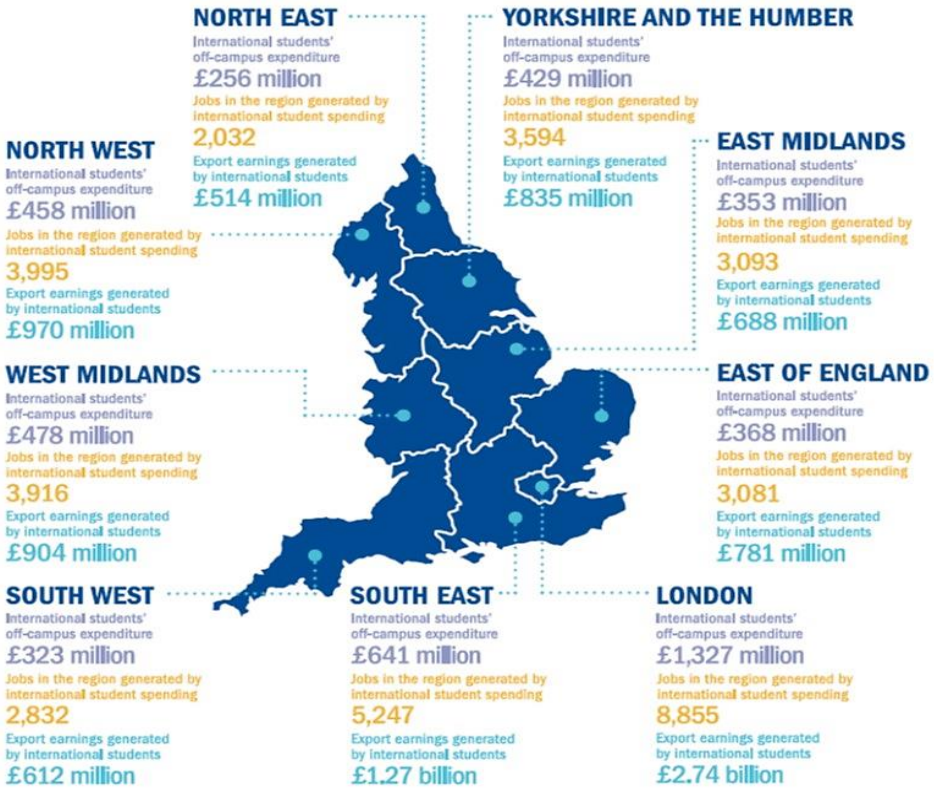


Figure 54: Regions of England with impact of universities

Figure 55: List of England universities on map

Aude has listed six main trends that have helped to shape university campuses in recent years as follows:

Starchitecture. According to Paul Roberts *(Coulson et al., 2017),* Starchitecture is often driven by an "aspiration to do something beyond the ordinary – to grab attention, or to demonstrate a modernity about what that institution wishes to do", he observes.

Adaptive reuse. A model that, according to its advocates, can be more environmentally friendly and cost-effective and is far more sensitive to the local landscape. Adaptive reuse is not always an easy option, or an inexpensive one: older buildings can pose several problems for would-be developers, from inefficiencies when it comes to heating and electricity use, to inherent design flaws that render structures unsuitable for university use and expensive to refurbish. Sometimes, however, universities have no choice but to repurpose existing buildings – as in cases where they are protected with listed status.

Sustainability. The Climate Change Act 2008 stipulates that all organizations in the UK need to make cuts in the ecological figures such us the carbon they emit: 34% by 2020, and 80% by 2050.

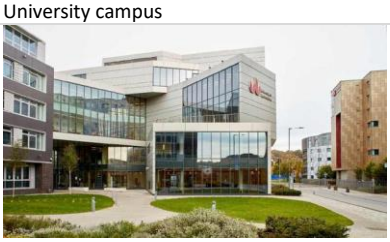
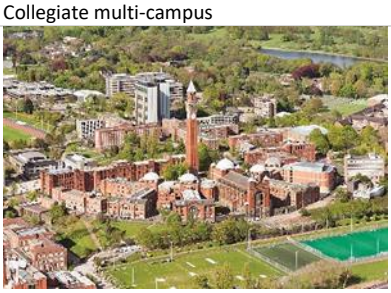
Shared use. One way to address the underuse of university buildings is by sharing them with other organizations. This can help to save money and reduce the university's carbon footprint. The Sugden Sports Centre, for example, was jointly funded by a trust set up in 1997 by Manchester Metropolitan University and what was then the University of Manchester Institute for Science and Technology.

Informal, flexible learning spaces. The impact of new technology on pedagogy is also influencing university building design. The University of Northampton is in the process of developing a £330 million town centre campus. It is scheduled to open its doors between 2018 and 2020.

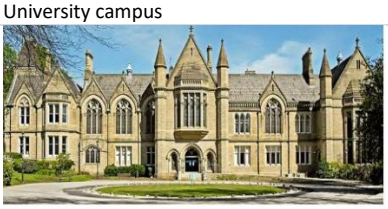
The allure of the city. According to Roberts, a city centre location looks increasingly desirable to universities intent on satisfying the demands of students.

Table 31: UK universities: Recognised bodies above 2000 students (Complete University Guide)

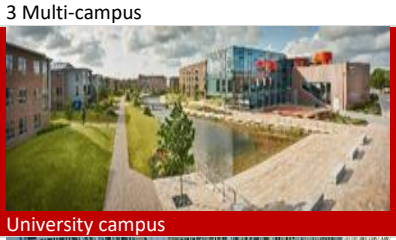
N	University	Campus types	Univ Status Date	Average Exp/stu	Area / population
1	Abertay University	Collegiate campus (Individual buildings)	1994		4,005
2	University of Alabama, Birmingham				
3	Anglia Ruskin University		1992		20,935

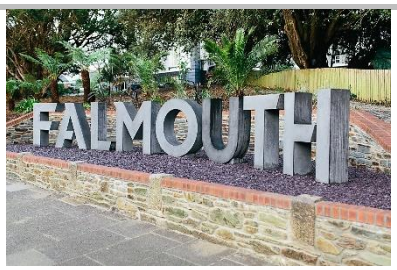
		Collegiate campus			
4	Aston University	University campus Classic	1966		12,495
6	University of Bath	City campus - Classic	1966		16,155
7	Bath Spa University	University campus	2005		7,630
8	University of Bedfordshire	 Collegiate multi-campus	2005		14,400
9	University of Birmingham	 Civic University Classic	1900		33,830
10	Birmingham City University	University campus	1992		24,065

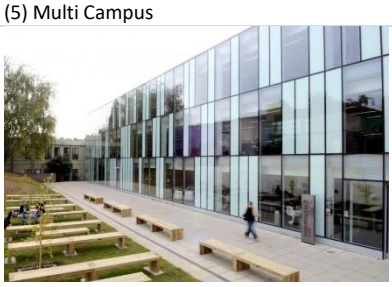
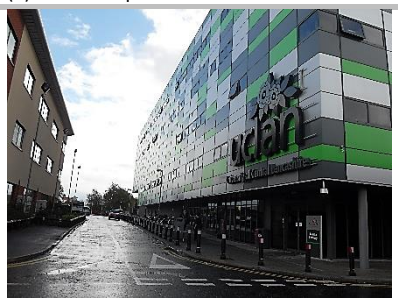
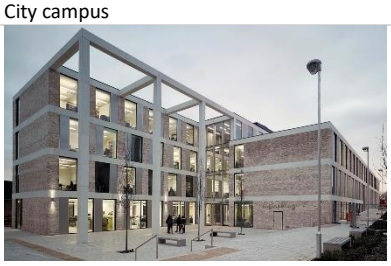
11	Bishop Grossteste University, Lincoln	Collegiate campus	2012		2,235
12	University of Bolton	University campus	2004		6,320
13	Bournemouth University		1992		19,045
14	BPP University	Private for-profit university (1st)	2013		9000
15	University of Bradford	City campus	1966		11,215
16	University of Brighton	5 Multi-campus	1992		21,135
17	University of Bristol	Civic (city) University	1909		21,905

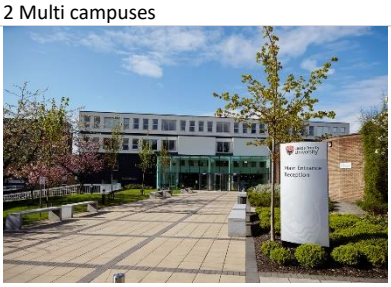
18	Brunel University London	University campus	1966		14,165
19	University of Buckingham	 Collegiate campus	1983	(1st SS=4.45)	2,400
20	Buckinghamshire New University	4 Multi-campus	2007		8,580
21	University of Cambridge	City campus - quadrangles	1209-1226	(3rd League 2018)	19,660
22	Canterbury Christ Church University	Collegiate campus	2005		16,055
23	University of Chester	City campus	2005		14,915
24	University of Chichester	Collegiate campus (3 main areas)	2005		5,520

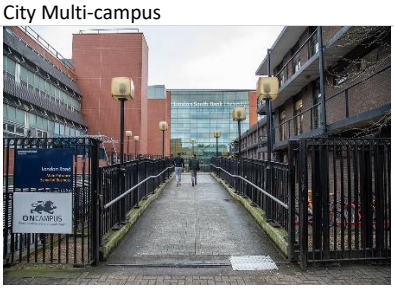
25	City University London	Collegiate campus	1966		18,995
26	Coventry University	City campus	1992	(5th SS=4.28)	29,430
27	Cranfield University	Collegiate campus	1993		3,980
28	University for the Creative Arts	City campus	2005		4,805
29	University of Cumbria	Collegiate campus	2007		8,790
30	De Montfort University	Collegiate campus	1992		20,905
31	University of Derby	City campus	1992		16,300

32	Durham University		1832	£1,026 (8th League 2018)	17,810
33	University of East Anglia	 Univ campus – Classic - Brutalist concrete	1963	£1,160	16,145
34	University of East London	 3 Multi-campus	1992		13,630
35	Edge Hill University	 University campus	2006	Best student experience	15,540
36	University of Essex	 Collegiate campus - Classic	1965	£1,230	13,795
37	University of Exeter	 Civic University Classic	1955		21,670

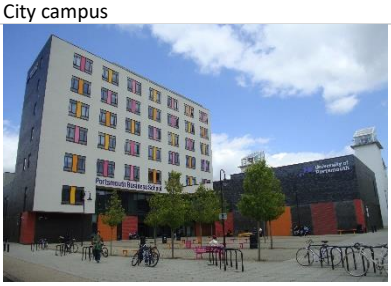
38	Falmouth University	 2 Multi-campus	2012		4,655
39	University of Gloucestershire	 3 Multi-campus	2001		7,835
40	University of Greenwich		1992		20,645
41	Harper Adams University	 Rural campus	2012	£1,575 (from 39/2014 to 1/2016)	5,575
42	University of Hertfordshire	 Collegiate campus	1992		24,655
43	University of the Highlands & Islands	 Collegiate campus	2011		8,415
44	University of Huddersfield	 Collegiate/Multi campus	1992		19,270
45	University of Hull		1954		16,305

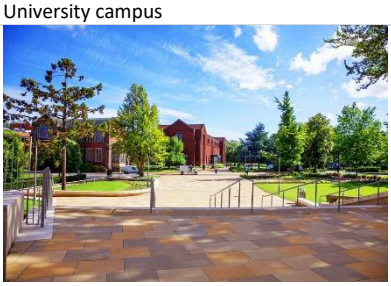
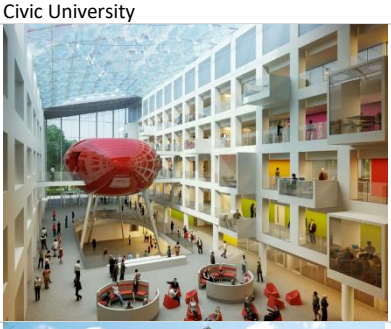
		Civic University - Classic			
46	Imperial College London (univ of London)		1907	(8th League 2018)	17,035
47	Keele University	Univ campus- Classic	1962	(4th SS=4.30)	10,120
48	University of Kent	Univ campus- Classic – city edge	1965		19,670
49	King's College London	(5) Multi Campus	1829		28,900
50	Kingston University	 (4) Multi Campus	1992		20,885
51	University of (Central) Lancashire	 City campus	1992		24,460
52	Lancaster University	 City campus- Classic - edge	1964	(9th League 2018)	13,115
53	University of Leeds	Civic University	1904		31,790

54	Leeds Beckett-Metropolitan University	 2 Multi campuses	1992		25,920
55	Leeds Trinity University	 Collegiate campus	2012		3,715
56	University of Leicester	 Collegiate campus	1957		17,825
57	University of Lincoln	 City campus	1992		13,475
58	University of Liverpool	 Civic City campus	1903		24,775
59	Liverpool Hope University	 Collegiate campus	2005	£1,164 (2nd SS=4.39)	4,940
60	Liverpool John Moores University	 3 multi campus	1992		21,875

61	University of London	City Multi-campus- Classic	1836		161,270
62	London Metropolitan University	City Multi-campus	2002		12,865
63	London South Bank University	 Collegiate campus	1992		17,605
64	Loughborough University	City campus	1966	£1,056 (10th League 2018)	16,950
65	University College London	City campus	1900	(8th League 2018)	37,135
66	University of Manchester	City campus	2004		39,700
67	Manchester Metropolitan University	Multi-campus (regenerated)	1992		32,485

68	Middlesex University	Multi-campus	1992		19,110
69	Newcastle University	City campus - civic	1963		23,795
70	Newman University, Birmingham	Collegiate campus (underdevelopment)	2012		2,810
71	University of Northampton	2 multi campus (underdevelopment)	2005	£1,028	12,985
72	Northumbria University, Newcastle	2 large campuses	1992		27,165
73	University of Nottingham	Civic University – Classic & Modern	1948		32,125
74	Nottingham Trent University	University campus	1992		27,920
75	Open University	Collegiate – Scattered campuses & buildings	1969		126,210

76	University of Oxford	City campus - quadrangles	Before 1167	(2nd League 2018)	24,860
77	Oxford Brookes University	4 multi campuses	1992		17,840
78	Plymouth University	City campus	1992	£1,167	23,155
79	University of Portsmouth	 City campus	1992		22,060
80	University of Reading	Civic University Classic	1926		14,980
81	Regent's University London		2013		3,591 FT
82	University of Roehampton	Univ campus- Classic	2004		8,750
83	University of Salford	University campus	1967	Case study L2	20,520
84	University of Sheffield	Civic University	1905	UK best student Union	27,925

85	Sheffield Hallam University	University campus	1992		31,485
86	University of Southampton	 Civic University	1952		25,155
87	Solent University		2005		11,285
88	University of St Mark & St John		2012		2,365
89	St Mary's University, Twickenham		2014		5,535
90	Staffordshire University		1992		15,860
91	University of Suffolk		2016		5,030

92	University of Sunderland		1992		12,995
93	University of Surrey		1966		15,050
94	University of Sussex	University campus- Classic	1961		15,155
95	Teesside University		1992		18,575
96	University of the Arts, London		2004		18,205
97	University of Ulster		1984		25,155
98	University of Warwick	Univ campus- Classic	1965	(8th League 2018)	24,655
99	University of West England, Bristol	Multi-campus	1992	£1,269	27,715
100	University of West London		1992		10,410

101	University of Westminster		1992		20,195
102	University of Winchester		2005		7,540
103	University of Wolverhampton	City campus	1992		19,790
104	University of Worcester		2005		10,455
105	University of York	city campus- Classic & modern	1963		17,155
106	York St John University	University campus - Outskirts	2006		5,980

10.3 Appendix (03) : List of significant US University Campuses

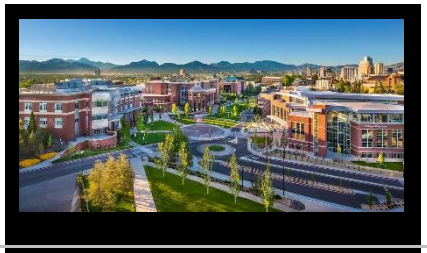
Table 32: General comparative info on significant university campuses in 50 States of the US

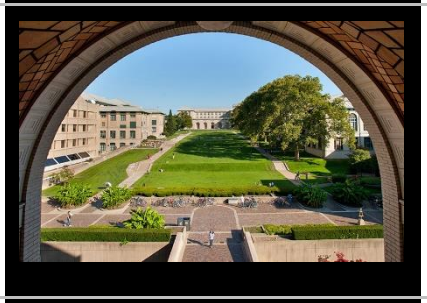
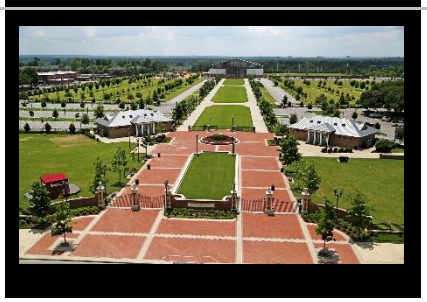
State	Pop & Area sq. mi	No Ins	Leading Universities	
1 Alabama	4,779,736 52,419.02	61		University of Alabama, Birmingham
2 Alaska	710,231 663,267.26	7		University of Alaska, Fairbanks (UAF)
3 Arizona	6,392,017 113,998.30	155		Frank Lloyd Wright School of Architecture
4 Arkansas	2,915,918 53,178.62	87		Arkansas State University
5 California	39,253,956 163,695.57	276		Stanford University
6 Colorado	5,029,196 104,093.57	132		Colorado College:

7 Connecticut	3,574,097 5,543.33	114		Yale University
8 Delaware	897,934 2,489.27	23		University of Delaware
9 Florida	18,801,310 65,754.59	439	University of Florida	Flagler College
10 Georgia	9,687,653 59,424.77	210		Berry College
11 Hawaii	1,360,301 10,930.98	2		University of Hawai'i, Mānoa
12 Idaho	1,567,582 83,570.08	43		Brigham Young University
13 Illinois	12,830,632 57,914.38	391		University of Chicago

14	6,483,802	175		University of Notre Dame
Indiana	36,417.73			
15	3,046,355	107		Iowa State University
Iowa	56,271.55			
16	2,853,118	99		University of Kansas
Kansas	82,276.84			
17	4,339,367	165		University of the Cumberlands
Kentucky	40,409.02			
19	4,533,372	173		Louisiana State University
Louisiana	51,839.70			
19	1,328,361	60		Bowdoin College
Maine	35,384.65			
20	5,773,552	148		University of Maryland
Maryland	12,406.68			

21	Massachusetts	6,547,629 10,554.57	114	Harvard University
22	Michigan	9,883,640 96,716.11	90	Central Michigan University
23	Minnesota	5,303,925 86,938.87	169	University of Minnesota
24	Mississippi	2,967,297 48,430.19	69	University of Southern Mississippi
25	Missouri	5,988,927 69,704.31	242	University of Missouri
26	Montana	989,415 147,042.40	54	University of Montana
27	Nebraska	1,826,341 77,353.73	68	University of Nebraska

28	Nevada	2,700,551 110,560.71	43	 University of Nevada
29	New Hampshire	1,316,470 9,349.94	43	Southern New Hampshire University
30	New Jersey	8,791,894 8,721.30	207	Princeton University
31	New Mexico	2,059,179 121,589.48	61	University of New Mexico
32	New York	19,378,102 54,556.00	632	Cornell University, New York
33	North Carolina	9,535,483 53,818.51	188	Duke University

34	672,591			
North Dakota	70,699.79	30		University of North Dakota
35				
Ohio	11,536,504 44,824.90	190		University of Cincinnati
36	3,751,351			
Oklahoma	69,898.19	158		Oklahoma State University
37	3,831,074			
Oregon	98,380.64	125		University of Portland
38	12,702,379			
Pennsylvania	46,055.24	388		Carnegie Mellon University
39	1,052,567			
Rhode Island	1,545.05	37		University of Rhode Island
40	4,625,364			
South Carolina	32,020.20	97		University of South Carolina

41	814,180			
South Dakota	77,116.49	33		University of South Dakota
42	6,346,105			
Tennessee	42,143.27	191		Rhodes College
43	25,145,561			
Texas	268,580.82	506		Rice University
44	2,763,885			
Utah	84,898.83	60		University of Utah
45	625,741			
Vermont	9,614.26	32		The University of Vermont
46	8,001,024			
Virginia	42,774.20	222		University of Virginia
47	6,724,540			
Washington	71,299.64	164		Washington University in St Louis

48				
West Virginia	1,852,994 24,229.76	99		West Virginia University
49				
Wisconsin	5,686,986 65,497.82	85		University of Wisconsin
50				
Wyoming	563,626 97,813.56	17		University of Wyoming

10.4 Appendix (04) : List of Profile Pages of Cal University Campuses

Table 33: UC Berkeley university profile

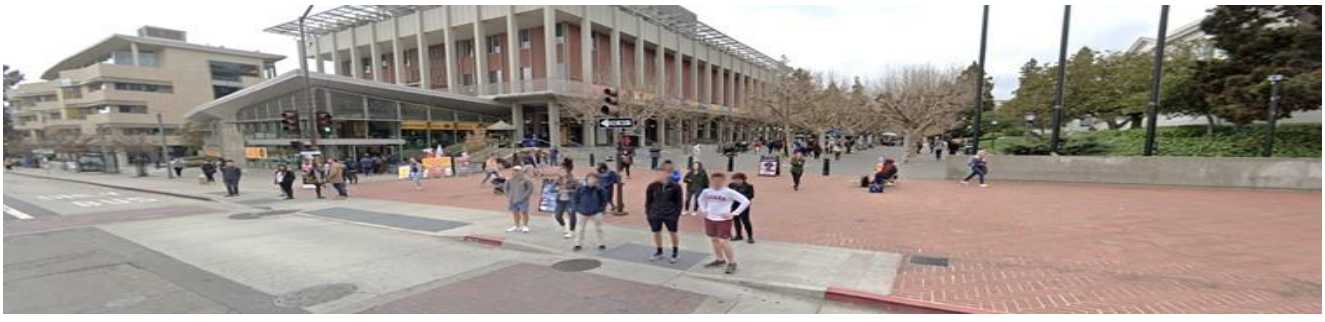
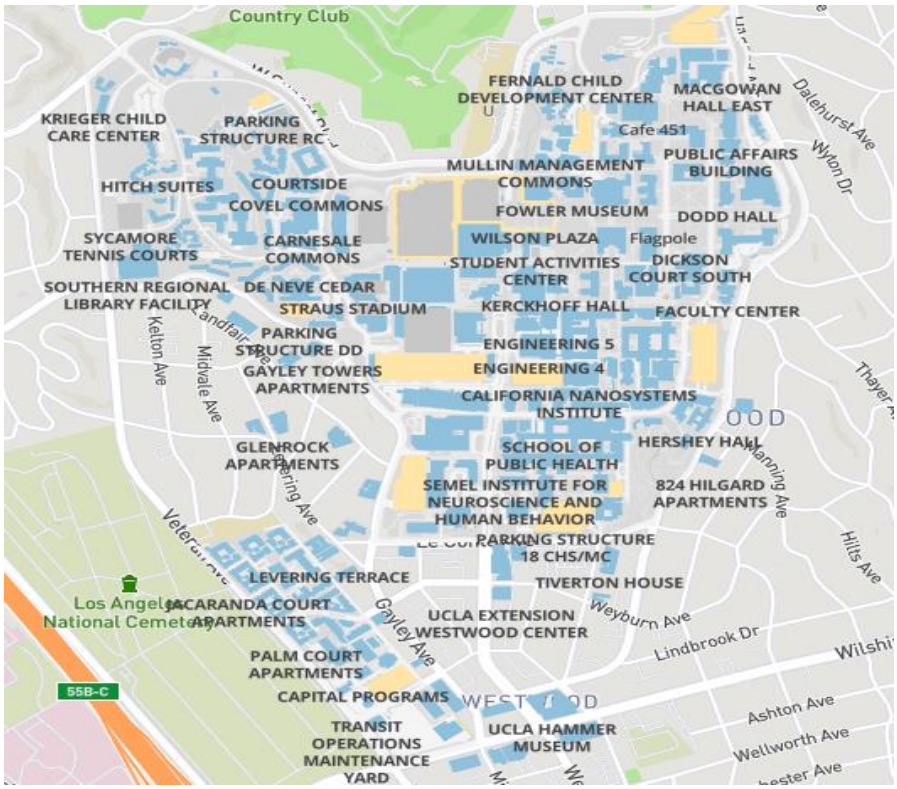
US SC #01 : University of California Berkeley (UCB)		
Variables		**Data records**
Figure 56: UC Berkeley campus plan (https://www.berkeley.edu/map)		
General profile	University	Public – Research (R1)
	Age	Founded 1868 (oldest university in the 10 UC system) – Mixture (mix of historical and modern buildings and spaces).
	Camp type	City / Suburban – Scale : large. (The campus listed in the National Register of Historic Places in 1981)
	Location	Berkeley, Oakland, California in the San Francisco Bay Area
	Boundaries	North Gate Hall & cedar-shingled building & CITRIS Headquarters from North. Lawrence Berkeley National Laboratory, California Memorial Stadium, Foothill Student Housin & Hearst Greek Theatre from East. Student union & Athletics from Sourth. West gate, Edwards Stadium, University Hall and administration buildings from West.
	Landmarks	North Gate Hill, Drawing Building, First Unitarian Church, California Hall, Sather Tower (Campanile) & Esplanade, Doe Memorial Library, Hearst Greek Theatre, University House, Gilman Hall (invention of plutonium)
	Total area	University land 4.99 Km² (1,232 acre). Campus size : 850,000 m²
	Students	FT students 30,799 – Selectivity 16.8% - over 350 programs
	2019 Ranking	#1 US public institution (US News & World Report) / #4 Best Global University (US News & World Report) #5 Academic ranking of world universites (Shanghai) #15 World University Rankings & #6 World Reputation Rankings (Times Higher Education)
	Fee £/year	Instate & total: £10,520 & 26,140 – Outstate & total: £32,630 & 47,650 – Endowment £3.41billion – Budget £2.22 billion
COS		
Entries and Edges COS7 - UCB1 : Sather Gate-Rd & Upper Sproul Plaza		

Table 34: UCLA university profile

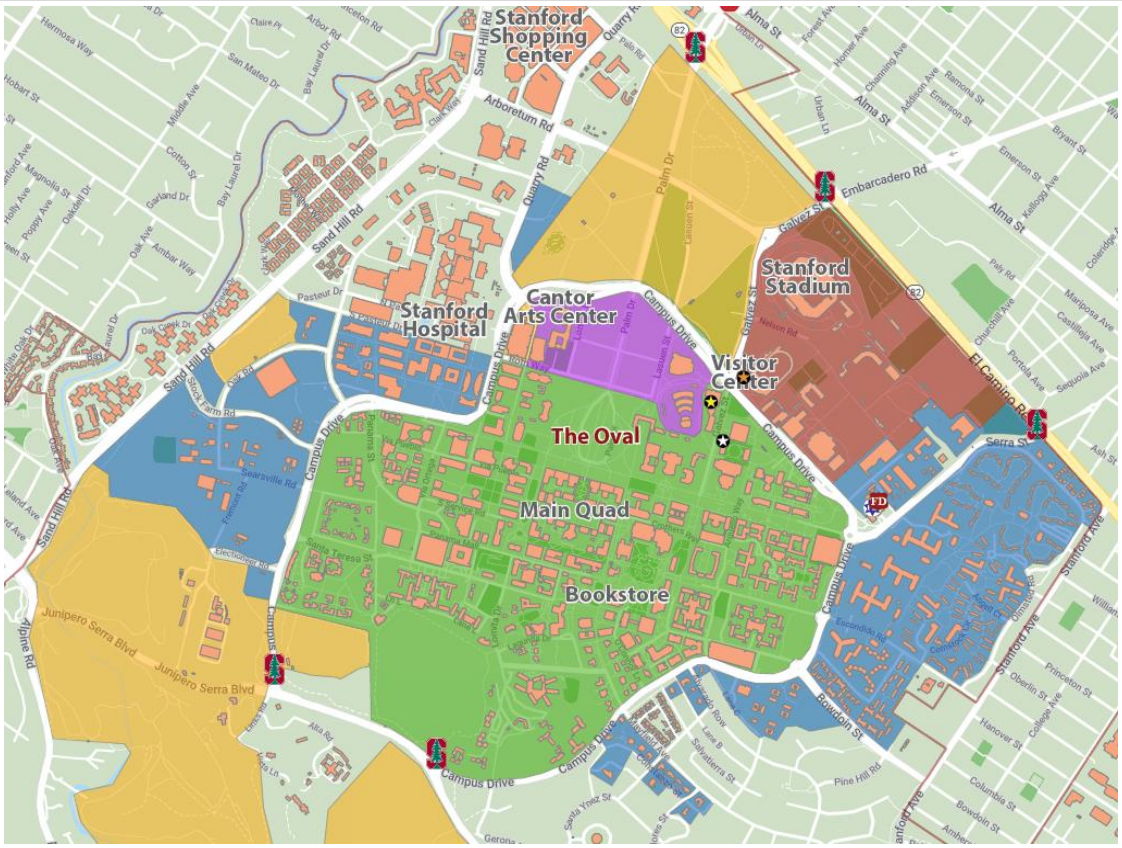
US SC #02 : University of California Los Angeles (UCLA)		
Variables		**Data records**
Figure 57: UC Los Angeles campus plan (https://map.ucla.edu/?b=1)		
General profile	University	Public – Research (R1) – founded : 1882 (Southern branch of the California State Normal School or now the San Jose State University) / 1919 (Southern Branch of the University of California)
	Cam type	Urban – Scale : large.
	Location	North of a Westwood Village, at the base of Santa Monica Mountains, 5 miles from Pacific Ocean
	Boundaries	UCLA's main campus is bounded by Sunset Blvd (North). Le Conte Ave (South), Hilgard Ave (East); Gayley Ave (West)
	Landmarks	Powell Library & Arches, Janss Steps, Royce Hall with Fountain, Murphy Sculpture Garden; Anderson curved building
	Total area	University land : 1.7 km² (200 buildings, 24,000 m² Parking). Campus size : 0.148 km²
	Students	FT students 30,873 (most applied-to university in the country 137,776) – Selectivity 14%
	2019 Rankings	#13 Best Global University (US News & World Report) #11 Academic ranking of world universites (Shanghai) #17 World University Rankings & #9 World Reputation Rankings (Times Higher Education) #4 US best value university (Forbes) #2 Top US Public Universities & #1 Best US College Campuses & #2 US Colleges with the Best Student Life (Niche)
	Fees £/year	Instate tuition & total: 9,815 & 26,010 - Outstate & total: 31,890 & 48,070 - Endowment £2.67 b - Budget £5.56 b
COS		
Central Plaza COS4 - UCLA1 : Bruin Plaza		

Park COS5 - UCLA2 : Wilson Park & Janss Steps

Table 35: USC university profile

US SC #03 : University of Southern California (USC)		
Variables		**Data records**
Figure 58: UC Berkeley campus plan (https://sc.edu/visit/map/)		
General profile	University	Research (R1) – Private not-for-profit
	Cam type	Urban/Gated. Scale : large – University Park Campus (selected) & Health Sciences Campus (excluded)
	Location	University Park, Los Angeles: LA Westwood neighborhood, 5m from Pacific Ocean
	Boundaries	Housing & public services (North & WEST). Harbor Freeway (EAST). Exposition Park & LA Memorial Coliseum (SOUTH)
	Landmarks	Widney Alumni House (1880), Tommy Trojan, Ronald Tutor Campus Center, Bovard Administration Building & Auditorium, Alumni Park, McCarthy Quad, USC Founders Park
	Total area	University land : 0.915 Km² (226 acre). Campus size : 606,500 m²
	Students	FT students 19,500 – Selectivity 11.4%
	2019 Ranking	#24 Best Global University (US News & World Report) #55 Academic ranking of world universites (Shanghai) #66 World University Rankings & #61 World Reputation Rankings (Times Higher Education) #1 US Colleges with the Best Student Life & #1 in Best Colleges for Design in America (Niche)
	Fee £/year	In/outstate tuition & total: £41,018 & 55,480 – Endowment £4.23 billion – Budget £3.93 b – Expenses £4,169 m
COS		
Special Spaces COS6 – USC1 : Alumni Park		

Table 36: Stanford university profile

Subcase #04 : Stanford University		
Variables		**Data records**
Figure 59: Stanford University campus plan (https://campus-map.stanford.edu/)		
General profile	University	Private – Research (R1) – Data of foundation : 1885
	Cam type	Suburban compact – Scale : large
	Location	Northern California: At the dynamic 'Silicon Valley', 35mi south of San Francisco, 20mi north of San Jose
	Boundaries	Adjacent to Palo Alto, bounded by El Camino Real, Stanford Avenue, Junipero Serra Boulevard, and Sand Hill Road.
	Landmarks	Main Quad & Memorial Church, Cantor Center for Visual Arts & Bing Concert Hall, Stanford Mausoleum, Hoover Tower, Rodin sculpture garden, Papua New Guinea Sculpture Garden, Arizona Cactus Garden, Arboretum, and the Dish, Hanna-Honeycomb House (by Frank Lloyd Wright)
	Total area	University land : 33.1 km ² (8,180 acre)
	Campus size	4.2 km²
	Students	FT students 17,178 – Selectivity 5%
	2019 Rankings	#3 Best Global University (US News & World Report) & #3 in US Best Colleges (Niche) #2 Academic ranking of world universites (Shanghai) #3 World University Rankings & #9 World Reputation Rankings (Times Higher Education)
	Fees £/year	Average tuition : 37130 & 52425 – Budget : 4.98 billion - Expenses : 659 million – Endowment 24.8 billion
COS		
White Memorial Fountain (also known as "The Claw") between the Stanford Bookstore and the Old Union is a popular place to meet and to engage in the Stanford custom of "fountain hopping".		
Central Plaza COS4 - Stan1 : Stanford Main Quad		

Entries & Edges COS7 - Stan2 : Stanford Oval / Palm Dr

Table 37: UC San Diego university profile

US SC #05 : UC San Diego (UCSD)		
Variables		**Data records**
Figure 60: UC San Diego campus plan (https://maps.ucsd.edu/map/default.htm)		
General profile	University	Public (University of California/UC system) – Research (R1) – founded: 1960 (Founded as an experiment)
	Cam type	Urban – Scale : large
	Location	San Diego: Lies along the Pacific Ocean in the La Jolla community
	Boundaries	La Jolla huge park & Scripps Institution of Oceano Graphy (NORTH & EAST). Park & La Jolla Beach (EAST). Housing & public services & La Jolla Village Drive (SOUTH). Apartments & San Diego freeway (WEST).
	Landmarks	Iconic Geisel Library, a heavily travelled & Snake paths from the library to Gilman Drive, La Jolla Playhouse, Stuart Collection, Old Scripps Building (the oldest oceanographic institute in US)
	Total area	University land: 8.66 Km² (2,141 acre: 761 buildings @ 1,152 & natural reserves & facilities @ 889). Campus size: 1.4 km²
	Students	FT students 35,802 – Selectivity 34%
	2019 Ranking	#21 Best Global University (US News & World Report). #34 best university in the world (Center for World University Rankings) #18 Academic ranking of world universites (Shanghai) #33 World University Rankings (Times Higher Education)
	Fee £/year	In/outstate tuition & total: £41,018 & 55,480 – Endowment £4.23 billion – Budget £3.93 billion – Expenses £4,169 million
COS		
Corridors COS3 – UCSD1 : Library Walk		

Corridors COS3 – UCSD2 : Warren Mall

Plaza COS4 – UCSD3 : York Hall or Revelle Plaza

Special/Inspired COS6 – UCSD4 : Challenge Course

Table 38: University of San Diego profile

US SC #06 : University of San Diego (USD)

Variables	Data records
Figure 61: University of San Diego campus plan (https://www.sandiego.edu/maps/)	
General profile – University	Private not-for-profit (Roman Catholic) - Research (R2) - founded 1949 (opened 1952 San Diego College for Women, 1972 USD)
General profile – Cam type	Urban/Gated – Scale : Medium
General profile – Location	San Diego: La Jolla neighbor, community of Linda Vista, at coast of the Pacific Ocean, 2mi north of downtown, north crest of Mission Valley.
General profile – Boundaries	Tecolote Canyon Natural Park (NORTH). Athletics, field & stadium (EAST). Housing & public services (WEST & SOUTH).
General profile – Landmarks	Bishop Leo T. Maher Garden, Gardens of the Moon/Sea/Sky, Mother Teresa Plaza, Plaza de San Diego, Strata Plaza.
General profile – Total area	0.728 Km² (180 acre)
General profile – Camp size	0.182 km²
General profile – Students	FT UG students 5,529 – Selectivity 52.9%
General profile – 2019 Ranking	#121 Best Global University & #88 Best Colleges/National Universities (US News & World Report) #156 World University Rankings (Times Higher Education) #9 Best US Catholic Colleges & #7 Best US College Campuses (Niche)
General profile – Fees £/year	In/outstate tuition & total: £38,170 & 51,075 – Endowment £390 million

COS

Quadrangle COS1 – USD1 : Luncheon Immaculata Lawn

Courtyards COS3 - UCSD3 : Plaza De San Diego. The large, central 'Paseo' is an expansive pedestrian promenade traversing the mesa. It connects west and east ends of campus through the academic core and provides a safe, direct and social corridor. Vehicular drop-off will be located at west & east entrances and traffic routed to the perimeter roads, the Paseo accommodate fire/emergency access vehicles.

Special Spaces COS6 – UCSD4 : Student Live Pavilion

Table 39: Pomona College profile

Variables	US SC #07 : Pomona College
Figure 62: Pomona College campus plan (https://www.pomona.edu/map/)	
General profile	
University	Private not-for-profit/Liberal arts colleges – Research (R2) – founded: 1887 (founding member of Claremont Colleges)
Cam type	Suburban (97% of students live in one of the 16 residence halls on campus) – Scale : Small
Location	College Way, Claremont, California, 35 mi east of LA downtown near the foothills of the San Gabriel Mountains.
Boundaries	The Claremont Colleges (NORTH & WEST & SOUTH). The Wash Park & Organic farm (EAST).
Landmarks	Stanley Quad, Marston Quad, Carnegie Hall, Pomona College Organic Farm
Total area	0.22 Km² (140 acre – total claremont colleges 57he/0.57km² with 9 blocks of the Claremont street grid, 66ac woodlands)
Camp size	0.16 km²
Students	FT students 1,670 – Selectivity 8%
2019 Ranking	#2 Best Value Schools (US News & World Report) / #4 National Liberal Arts Colleges (US News & World Report) #24 US College Rankings (Times Higher Education)
Fees £/year	In/outstate tuition & total: £38,655 & 52,000 – Endowment £1.61 billion
COS	

Courtyyyards COS2 - Pom1 : Studio Art Hall

Table 40: University of California San Francisco profile

US SC #08 : University of San Francisco (USFCA)

Variables	Data records

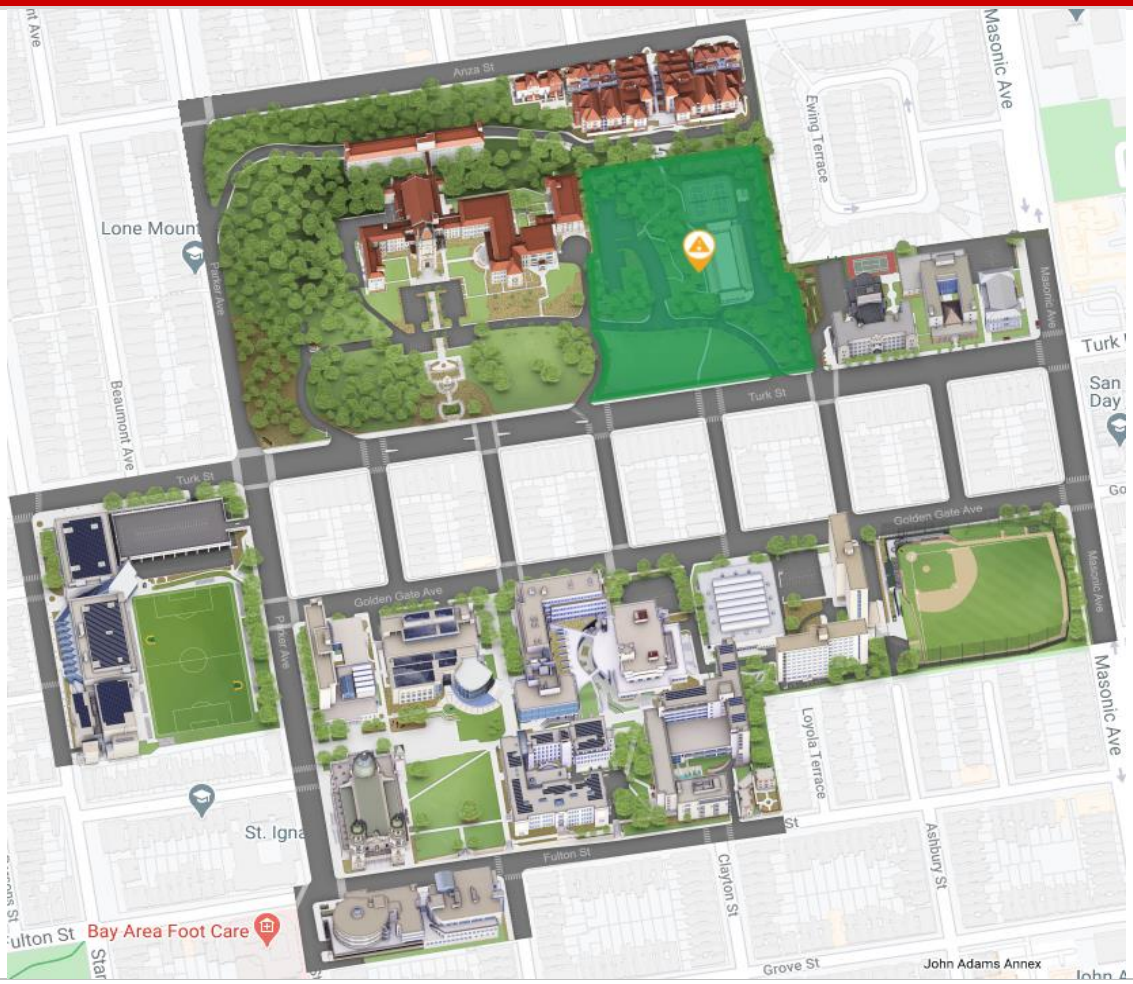


Figure 63: UC San Francisco campus plan (https://www.usfca.edu/directions/campus-map)

General profile		
	University	Private Jesuit – Research (State Graduate Institutions) Founded: 1855 (1864 private medical school - The School of Medicine is the oldest medical school in Western States).
	Cam type	Urban – Scale : Medium
	Location	San Fransisco: The 3 Affiliated Colleges were united in 1898 located at Golden Gate Park (now Parnassus Heights).
	Boundaries	San Francisco Botanical Garden & Stadium. The Common, a public park which serves as a community park (NORTH). The 3rd St, which acts as the main arterial connection to the city; will also accommodate the proposed MUNI 3rd St Light Rail line, and the proposed bus line (EAST). Owens Street (WEST). 16th St (SOUTH). The only public street running through the campus is 4th St.
	Landmarks	Saint Ignatius Church (1914), Kalmanovitz Hall (1927), Lone Mountain (1932), Gleeson Library (1950), Ulrich Field (1958)
	Total area	University lans : 0.086 Km² (55 acre). Area of main campus : 62,300 m²
	Students	FT students 5,852 – Selectivity 71%
	Ranking	#103 National Universities (US News & World Report) - #156 US College Rankings (Times Higher Education)
	Fee £/year	In/outstate tuition & total: £37,970 & 50,070 – Endowment £256 million – Operating Budget £343 million

COS

Entries & Edges COS7 - USFCA1 : Lone Mountain Main Building Gate

Table 41: San Francisco State University profile

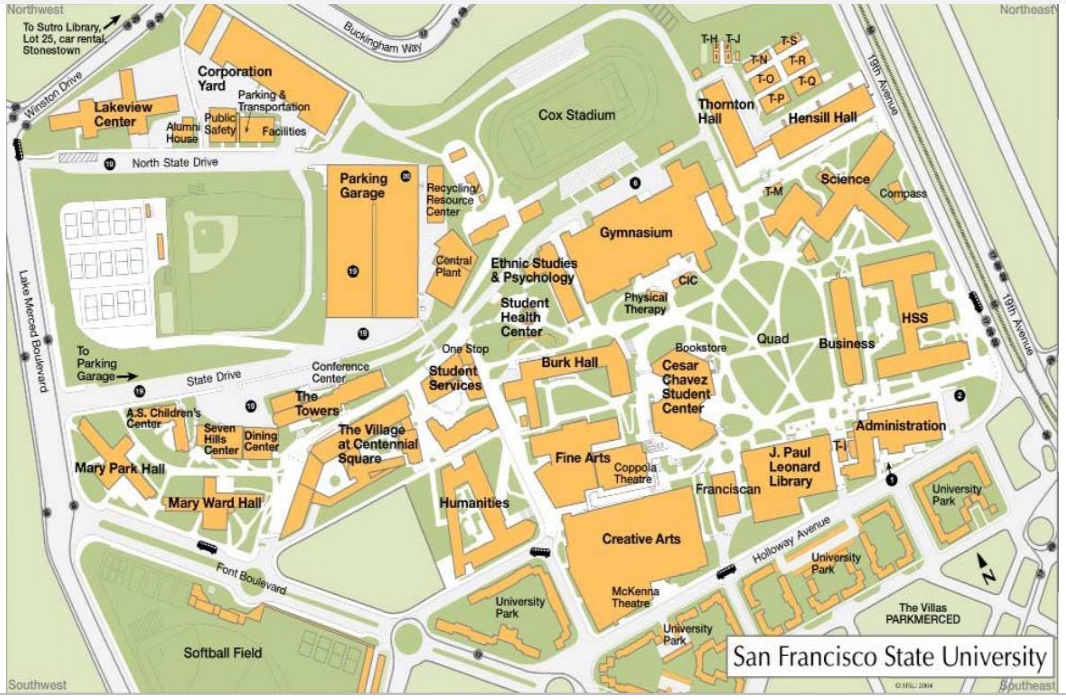
Variables	US SC #09 : San Francisco State University (SFSU)	
Figure 64: San Francisco State University campus plan www.immagic.com/eLibrary/ARCHIVES/MAPS/US05CASU.pdf		
General profile	University	Public – Research (R2)
	Age	Founded: 1899 (independent teachers' college - Anna Blake School). Joined the UC system in 1944 (3rd oldest in the system). Founded as Toland Medical College in 1864, before becoming incorporated with the University of California in 1873, UCSF has since become a renowned (and wealthy) medical university.
	Cam type	Urban – Scale : Large
	Location	Southwest of San Francisco, less than 2 miles from the Pacific coast.
	Boundaries	Stadium, university park, stonestown (NORTH&EAST). Wellness center, softball field, university park, children (WEST&SOUTH).
	Landmarks	J. Paul Leonard Library, Cesar Chavez Student Center, Entrance at 19th Ave & Holloway Ave
	Total area	University land : 0.57 Km² (141 acre). Campus size : 227,500 m²
	Students	FT students 24,215 – Selectivity 70.5%
	Ranking	#17 Best Undergraduate Teaching (US News & World Report) & #29 Regional Universities West (US News & World Report)
	Fees £/year	Instate tuition & total £5,315 & 13,820 – Outstate tuition & total £14,125 & 25,240 – Endowment £69 Million
COS		
Parks COS5 - SFSU1 : SFSU Meadow		

Table 42: Santa Clara University profile

US SC#10 : Santa Clara University (SCU)

Variables	Data records

Figure 65: Santa Clara University campus plan (https://www.scu.edu/map/)

General profile	University	Private not-for-profit (Roman Catholic - Society of Jesus) – Research (R2)
	Age	Founded 1851 (first college in CA, Mission Santa Clara built by Franciscans) – Modern buildings
	Cam type	Urban/Gated – Scale : Small
	Location	Santa Clara, California: South of San Francisco Bay, at the heart of Silicon Valley, 5 miles from San Jose International Airport
	Boundaries	(northside), Chapman Morse community (south).
	Landmarks	St Joseph's Hall, Center of Performing Arts, Learning and commons library, Mission Santa Clara de Asis, De Saisset Museum
	Total area	0.43 Km² (106 acre). Campus size : 237,500 m²
	Students	FT students 4,685 – Selectivity 49%
	2019 Ranking	#53 in National Universities (US News & World Report) & #25 in Best Undergraduate Teaching (US News & World Report) #6 Best Catholic University in US (college factual)
	Fee £/year	In/outstate tuition & total: £38,750 & 50,090 – Endowment £746 million – Operating budget £378 million

COS

Quadrangles COS1 - SCU1 : Art & Science Quad

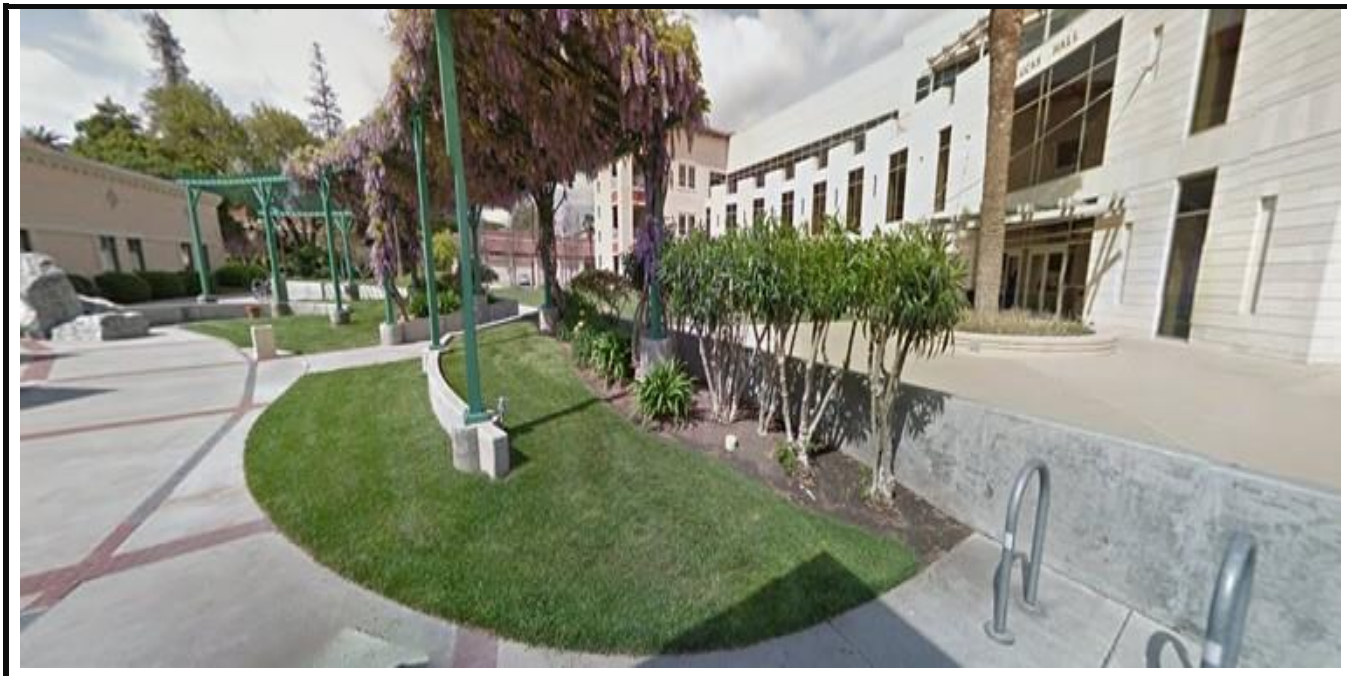
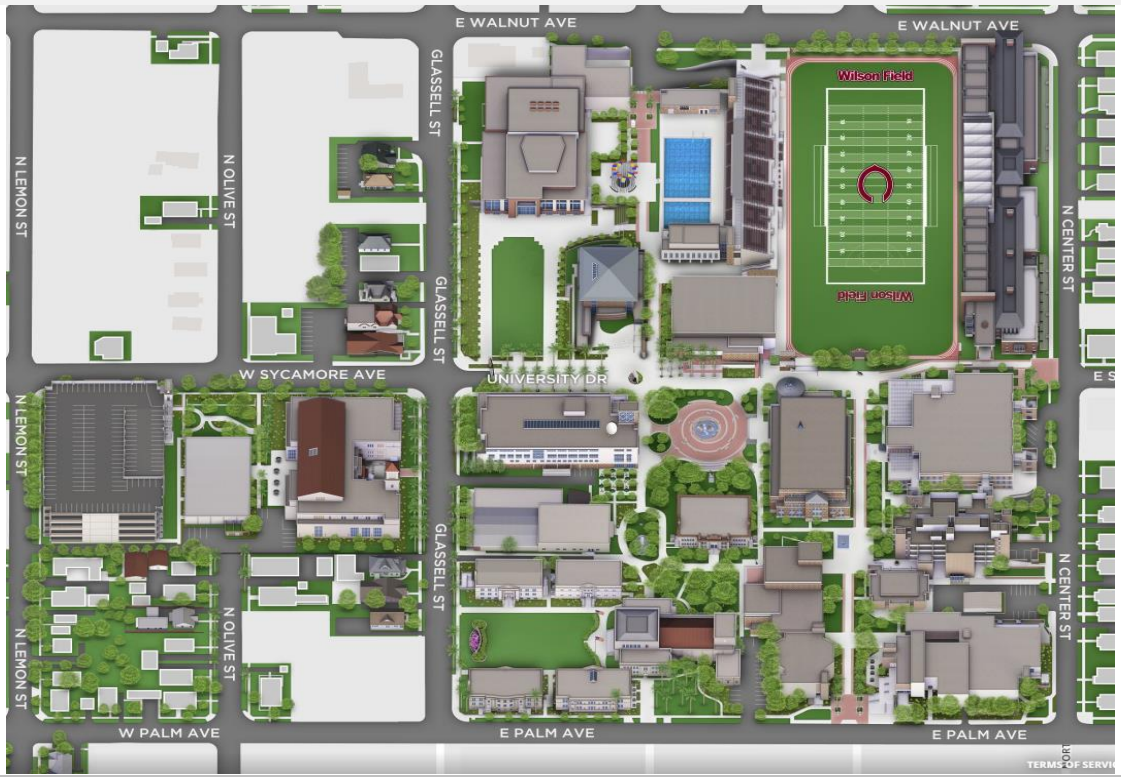


Table 43: Chapman University profile

Variables	US SC #11 : Chapman University (CU)	
Figure 66: Chapman University campus plan (www.chapman.edu/about/maps-directions/campus-map/index.aspx)		
General profile	University	Private not-for-profit (Christian Church - Disciples of Christ) – Research (R2) – Founded 1861
	Cam type	Suburban – Scale : Medium
	Location	Orange County, California: an hour from Los Angeles, a top west coast university, Within a residential community.
	Landmarks	Global Citizen & Liberty & Attalllah Piazzas & Marion fountain, Baldwin family pavilion, Aitken Arts Plaza, Wilson field
	Total area	University land : 0.32 Km² (78 acre). Campus size : 105,250 m² (main campus – Orange)
	Students	FT students 7,505 – Selectivity 56% – #125 Best Colleges is National Universities (US News & World Report).
	Fee £/year	In/outstate tuition & total: £40,160 & 53,190 – Endowment £298 million – market value £155 million

COS

Pedestrian malls COS3 - Chap1 : University Drive

Central Plaza COS4 – Chap2 : Attallah Piazza

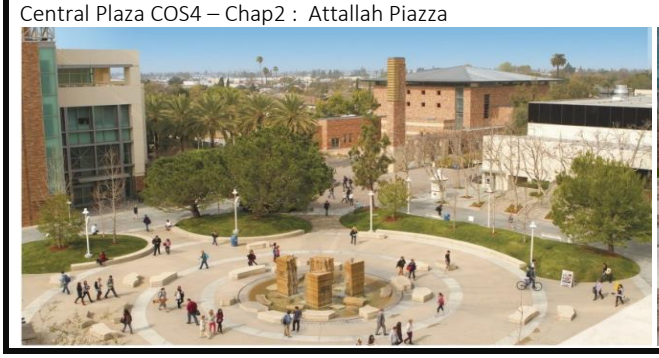
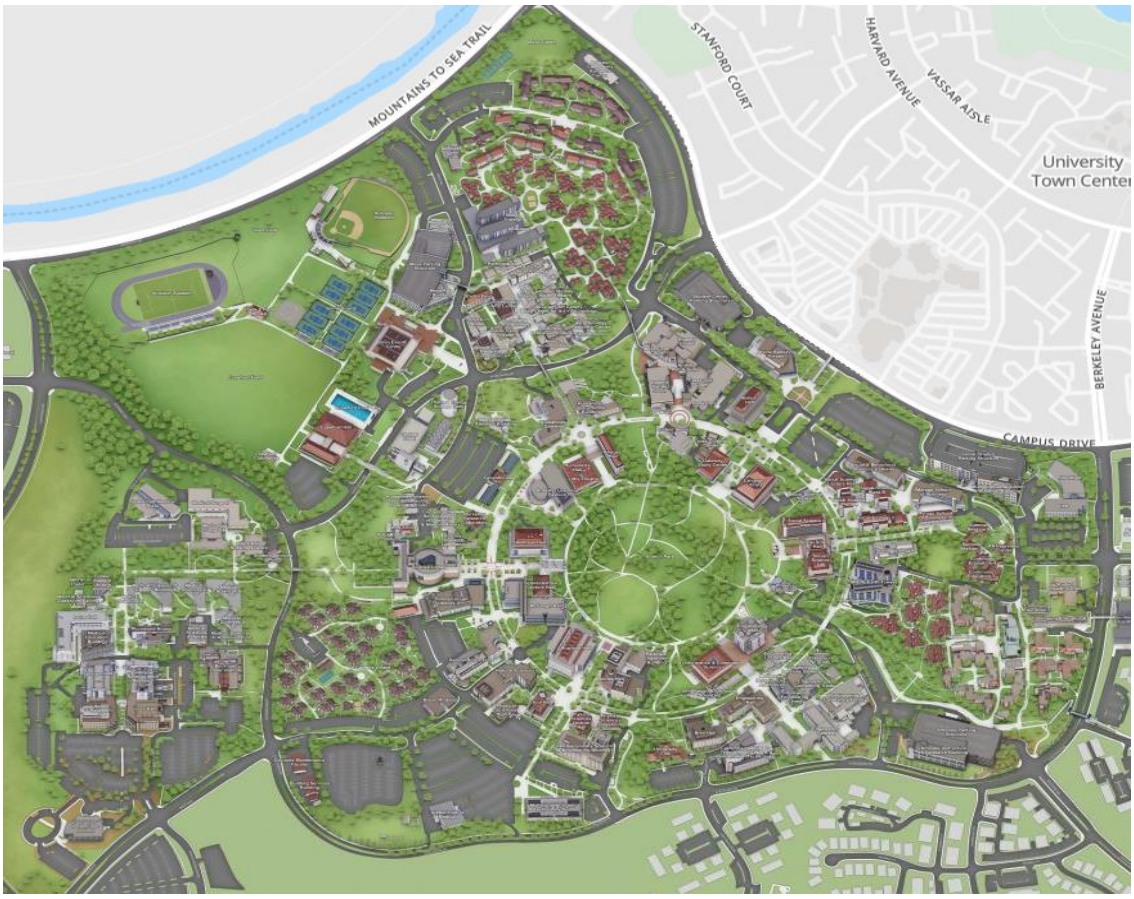


Table 44: UC Irvine profile

Variables	US SC #12 : University of California Irvine (UCI)	
Figure 67: UC Irvine campus plan (https://map.uci.edu/?id=463#!ct/52435)		
General profile	University	Public – Research (R1) – Founded 1965 (site identified on 1959)
	Cam type	Suburban – Scale : Large
	Location	Camino Del Sol, Orange County, California
	Boundaries	Concentric layout (circular Alrich Park at center), University Town Center & Mason Regional Park (NORTH). Turtle communities (EAST). San Joaquin Transportation & freeways & Mountains (SOUTH/WEST).
	Landmarks	Brutalist architecture (School & Plaza of Humanities), Ring Mall, Stacey Tech Pavillion, Engineering Plaza, Infinity Fountain, Langson Library, Science Library & Garden, Biological Sciences Plaza, Student Center Plaza & Courtyard & Bridge, Jao Family Sculpture Park, Palo Verde Bridge, Social Sciences Plaza, Schonfeld Fountain, Anteater Plaza, Founders Court
	Total area	University land : 5.97 Km² (1,475 acres). Campus size : 627,600 m²
	Students	FT students 30,382 – Selectivity 28.8%
	2019 Ranking	#35 Best Colleges is National Universities (US News & World Report) & #8 Public University (US News & World Report) #98 World University Rankings (Times Higher Education)
	Fee £/year	In.tuition&total 10,190 & £22,300 - Out.tuition&total £31,945&£44,060 - End £0.75b - Economic impact 3.66b - Expenses 319m

COS

Courtyards COS2 - UCI1:

Parks COS5 – UCI2: Aldrich Park (Circular, 17 acre botanical garden)

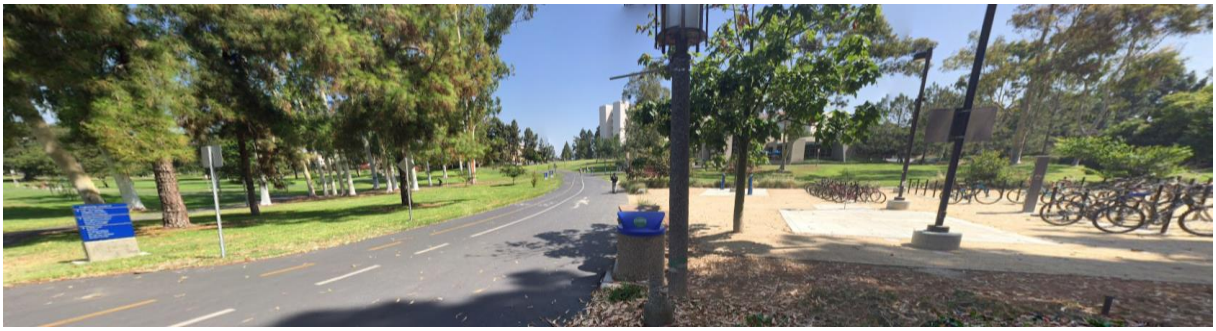
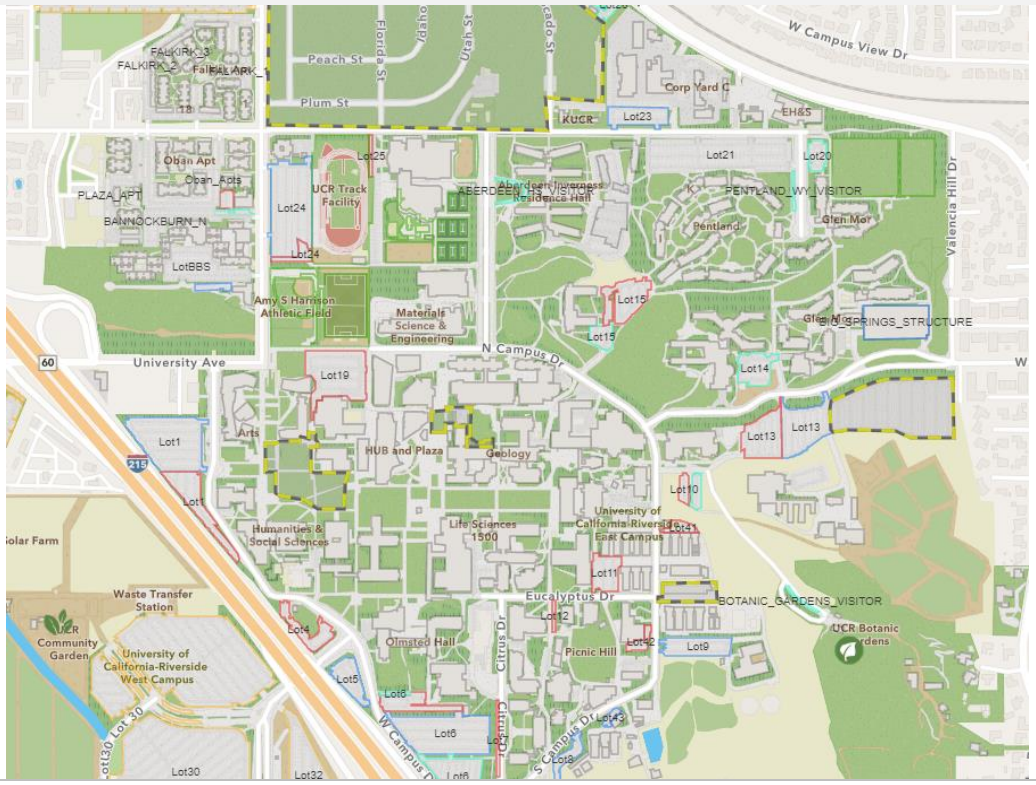
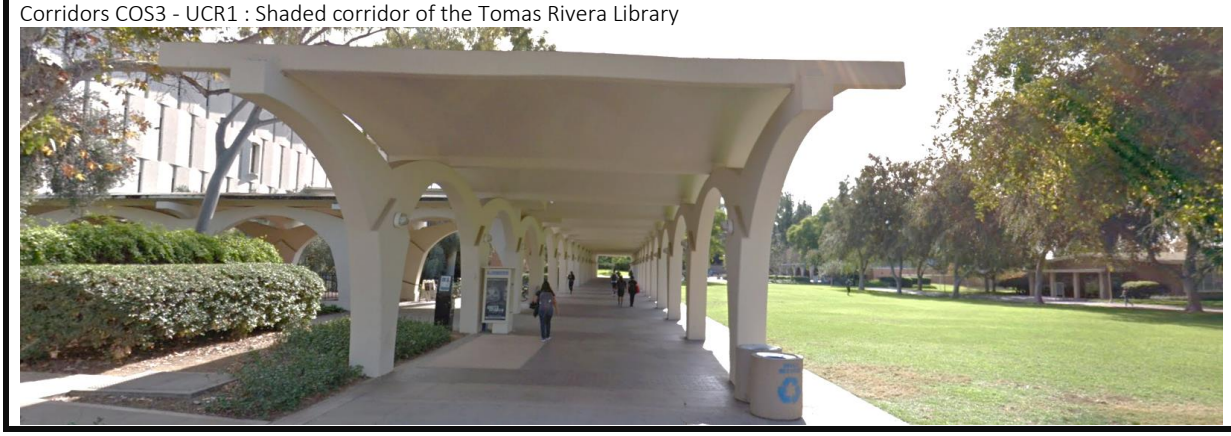
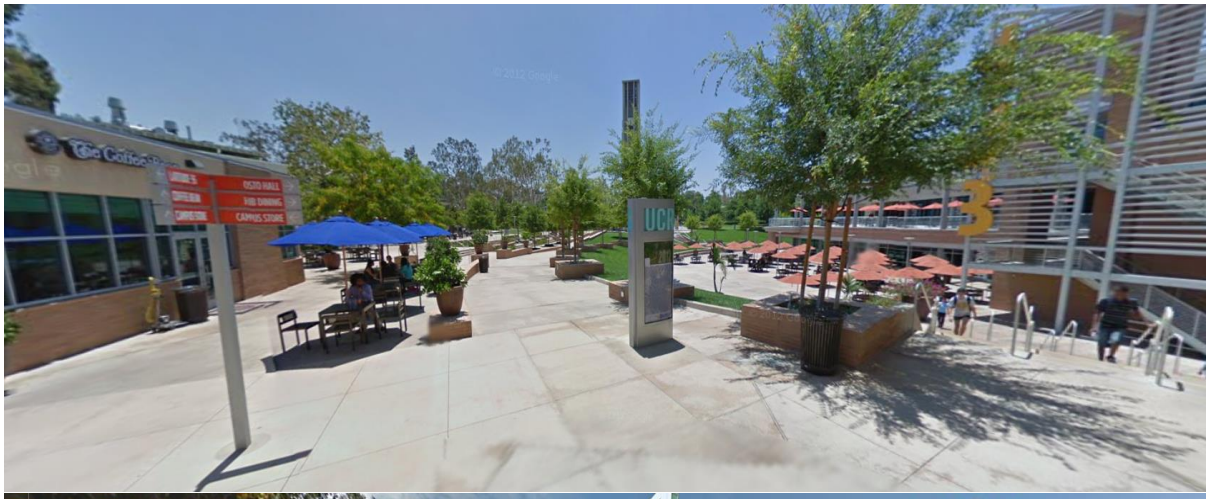


Table 45: UC Riverside profile

Variables	US SC #13 : University of California Riverside (UCR)	
Figure 68: UC Riverside campus plan (https://campusmap.ucr.edu/)		
General profile	University	Public – Research (R1) – Founded/opened 1954 (1906 was a Citrus Experiment Station on the slopes of Mount Rubidoux)
	Cam type	City/compact – Scale : Large
	Location	Riverside, Southern California
	Boundaries	University Neighborhood (NORTH/EAST). Botanic gardens & Farms & Agricultural Experimentation Stations (SOUTH/WEST).
	Landmarks	Belltower, Arched corridors, Rivera Library, Highlander Hub & Plaza, Sproul Hall, Olmsted Plaza, Botanic gardens, Mission Inn
	Total area	University land 4.86 Km² (1200 acres). Campus size : 21,600 m²
	Students	FT students 22,055 – Selectivity 57%
	2019 Ranking	#88 National Universities & #1 US Social Mobility - 2 years in a row (US News & World Report) #251 World University Rnakings & #192 US College Rankings (Times Higher Education) #9 Public Universities (Money Magazine)
	Fees £/year	Instate tuition & total: £10,135 & 22,500 – Outstate tuition & total: £31,900 & 44,300 – Endowment £188 million – Operating Budget £780 m – Economic impact £1.97 billion – Research & teaching expenses £420 million
COS		
Corridors COS3 - UCR1 : Shaded corridor of the Tomas Rivera Library		

Central Plaza COS4 - UCR2 : Student Commons & market street



Special plazes COS6 – UCR3 : Picnic Hill

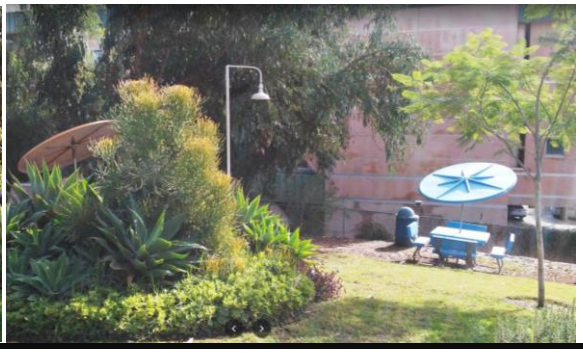


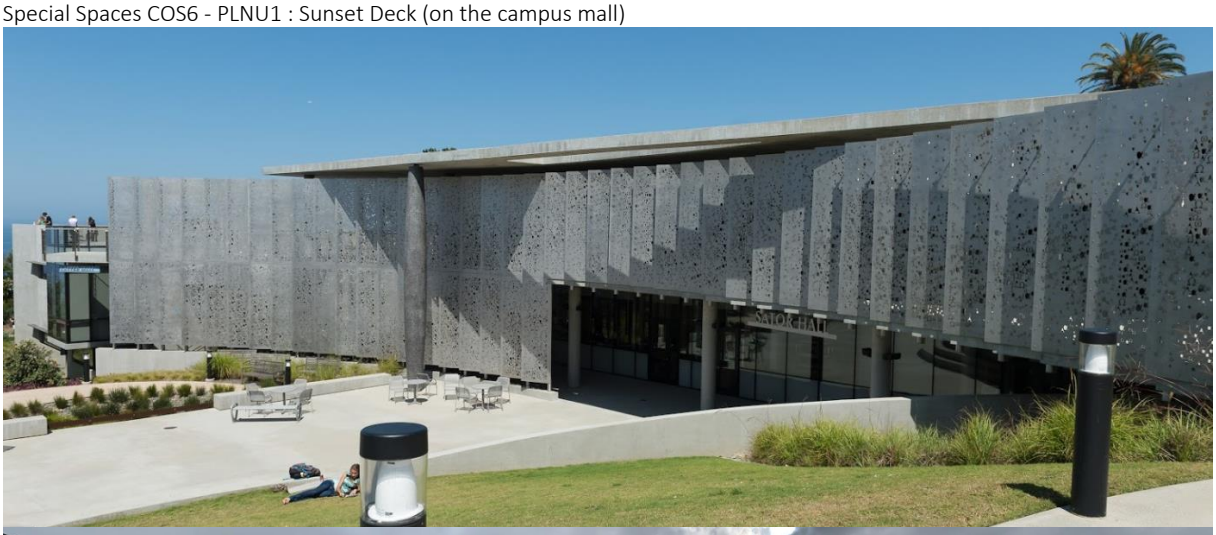
Table 46: Point Loma Nazarene University profile

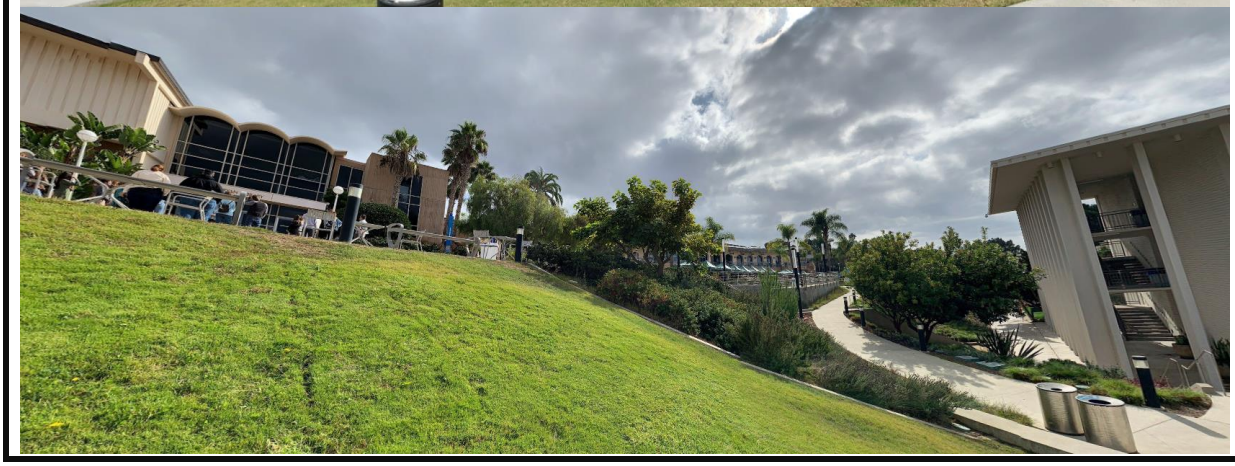
Variables	US SC #14 : Point Loma Nazarene University (PLNU)	
	Figure 69: PLNU campus plan (https://www.pointloma.edu/sites/default/files/plnu-maincampus-map.pdf)	
General profile	University	Private not-for-profit. Liberal arts college (R2). Founded 1902 (Bible college/Christian by Church of the Nazarene), 1998 (PLNU)
	Cam type	Urban – Scale : Small
	Location	Oceanfront, San Diego, California: Within the Sunset Cliffs neighborhood of the Peninsula Community Plan and Local Coastal Program Plan,
	Boundaries	west of Catalina Boulevard and east of the Sunset Cliffs Natural Park, South is the US Navy property.
	Landmarks	Bishop Leo T. Maher Garden, Gardens of the Moon/Sea/Sky, Mother Teresa Plaza, Plaza de San Diego, Strata Plaza.
	Total area	University land : 0.136 Km² (87 acres). Campus size : 0.1 km²
	Students	FT UG students 2,595 – Selectivity 69%

	2019 Ranking	#121 Best Global University (US News & World Report) / #88 Best Colleges/National Universities (US News & World Report) #156 World University Rankings & # World Reputation Rankings (Times Higher Education)
	Fees	In/outstate tuition & total: £38,170 & 51,075 – Endowment £390 million – Expenses £106 million – Revenues £111 million

COS

Special Spaces COS6 - PLNU1 : Sunset Deck (on the campus mall)

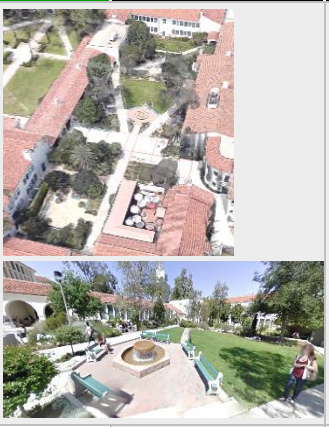




10.5 Appendix (05) : List of COS Profiles in Cal Universities

COS1 Quad - Garden	COS2	COS3	COS4	COS5	COS6	COS7

Table 47: A sample of the earlier comparisons : Quadrangles (COS-1) – SDSU & USD & SCU

Variables		1. SDSU1 Hebner Mediterranean Garden	2. SDSU2 Banana Quad	3. USD1 Luncheon Immaculata Lawn	4. USD2 Bishop Leo T. Maher Garden	5. SCU1 Art & Science Quad
Aerial view						
General profile	University	Public & Research (1)	Public & Research (1)	Private & Research (1)	Private & Research (1)	Private catholic & Research1
	Cam type	Compact, 1897	Compact, 1897	Gated, 1949	Gated, 1949	Compact, city, Med, 1851
	Land	1.165 km²	1.165 km²	0.728 km²	0.728 km²	0.4289 km²
	Campus	0.44 km²	0.44 km²	0.11 km²	0.11 km²	0.106 km²
	Enr - acp%	34,828 – 35%	34,828 – 35%	8,905 – 50%	8,905 – 50%	8,422 – 48%
	Tition $	In 7,488 – Out 19,368	In 7,488 – Out 19,368	In&out 49,358	In&out 49,358	In&out 49,858
	Accom $	16,735	16,735	12,980	12,980	14,490
	End / Bud$	293 m / 894.2 m	293 m / 894.2 m	530 m	530 m	840.7 m
Visit	No @ hrs	17 times @ 190 hrs	6 times @ 190 hrs	3 times @ 54 hrs	2 times @ 54 hrs	1 time & 4 hrs
	T. Period	8 months	8 months	2 weeks	2 weeks	1 Day Morning/noon
Context	Area	3750 m²	3500 m²	1870 m²	1600 m²	2400 m²
	Adjacents	Educational	Water tank - campus axis	Imaculata, café, Maher	Maher hall, health center	Arts & scince - Lucas hall
	Heights	1 & 2 floors	1 & 2 floors	1 to 3 floors	3 floors	1 to 3 floors
	Enclosure	90% Buildings 4 sides	70% Buildings 3 sides	60% Build 2 sides, arcade	75% Buildings 3 sides	55% Buildings 2 sides
Physical features	Green	2500 m²	1750 m²	950 m²	1100 m²	1500 m²
	Circu	800 m²	1350 m²	600 m²	500 m²	1100 m²
	Veg	380 m²	170 m²	35 m²	230 m²	40 m²
	Shade	5 trees / 60 m²	5 trees / 30 m²	Arcades / 140 m²	Arcades & trees / 450 m²	Tree & wood stru./120m²
	Racks	N	N	N	N	25 / 30 m²
	Water	1 @ 15m²	N	N	N	N
	Seats	209	120	36	18	Concrete decks
	Lights	10	8	28	16	32
	Signs	5	8	12	4	6
	arts	N	N	N	2	N
	Others	plants from Mediterranean climates across the globe	Contains the campus landmark/logo & main axis	N	N	Rocks, fire, 2 palm trees
Duration	<20	67 (x10 = 670)	86 (x10 = 860)	29 (x10 = 290)	13 (x10 = 130)	11 (x10 = 110)
	20-40	33 (x30 = 990)	40 (x30 = 1200)	16 (x30 = 360)	7 (x30 = 210)	6 (x30 = 180)
	41-60	18 (x50 = 900)	6 (x50 = 300)	5 (x50 = 250)	5 (x50 = 250)	3 (x50 = 150)
	>60	4 (x80 = 320)	1 (x80 = 80)	1 (x80 = 80)	3 (x80 = 240)	2 (x80 = 160)
Avg COS users		11,250	14,000	4,670	3,050	2,650
Density st / m²		1.47 st/m²	1.41 st/m²	0.94 st/m²	0.45 st/m²	0.45 st/m²
Frequency Fu		0.3	0.4	0.25	0.19	0.11
Duration Ds		1.28	1.16	0.87	0.86	0.42
Intensity Iu		1.99	1.97	1.26	1.18	0.73
Cost		130 $/m²	125 $/m²	80 $/m²	120 $/m²	200 $/m²
ES-COS		**1.53**	**1.58**	**1.58**	**0.98**	**0.37**

	COS 2 Courts - Yards					

Table 48: A sample of the earlier comparisons : Courtyards (COS-2) – SDSU & UCLA & POMONA

Variables		6. SDSU1 Goldberg/Aztec Union	7. SDSU2 Student Services East	8. UCLA ??????	9. POM1 Studio Art Hall
Aerial view					
General profile	University	Public-teaching, 1897	Public-teaching, 1897		Private-Research
	Cam type	Compact	Compact		Suburban, small, 1887
	Land	1.165 km²	1.165 km²		0.5666 km²
	Campus	0.44 km²	0.44 km²		0.06 km²
	Enr - acp%	34,828 – 35%	34,828 – 35%		1,660 – 9%
	Tition $	In 7,488 – Out 19,368	In 7,488 – Out 19,368		In & outstate 51,076
	Accom $	16,735	16,735		16,150
	End / Bud$	293 m / 894.2 m	293 m / 894.2 m		2.0 b
Visit	No @ hrs	24 times @ 190 hrs	5 times @ 190 hrs		1 time @ 4 hrs
	T. Period	8 months	8 months		1 day Morning/Noon
Context	Area	850 m² (Including arcades)	1700 m²		550 m²
	Adjacents	Cafés, ent, reception, transit, entertainment, admin, sports	St services & Tower, Aztec Dr, Campanille mall		Studio Art hall surrounded by streets and parks
	Heights	3 floors	2 & 3 floors		2 floors
	Enclosure	95% Aztec uion - 4 sides	85% St services – 3 sides		90% 1 building – 4 sides
Physical features	Green	N	30 m² (plant box)		180 m²
	Circu	800 m²	1550 m²		300 m²
	Veg	23box & 9 trees / 35m²	30 m²		100 m²
	Shade	500 m²	1100 m² (beneath building)		300 m² (tree & stairs)
	Racks	N	N		N
	Water	1 @ 20 m²	N		N
	Seats	75 (15x4 + 15)	55 (12x4 + 7)		16 Movable seats (varies)
	Lights	121	68		47
	Signs	20	39		23
	arts	N	N		6
	Others	16 CCTV	Can machnie, WC, posts cabinets, screens		Smart building, art boards, rocks, patterns,
Duration	<20	95 (x10 = 950)	31 (x10 = 310)		17 (x10 = 170)
	20-40	43 (x30 = 1290)	17 (x30 = 510)		10 (x30 = 300)
	41-60	23 (x50 = 1150)	14 (x50 = 700)		7 (x50 = 350)
	>60	2 (x80 = 160)	7 (x80 = 560)		4 (x80 = 320)
Avg COS users		11,900	14,110		1,705
Density st / m²		7.65 st / m²	1.59 st / m²		0.74 st / m²
Frequency Fu		1.4	0.83		0.31
Duration Ds		6.96	2.03		3.46
Intensity Iu		10.49	3.61		13.62
Cost		250 $/m²	150 $/m²		350 $/m²
ES-COS		**4.14**	**2.41**		**3.89**

Table 49: A sample of the earlier comparisons : Pedestrian Malls (COS-3) 1/2 – SDSU & UCR & USD & Chapman University

Variables		10. SDSU5 Centennial Mall	11. UCR1 Shaded corridor	12. USD3 Plaza De San Diego	13. CHAP1 University Dr
Aerial view					
General profile	University	Public-teaching	Public - Research	Private-catholic, 1949	Private - Christian church
	Cam type	Compact, 1897	City, 1954	Gated	City, compact, 1861
	Land	1.165 km²	0.3156 km²	0.728 km²	0.3156 km²
	Campus	0.44 km²	0.12 km²	0.11 km²	0.12 km²
	Enr - acp%	34,828 – 35%	23,278 – 57%	8,905 – 50%	9,392 – 57%
	Tition $	7,488 -19,368	In 13,887 – out 42,879	In&out 49,358	In & Outstate 52,724
	Accom $	16,735	16,000	12,980	14,910
	End /Bud$	293 m / 894.2 m	231.1 m	530 m	352.6 m
Visit	No @ hrs	4 times @ 12 hrs	2 times & 8 hrs	7 times & 54 hrs	1 time & 5 hrs
	T. Period	8 months	1 day – Noon/evening	2 weeks	1 day Morning/Noon
Context	Area	12,800 m²	1,700 m²	8,700 m²	3750 m²
	Adjacents	Entry, field, library, edu.	Entry, plazas, Tomas Rivera Library	Education building each with separate courtyard	Sports/field, library, education, cafe, campus ent
	Heights	1 to 5 floors	2 floors	2 & 3 floors	2 & 3 floors
	Enclosure	50% Build 2sides	25% Buildings 1 side	65% Buildings, ent rings & parking	85% Buildings 2 sides
Physical features	Green	4850 m²	N	3500 m²	1600 m²
	Circu	7,650 m²	1,400 m²	4000 m²	2100 m²
	Veg	200 m²	N	300 m²	1000 m²
	Shade	200 m²	1,400 m²	60 m²	350 m²
	Racks	50 m²	150 m²	10 m²	N
	Water	N	N	2 @ 40 m²	1 @ 42 m²
	Seats	Countless	N	Countless	28
	Lights	82	18	36	36
	Signs	38	5	22	22
	arts	3	N	5	5
	Others	Art wall, fire, bike lane	N	Memory wall	Icons, water fountain, build. entries
Duration	<20	73 (x10 = 730)	52 (x10 = 520)	140 (x10 = 1400)	41 (x10 = 410)
	20-40	49 (x30 = 1470)	0 (x30 = 0)	88 (x30 = 2640)	15 (x30 = 450)
	41-60	38 (x50 = 1900)	0 (x50 = 0)	49 (x50 = 2450)	7 (x50 = 350)
	>60	19 (x80 = 1520)	0 (x80 = 0)	41 (x80 = 3280)	2 (x80 = 160)
Avg COS users		130,560	54,060	167,910	35,625
Density st / m²		1.97 st / m²	9.57 st / m²	2.87 st / m²	2.79 st / m²
Frequency Fu		1.02	3.18	1.93	0.95
Duration Ds		0.74	0.51	1.87	0.61
Intensity Iu		2.22	1.9	4.69	1.99
Cost		160 $/m²	150 $/m²	220 $/m²	140 $/m²
ES-COS		**1.39**	**1.27**	**2.14**	**1.42**

Table 50: A sample of the earlier comparisons : Pedestrian Malls (COS-3) 2/2 – SDSU detailed & UCSD

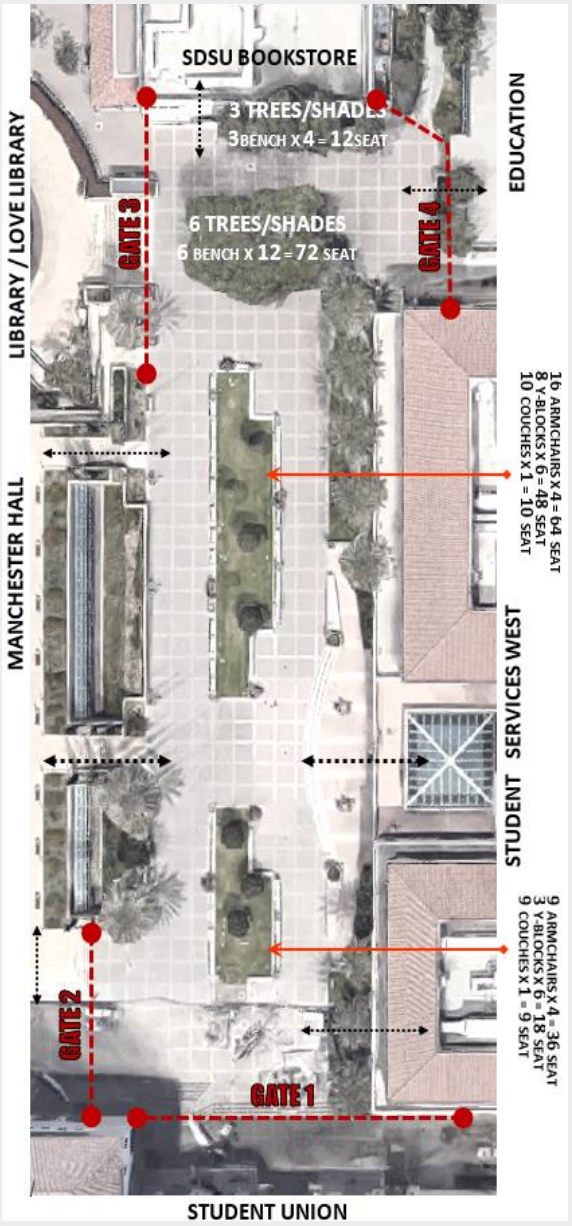
Variables		14. SDSU6 Campanile Mall		15. UCSD1 York Hall Plaza
Aerial view				
General profile	University	Public-teaching		Public-Research
	Cam type	Compact, 1897		Suburban, large, 1960
	Land	1.165 km²		8.663 km²
	Campus	0.44 km²		0.86 km²
	Enr - acp%	34,828 – 35%		34,979 – 36%
	Tition $	7,488 - 19,368		In 16,163 - Out 44,197
	Accom $	16,735		13,254
	End / Bud$	293 m / 894.2 m		1.3 b
Visit	No @ hrs	20 times @ 190 hrs		4 times @ 40 hrs
	T. Period	8 months		2 weeks
Context	Area	7,000 m²		5,625 m²
	Adjacents	Education & library & café & st union		Education & library & cafe
	Heights	2 to 3 floors		4 to 6 floors
	Enclosure	90% building 4 sides		75% - buildings 2 sides
Physical features	Green	700 m²		1000 m²
	Circu	5400 m²		4500 m²
	Veg	42 / 160 m²		26 / 70 m²
	Shade	700 m²		125 m²
	Racks	N		N
	Water	N		1 / 25 m²
	Seats	355		36
	Lights	24		8
	Signs	24		8
	arts	N		N
	Others	N		N
Duration	<20	96 (x10 = 960)		26 (x10 = 260)
	20-40	28 (x30 = 840)		7 (x30 = 270)
	41-60	12 (x50 = 600)		2 (x50 = 100)
	>60	5 (x80 = 400)		0 (x80 = 0)
Avg COS users		77,000		39,940
Density st / m²		1.57 st / m²		1.57 st / m²
Frequency Fu		1.1		0.71
Duration Ds		0.56		0.18
Intensity Iu		2.76		2.19
Cost		75 $/m²		120 $/m²
ES-COS		**2.76**		**1.82**

Table 51: A sample of the earlier comparisons : Central Plazas (COS4) – SDSU & STAN & UCLA & UCR & Chapman

Variables		16. SDSU7 Sycamore Plaza	17. STAN1 Stanford Main Quad	18. UCLA1 Bruin (central) Plaza	19. UCR2 Student Commons & market street	20. CHAP2 Attallah Piazza
Aerial view						
General profile	Uni	Public-teaching	Private-Research	Public-research	Public - Research	Private - Christian church
	Cam type	Compact, 1897	Urban, Medium, 1885	Urban, 1919	City, 1954	City, compact, 1861
	Land	1.165	33.103 km²	2.5 km²	4.86 km²	0.3156 km²
	Campus	0.54	1 km²	1.15 km²	0.35 km²	0.09 km²
	Enr-acp%	34,828 - 35%	16,914 - 5%	45,428 - 16%	23,278 - 57%	9,392 - 57%
	Tition $	7,488 -19,368	In & outstate 49,617	In 13,280 - Out 43,294	In 13,887 - out 42,879	In & outstate 52,724
	Accom $	16,735	15,112	13,280	16,000	14,910
	End/Bud	293m/894.2m	22.4 b	5 b & 6.7 b	231.1 m	352.6 m
Visit	No @ hrs	18 @ 190 hrs	2 times @ 14 hrs	3 times @ 40 hrs	2 times @ 8 hrs	1 time @ 5 hrs
	T. Period	8 months	3 days	2 weeks	1 day	1 day Morning/Noon
Context	Area	5500 m²	12,900 m²	3,530 m²	25,000 GSF / 3000 m²	3300 m²
	Adjacents	Library, adm, edu, 2 malls, foodcourt	Memorial quad & church, educational buildings	St union/store, athletics build., recreation center, unicamp	St clubs, pub, sports, bar&grill, coffee, retail, adm, conf center	Leatherby Libraries, Beckman Hall, Starbucks, campus ent
	Heights	2 to 5 floors	2 to 5 floors	2 & 3 floors	4 floors	2 & 3 floors
	Enclosure	65% - 4 building	95% - 6 buildings	80% - 4 Buildings	40% - 3 buildings, piazza & market street	85% - 4 Buildings
Physical features	Green	280 m²	1600 m²	850 m²	1550 m²	1750 m²
	Circu	4400 m²	11,300 m²	2,500 m²	1900 m²	1550 m²
	Veg	33 trees / 65m²	1600 m²	600 m²	29 trees @ 60 m²	1150 m²
	Shade	1060 m²	1600 m²	1100 m²	100 m²	720 m²
	Racks	24 m²	N	15 m²	6 @ 8 m²	N
	Water	N	N	N	N	N
	Seats	152	Concrete steps	Countless- concrete steps	Natural	Countless
	Lights	22	40	20	N	12
	Signs	4	8	14	N	8
	arts	N	Dec elev. & floor patterns	2	N	3
	Others	N	Paved ex/ 8 plant box	Bin, stage, stair, statue	N	Campus landmark
Duration	<20	66(x10 = 660)	69 (x10 = 690)	46 (x10 = 460)	56 (x10 = 560)	42 (x10 = 420)
	20-40	25 (x30=750)	21 (x30 = 620)	18 (x30 = 540)	49 (x30 = 1470)	22 (x30 = 660)
	41-60	2 (x50 = 100)	11 (x50 = 550)	2 (x50 = 100)	44 (x50 = 2200)	7 (x50 = 350)
	>60	0 (x80 = 0)	7 (x80 = 560)	0 (x80 = 0)	31 (x80 = 2480)	4 (x80 = 320)
Avg COS users		50,600	28,380	21,535	32,400	40,920
Density st / m²		1.67 st / m²	0.81 st / m²	st / m²	2.78 st / m²	2.19 st / m²
Frequency Fu		0.92	0.22	0.61	1.08	1.24
Duration Ds		0.57	0.31	0.52	3.73	0.88
Intensity Iu		1.88	3.13	2.87	7.23	2.03
Cost		100 $/m²	150 $/m²	120 $/m²	270 $/m²	180 $/m²
ES-COS		**1.88**	**2.09**	**2.39**	**2.67**	**1.13**

Table 52: A sample of the earlier comparisons : Fields & Parks (COS-5) – SDSU & UCLA & & UCI & SFSU

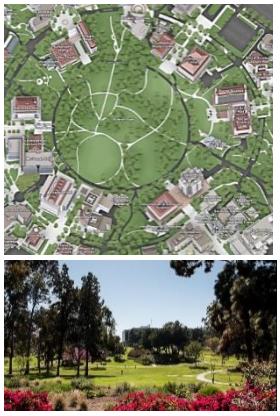
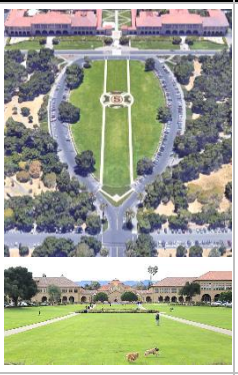
Variables		21. SDSU8 ENS Playfield 700	22. UCLA2 Wilson Park & Janss Steps	23. UCI1 Central park	24. SFSU1 SFSU Meadow
Aerial view					
General profile	Univ	Public - teaching	Public-research	Public - research	Public - teaching
	Cam type	Compact, 1897	Urban, 1919	Suburban, 1965	Urban, 1899
	Land	1.165	2.5 km²	6.18 km²	0.57 km²
	Campus	0.44	0.95 km²	0.51 km²	0.18 km²
	Enr-acp%	34,828 – 35%	45,428 – 16%	35,242 – 37%	29,607 – 70%
	Tition $	In 7,488 – Out 19,368	In 13,280 – Out 43,294	In 15,516 – Out 43,530	In 7,260 – Out 19,140
	Accom $	16,735	13,280	14,829	13,462
	End/Bud$	293 m / 894.2 m	5 b & 6.7 b	853.3 m	47.8 m
Visit	No @ hrs	6 ti @ 190 hrs	4 times @ 40 hrs	2 times & 8 hrs	1 time & 5 hrs
	T. Period	8 months	2 weeks	1 day	1 day
Context	Area	12,150 m²	19,000 m²	40,000 m²	11,600 m²
	Adjacent	Arena, Music & dance building, construction, Calpulli center, parking, student housing	Wilson plaza & North field, Dickson court, st activities center, Powel library, Museum, Cofee house, edu	All campus is circulating the park	Memorial grove, Succulants Garden, college of Bussiness, library, student center & bookstore, Malcolm plaza
	Heights	2 & 3 floors	2 & 3 floors	1 to 6 floors	2 & 3 floors
	Enclosur	65% - 6 buildings	30% - 6 buildings	35% - 16 buildings	30% - 6 buildings
Physical features	Green	11,150 m² - Sand 1000 m²	14,500 m²	33,000 m²	10,000 m²
	Circu	Surrounded by corridors	4,450 m² (Election walk)	7,000 m²	2,100 m²
	Veg	250 m²	7,500 m²	7,500 m²	1,500 m²
	Shade	50 m²	6,000 m²	10,000 m²	2,400 m²
	Racks	N	50 m²	N	N
	Water	N	1 @ 150 m²	N	N
	Seats	N	Countless	Countless	Countless
	Lights	12	140	96	25
	Signs	4	39	18	13
	arts	N	2	3	2
	Others	Fences for sports/playground	Stairs, ramps, rails, posts cabins	landforms	Levels, shades
Duration	<20	12 (x10 = 660)	49 (x10 = 490)	52 (x10 = 520)	38 (x10 = 380)
	20-40	15 (x30 = 750)	33 (x30 = 630)	50 (x30 = 1500)	22 (x30 = 660)
	41-60	30 (x50 = 100)	21 (x50 = 1050)	41 (x50 = 2050)	14(x50 = 700)
	>60	15 (x80 = 0)	14 (x80 = 1120)	30 (x80 = 2400)	12 (x80 = 960)
Avg COS users		3,645	34,200	4,000	33,600
Density st / m²		0.12 st / m²	0.57 st / m²	0.04 st / m²	0.68 st / m²
Frequency Fu		0.03	0.18	0.01	0.29
Duration Ds		0.26	0.42	0.27	0.39
Intensity Iu		*0.37*	1.25	0.42	0.41
Cost		20 $ / m²	130 $/ m²	80 $/ m²	90 $/ m²
ES-COS		**0.02**	**0.97**	**0.51**	**0.46**

Table 53: A sample of the earlier comparisons : Special Spaces (COS-6) – SDSU & USD & USC

Variables		25. SDSU9 Plaza Scripps Terrace	26. USD4 Student Live Pavilion	27. USC1 Alumni Park
Aerial view				
General profile	Uni	Public-teaching	Private-catholic	Private - Research
	Camp type	Compact, 1897	Gated, 1949	Gated, Urban, Large, 1880
	Land	1.165 km²	0.728 km²	0.9146 km²
	Campus	0.44 km²	0.11 km²	0.56 km²
	Enr-acp%	34,828 – 35%	8,905 – 50%	36,487 – 16%
	Tition $	In 7,488 – Out 19,368	In&out 49,358	In&out 56,225
	Accom $	16,735	12,980	15,400
	End/Bud$	293 m / 894.2 m	530 m	5.1 b
Visit	No@hrs	8 ti @ 190 hrs	5 times & 54 hrs	2 times & 9 hrs
	T.Period	8 months	2 weeks	2 Days Morning/noon
Context	Area	8,050 m²	1,000 m²	6,400 m²
	Adjacents	Corridors/sports/education/library	Foodcourt, sports, 2 streets, parkyard	Campus plaza/childs way/Trousdale pkwy, Hellman way, Memorial library, VKC library, Memorial museum
	Heights	Scripps building 1 floor	3 floors	4 floors
	Enclosure	15% - Corridors then buildings 4 side	30% building 1 side	40% corridors then buildings 4 side
Physical features	Green	6700 m²	100 m²	100 m²
	Circu	1600 m²	700 m²	1000 m²
	Veg	2100 m²	25 m²	1700 m²
	Shade	1250 m²	1 tree & 10 umbrellas @ 165 m²	2,350
	Racks	N	10 m²	N
	Water	2 @ 215 m²	N	1 @ 70 m²
	Seats	NA	36 t & 130 ch & 2 beds	36 t & 130 ch & 2 beds
	Lights	102	5 posts	23 posts
	Signs	17	6	12
	arts	3	2	4
	Others	Pond, wild life, wood deck, bridge, ramps	Stage & stairs, campus sign	Prentiss memorial fountain, USC green logo, Flowers, clock, special lights
Duration	<20	50 (x10 = 500)	18 (x10 = 180)	34 (x10 = 340)
	20-40	41 (x30 = 1230)	9 (x30 = 270)	21 (x30 = 630)
	41-60	35 (x50 = 1750)	6 (x50 = 300)	17 (x50 = 850)
	>60	31 (x80 = 2480)	3 (x80 = 240)	6 (x80 = 480)
Av COS users		82,915	2,300	60,800
Density st / m²		1.13 st / m²	1.58 st / m²	0.97 st / m²
Frequency Fu		1.03	0.23	0.95
Duration Ds		1.23	1.65	0.59
Intensity Iu		2.86	2.53	*2.38*
Cost		270 $/ m²	220 $/ m²	250 $/ m²
ES-COS		**1.15**	**1.05**	**0.95**

Table 54: A sample of the earlier comparisons : Entries & Edges (COS-7) – SDSU & UC Berkeley & STANFORD & USF

Variables		28. SDSU10	98. SDSU11	30. UCB1	31. STAN2	32. USF1
		The Bridge (South gate)	SDSU Transit Plaza	Sather Gate-Rd & Upper Sproul Plaza	Stanford Oval / Palm Dr	Lone Mountain Main Building Gate
Aerial view						
General profile	University	Public-teaching	Public-teaching	Public-Research	Private-Research	Private-Research
	Cam type	Urban compact, large, 1897		Urban, large, 1868	Urban, Medium, 1885	Urban, Medium, 1885
	Land	1.165 km²	1.165 km²	4.986 km²	33.103 km²	0.2226 km²
	Campus	0.44 km²	0.44 km²	0.67 km²	1 km²	0.08 km²
	Enr - acp%	34,828 – 35%	34,828 – 35%	40,174 – 16%	16,914 – 5%	11,018 – 71%
	Tition $	7,488 – 19,368	In 7,488 – Out 19,368	In 14,098 – Out 42,112	In & outstate 49,617	In & outstate 46,250
	Accom $	16,735	16,735	17,274	15,112	14,330
	End / Bud$	293 m / 894.2 m	293 m / 894.2 m	4.1 b	22.4 b	297.5 m
Visit	No @ hrs	38 ti @ 190 hrs	38 ti @ 190 hrs	3 times @ 17 hrs	2 times & 14 hrs	1 time & 6 hrs
	T. Period	8 months	8 months	3 days	3 days	1 day
COS Context	Area	700 m²	3,300 m²	4,500 m²	18,000 m²	2,300 m²
	Adjacents	Entry, reception, st union, housing	Entry, st union, transit, cafes	Art studio, café, union, adm	Main entry, Palm dr, Serra mall, Parking	Ent, Turk blvd, Lone Mountain circle lot, parks
	Heights	3 floors	2 to 4 floors	2 to 4 floors	0 floors	0 floors
	Enclosure	5% Build 1 side	35% buildings 2 sides	35% buildings 2 sides	0% enclosed by str/parks	0% closed by fence/parks
Physical features	Green	N	850 m²	570 m²	16,700 m²	1700 m²
	Circu	610 m²	2800 m²	3500 m²	1300 m²	640 m²
	Veg	N	400 m²	500 m²	1000 m²	1700 m²
	Shade	N	850m² natural & structures	1300m² natural & structures	8 trees / 1250 m²	200 m²
	Racks	N	20 m²	25 m²	N	N
	Water	N	N	1 @ 35 m²	N	1 @ 5m²
	Seats	N	62 seats & decks	159 seats & decks	24 (6x4 wood decks)	N
	Lights	102	42	96	50	10
	Signs	N	16	44	2	4
	arts	N	3	9	S – campus green logo	USF logo, unique flowering
	Others	landmark	Bus stops/machine, skatings	unique trees, boards, flags	6 bins	2 gates, stair/rail, seeing deck
Duration	<20	7 (x10 = 70)	39 (x10 = 390)	182 (x10 = 1820)	100 (x10 = 1000)	32 (x10 = 320)
	20-40	0	22 (x30 = 660)	30 (x30 = 900)	35 (x30 = 1050)	5 (x30 =150)
	41-60	0	12 (x50 = 510)	8 (x50 = 400)	15 (x50 = 750)	1 (x50 = 50)
	>60	0	3 (x80 = 240)	3 (x80 = 240)	10 (x80 = 800)	0 (x80 = 0)
Avg COS users		20,790	30,030	176,400	12,600	2,070
Density st/m²		9.29 st / m²	6.17 st / m²	35 st / m²	0.24 st / m²	0.37 st / m²
Frequency Fu		2.97	1.02	3.92	0.07	0.09
Duration Ds		0.01	0.91	1.24	0.33	0.37
Intensity Iu		*0.39*	*2.44*	*8.61*	*2.36*	*0.33*
Cost		170 $/ m²	180 $/ m²	140 $/ m²	50 $/ m²	190 $/ m²
ES-COS		**0.23**	**1.35**	**6.15**	**4.73**	**0.18**

10.6 Appendix (06) : UOS Materials & Costs

Hardscape supplied a total area of 12,000m2 of materials, including a complex range of Kellen materials used in different patterns.

- Kellen Lavaro 50/200 × 200/600 x 80mm Wit, Zwart, Grijs and Rood paving
- Kellen Lavaro Wit 701 steps with Crystal Black granite inserts
- Kobra granite edgings
- Kobra and Poppy granite seating
- Kobra granite copings
- Royal White granite walling units with internal Crystal Black, Royal White, Cloudy White granites

Table 55: Lice of COS features, materials, and prices at UOS

Function	Name	Materials	Dimensions	No Required in	Supply price
Paving	Granite setts	Stardust Black Cloudy White Kobra (mid grey)	Various	Station Square	£59.00
	Granite Planks	Stardust Black Cloudy White Kobra (mid grey)	Various	Chapman Square	£54.00/m2
	natural stone aggregate concrete paving (type1)	Modular concrete paving	Various from 100 x 100 x 80mm to 1000 x 1000 x 140mm	Avenue and Broadwalk	£37.00 - £42.00/m2
	natural stone aggregate concrete paving (type 2)	Modular concrete paving	Various from 100 x 100 x 80mm to 1000 x 1000 x 140mm	Broadwalk and Newton Square	£25.00/m2
	Net land Dutch Pavers	Clay paving	Various	Adjacent to Peel Building	£42.00/m2
Seating	Bespoke circular granite bench	Cloudy white granite	External diameter - 4000mm Internal diameter - 2400mm	7 in Chapman Square	£10,000
	Bespoke Black Granite Bench	Stardust Black Flamed	1800 x 650mm	12 in Station Square and entrance to The Avenue	£1,060.00
	Rough and Ready Benches	Standard: FSC hardwood from certified European and South- American tree forestry plantations,	2340mm long x 600mm wide	12no. required for Newton Square 12no. required for The Avenue	£1,182
	Rough and Ready Circular Bench	Standard: FSC hardwood from certified European and South- American tree	Internal diameter 2200mm External diameter 3000mm	11no. for the Broadwalk	£5,108

		forestry plantations,			
Signage	'Legible London' Type Monolith	Vitreous enamel	To be confirmed	No. required	£4,925.00
	Campus Fingerpost	Bronze anodised aluminium post, finials and finger-slats	To be confirmed	7no. across the campus	£1,895.00
	Campus Wall Signage	Extruded aluminium outer casing	To be confirmed	5no. required	£2,100.00
	Wayfinding Paving	Royal white in stardust black granite	Various	No. required 50m2	£300/m2
Bins	Lb10 Litter bin	stainless steel	Internal diameter 220cm / external diameter 300cm	31no. required across the campus	£850
Bollards	Pass 275/P800 Stainless Steel Automatic Bollard	Stainless steel	Diameter - 275mm Height - 800mm	1no. at entrance to The Avenue	£23,000
	Static and manual retractable bollards	Stainless steel	154mm diameter	20no. across campus	£200
	Granite Bollard	Stardust black granite	400x400x800mm	20no. for Station Square 10no. for The Avenue 10no. for Newton Square 10no. for the Broadwalk	£192.85
Cycle Stands	Fin 600	Mild steel	800mm above ground 300mm below ground 1040mm width	To be confirmed	To be confirmed
Tree Grille	Portman Range	Mild steel	1475 x 745mm	To be confirmed	£462.00

10.7 Appendix (07) : COS-DI – The Observation Template

Table 56: COS-DI – The Observation Template

University/city		Type		Area		Students	Rank #
Week day		Date	.. / .. / ..	Visit Time	.. : ..	Duration	..min
Special ocasion		Weather		Period	□ Morning □ Lunch □ Evening		
COS name		Type		COS # …	**B1. Area**		**B2. Cost**
Notes / sketches				Map / location			

COS Description		North	South	East	West
External proximity					
Internal Landuse					
Surrounding Heights					
Access					
Design Features	*B3. Sitting*				
	B4. Enclosure				
	B5. Circulation				
	B6. intersection				
	B7. Vegetation				
	B8. Greenery				
	B9. Shade				
	B10. Site Furniture – *Water*				
	Bike racks				
	Light				
	Signs				
	Sculpture/arts				
	Stair/ramp				
	Others				

Space & Gate counts

Direction	*North*		*South*		*East*		*West*	
	N1 ent	*N1 exit*	*S2 ent*	*S2 exit*	*E3 ent*	*E3 exit*	*W4 ent*	*W4exit*
Pr Mr- Ln- Ev								
COS users	*Morning :*		*Lunch :*		*Evening :*		*Average :*	
Type	*Zone1 / Individual*		*Zone2 / Social*		*Zone3 / Programmed*		*Zone4 / Active*	
User counts	*Phone/laptop* *Study* *Meal* *Observe*		*Meeting* *Chatting* *Meal* *Grp study*		*Meeting* *Event* *Tour* *Class/Assi.*		*Walk/run* *Bike* *Play* *Rest*	
Total numbers								
Percentage %								
C1. Fu st/m²								
Duration	*Us < 20*		*20 < Us < 40*		*40 < Us < 60*		*Us > 60*	
Ind-Soc-Pro-Act								
C2. Ds st / m²	*x10*		*x30*		*x50*		*x80*	
C3. Iu st / m²								
ES-COS								

10.8 Appendix (08) : SDSU Observation Counts and Notes

Table 57: A sample of the earlier Gate Counts at SDSU-COS

SDSU - 1

Mode of movement	Peak Time	Gate 1		Gate 2		Gate 3		Gate 4		Gate 5	
		Ent	Exit	Ent	Exit	Ent	Exit	Ent	Exit	Ent	Exit
Walking	08:30 - 09:30	40	20	135	60	25	70	10	25	5	15
	12:00 - 13:00	200	110	535	240	130	310	90	185	60	85
	16:00 -17:00	180	130	470	210	150	250	80	200	75	90
PEAK AVERAGE / HOUR						ENT	730	EXIT	670	Total	1400

SDSU - 2

Mode of movement	Peak Time	Gate 1		Gate 2		Gate 3	
		Ent	Exit	Ent	Exit	Ent	Exit
Walking	08:30 - 09:30	95	70	300	80	390	185
	12:30 - 13:30	270	375	660	590	770	860
	16:30 -17:30	85	135	150	350	250	510
PEAK AVERAGE / HOUR		Ent	1125	Exit	1185	Total	2310

SDSU - 3

Mode of movement	Peak Time	Gate 1		Gate 2		Gate 3		Gate 4		Gate 5	
		Ent	Exit	Ent	Exit	Ent	Exit	Ent	Exit	Ent	Exit
Walking	08:30 - 09:30	360	200	185	110	230	400	160	55	40	180
	12:00 - 13:00	1000	910	405	690	815	1500	315	670	150	550
	16:00 -17:00	900	750	340	540	700	1250	180	500	120	420
PEAK AVERAGE / HOUR						ENT	5900	EXIT	3700	Total	9600

SDSU - 4

Mode of movement	Peak Time	Gate 1		Gate 2		Gate 3		Gate 4	
		Ent	Exit	Ent	Exit	Ent	Exit	Ent	Exit
Walking	08:30 - 09:30	65	160	15	40	235	50	15	10
	12:00 - 13:00	1000	550	250	160	1500	300	80	100
	16:00 -17:00	900	350	200	150	1300	280	65	50
PEAK AVERAGE / HOUR				ENT	2465	EXIT	830	Total	3295

SDSU - 5

Mode of movement	Peak Time	Gate 1		Gate 2		Gate 3		Gate 4	
		Ent	Exit	Ent	Exit	Ent	Exit	Ent	Exit
Walking	08:30 - 09:30	110	20	130	30	90	50	30	110
	12:30 - 13:30	70	50	70	60	70	50	50	80
	16:30 -17:30	70	90	60	110	40	150	150	60
PEAK AVERAGE / HOUR								Total	450

SDSU - 6

Mode of movement	Peak Time	Gate 1		Gate 2		Gate 3		Gate 4		Gate 5	
		Ent	Exit	Ent	Exit	Ent	Exit	Ent	Exit	Ent	Exit
Walking	08:30 - 09:30	310	170	115	70	120	370	70	35	40	180
	12:00 - 13:00	470	390	205	160	290	410	90	120	210	250
	16:00 -17:00	280	350	50	140	300	270	80	90	120	220
PEAK AVERAGE / HOUR						ENT	900	EXIT	800	Total	1700

Mode of movement	Peak Time	Gate 1				Gate 2			
		Ent		Exit		Ent		Exit	
Walking	08:30 - 09:30	490		20		20		490	
	12:30 - 13:30	290		380		380		290	
	16:30 -17:30	160		760		760		160	
PEAK AVERAGE / HOUR		Ent	750	Exit	1150			Total	1900

Table 58: SDSU Static Snapshots - Description of student experiences within the 7 COSs typologies

Experience Typology [4 ZONES]			COS Typology						
			SDSU-1	SDSU-2	SDSU-3	SDSU-4	SDSU-5	SDSU-6	SDSU-7
ZONE 1 - INTERACTIVE Cognitive / Personal	Studying / Reading / Relax	8:00 - 9:00	8	4	65	13		10	
		12:00- 13:00	38	22	385	68	7	120	0
		16:00-17:00	24	15	296	53		190	
	Eating, smoking, using tech. (phone / laptops)	8:00 - 09:00	9	11	110	18		18	
		12:00-13:00	64	29	530	120	23	265	24
		16:00-17:00	85	16	415	83		170	
INT Experience score / 25 Int user * 525hr * 1000 / Area * COS user * 0.25			**15** 35,000 * 525 / 3500 * 1400 * 0.25	**17** 16,000 * 525 / 850 * 2310 * 0.25	**8** 296,000 * 525 / 8400 * 9600 * 0.25	**7** 58,000* 525 / 5500 * 3295* 0.25	**6** 15,000 * 525 / 12150 * 450 * 0.25	**19** 124,000 * 525 / 8400 * 1700 * 0.25	**4** 24,000 * 525 / 7000 * 1900 * 0.25
ZONE 2 - COMMUNAL Social & Cultural	Group Meeting / Chatting	8:00 - 09:00	10	9	189	26		27	
		12:00 -13:00	74	34	1170	215	8	212	123
		16:00-17:00	48	20	875	135		179	
	Regular Event / visiting tours or guests	8:00 - 09:00							
		12:00 -13:00	50 / 7	400 / 7	420 / 7	380 / 7 Farmers	700 / 7	300 / 7	0
		16:00-17:00							
COM Experience score / 25 Com user * 525hr *1000 / Area * COS user * 0.25			**19** 44,000 * 525 / 3500 * 1400 * 0.25	**22.5** 21,000 * 525 / 850 * 2310 * 0.25	**19.5** 745,000 * 525 / 8400 * 9600 * 0.25	**14.5** 126,000 * 525 / 5500 * 3295 * 0.25	**3** 8,000 * 525 / 12150 * 450 * 0.25	**21** 143,000 * 525 / 8400 * 1700 * 0.25	**19.5** 53,000 * 525 / 7000 * 1900 * 0.25
ZONE 3 INStructive	Academic / outdoor project / Coaching	8:00 - 09:00							
		12:00 -13:00	16 garden	7	75	10	12	60	0
		16:00-17:00							
INS Experience score / 25 Ins user * 525hr * 1000 / Area * COS user * 0.25			**7** 16 * 525 / 3500 * 1400 * 0.25	**7.5** 7,000 * 525 / 850 * 2310 * 0.25	**2** 1,000 * 525 / 8400 * 9600 * 0.25	**1** 10,000 * 525 / 5500 * 3295 * 0.25	**4** 12,000 * 525 / 12150 * 450 * 0.25	**9,5** 60,000 * 525 / 8400 * 1700 * 0.25	**0**
ZONE 4 - ACTIVE Physical & Recreational	Walking through	8:00 - 09:00	400	500	950	185	20	200	440
		12:00 -13:00	1950	3950	9600	3850	450	1700	1900
		16:00-17:00	1600	3400	5700	3295	250	1530	1750
	Cycling / Skating	8:00 - 09:00	11	7	37	28	0	9	19
		12:00 -13:00	47	41	575	220	2	50	8
		16:00-17:00	90	65	780	370	1	67	12
	Playing	8:30-9:30							
		12:30-13:30	0	5	9	15	48	15	0
		16:30-17:30							
ACT Experience score / 25 Act user * 525hr * 100 / Area * COS user * 0.25			**18**	**23**	**22**	**21**	**23**	**20**	**24**
OVERALL Experience score % [INT + COM + INS + ACT]			**59 %**	**70 %**	**51.5 %**	**43.5 %**	**36 %**	**69.5 %**	**47.5 %**

Table 59: A sample of the earlier ranks & recommendations based on preliminary ES-COS of SDSU

Ranking of the SDSU COSs		Score	Design features related to the SDSU COSs
1 Courtyard		SDSU2 70%	Relatively small size, relatively small corridors, strong identity, Proximity to the students Union, active edges of the Plaza (x restaurants, y coffee shops, etc), less vegetation
2 Inspired		SDSU6 69.5%	Diverse trees, water, 50% shadowed area, ecological, wildlife, strong identity, deep connections to place
3 Quadrangle		SDSU1 59%	Access to surrounding educational buildings, more seats, poor maintenance
4 Mall		SDSU3 51.5%	Good access, intermediate location, access to scooter/bikes, unused Manchester hall area
5 Entries		SDSU7 47.5%	Opportunities to be SDSU significant landmark, need better design for the start and end nodes of bridge
6 Plaza		SDSU4 43.5%	Huge unused central plaza, central yet lost, more green, the main nodes should be improved to guide users easier through the campus, unfordable seating, lack water elements
7 Field		SDSU5 36%	Flexible site furniture (seats, shadows, sport equipment, etc) , More activities, less vegetation on edges, Poor maintenance

10.9 Appendix (09) : Overview of the budget models used in HE

Table 60: Overview of the 7 budget models used in HE (Hanover Research, Insights Blog, Apr2013)

	Budget	Definition	Benefit	Drawback
1	Incremental Budgeting	This is the most common type of budgeting. Budget proposals and allocations are based upon the funding levels of the previous year. Frequently, the amount of the budget increases by some fixed percentage, such as 5 or 10% of the prior year's amount.	- Easy to implement, easy to use to prepare a new budget. - Provides budgetary stability. - Allows universities to plan multiple years into the future, due to the predictability of the model. - Accepted by most governing boards. It is especially practical in situations of little budgetary flexibility and fairly fixed costs.	- Often criticized with limited vision, as it is difficult to determine where costs have been incurred and how these costs contribute to revenue and value creation. - It maintains the status quo and does not encourage planning. - It does not require any connection between allocation of resources and institutional goals (so must compare budget with the university's mission & strategic plan).
2	Zero-Based Budgeting	At the beginning of every budget planning period, the previous year's budget for each unit is cleared. Every part of university must re-request funding levels & all spending must be re-justified. This process is unfit for programs which are of a continuing nature - as are many programs in educational institutions. For example, a college will need to "teach out" students, even if a particular major is dropped. Sometimes is used for rethinking the nature of the program, or whether a particular course of study is still relevant to the students.	- Effective way of controlling for unnecessary costs and has the potential to make budget discussions more meaningful. All money allocated to a department-division-unit has a purpose, keeping waste &discretionary spending to a minimum. - Beginning at zero is seen as the best exercise to review discretionary overhead (instead of incrementing the new on the old).	- While conceptually attractive, it requires a great deal of managerial time to prepare and implement. It takes longer to prepare and may be too radical a solution for the task at hand. - Only few universities have the time or resources to redo their entire organizational financial plan on an annual basis.
3	Planning, Programming, Budgeting Systems (PPBS)	PPBS attempts to merge the strategic planning process with the allocation of funds. It is generally implemented by a top-down approach.	- Useful when focused on the benefit an activity will provide rather than on what resources are available to expend. That is only cut budget in a particular area if not tied to benefit. If budget is tied to the benefit then informing the decision-maker what benefit the organization must forego. - Highlights the importance of testing the long-range fiscal implications of the plan (future costs of an action). Long-range fiscal planning is important in retaining future flexibility & responsiveness.	- Very time consuming and therefore very difficult (even impossible) to implement unless you have a large staff and lots of time.
4	Centralized Budgeting or Executive Budget Model	The budgeting process is centralized in a specific office - commonly a vice president's office. This vice president is the one who submits the budget to the board. Requires all decision-making powers to be in the hands of upper-level administration.	- A prudent way to navigate difficult financial circumstances, due to the powers invested in top administrators to make tough decisions for the university. - Consideration of the entire needs of the organization.	- When budgeting is centralized, and the element of competition is removed, departments may be less motivated to generate revenue. - It is not a participatory model, and thus is unlikely to have buy-in from the cost centre managers

			- Consolidating and standardizing information. - Centralizing controls and procedures.	who will have to make the budget work effectively. Given that most middle-level managers today want input into decision-making, the executive budget model very seldom achieves success.
5	Performance-Based Budgeting Or Activity-Based Budgeting	Focuses on activities and their outcomes (as opposed to objectives) - specifically the historical performance of the team. Examples of indicators that might be used to measure past performance in an academic setting are the number of credits taught, the number of sections taught, the number of students in the program, the number of graduates, the number of graduates employed, etc. Awards financial resources to institutional activities that see the greatest return (in the form of increased revenues) for the institution.	- This method is rational, objective, and rewards performance characteristics the institution wants to encourage. It is primarily used as a top-down method of budgeting in hierarchical organizations. - Often imposed on public systems of education because of greater accountability demands. - Link the funding of public institutions to the results they deliver lends an increased level of transparency to expenditures among institutions. - Useful if the university can precisely state where revenues are coming from and link these revenues to broader strategics.	- Must include time for the review of performance measures (which itself necessitates a prior collection and analysis process) and time for discussion of performance against expectations. - The fact that quality indicators are difficult to identify. - Agreement on appropriate measurements for evaluation is difficult to accomplish. - The cause/effect relationship is usually complex and often difficult to measure. Thus quality indicators are often used as supplements to financial measures when evaluating the effectiveness of a cost centre or department.
6	Formula Budgeting	Creates a budget formula by estimating future budget requirements through the manipulation of data about future programs and by utilizing the relationship between the program and the cost. This method assumes that the past accurately predicts the future (formula is a cost analysis of past performance). Example: Budgets for typical class/space supplies are created by multiplying the historical cost of the materials per student times the number of users or average enrolments.	- Can be quite useful for some budget accounts where the expenditures are small and numerous, such as instructional supplies, or where the mathematical relationship is very consistent.	- If the data is inconsistent or the formula is an inaccurate summary of past history, then the estimate will not be reliable. - Stifles innovation and change. It assumes and encourages the status quo. - Because formula budgeting is so simple, it often is applied to circumstances where it is inappropriate.
7	Responsibility Centre Management	Designed to support the achievement of academic priorities within an institution and allows for a budget which closely follows those priorities. Each unit receives all of its own revenues and income (tuition fees, government supports where applicable), and responsible for their own expenses.	Solution to budgetary woes brought on by the recession.	Could cause deans to resort to inefficient measures to prevent students from enrolling in courses in other colleges.

Table 61: Types of Assessments associated with Indicators of succuss of Investment

Investment Indicators	Assessment	Success Depends on	Indicators	Evidence
Rental levels/returns Capital values	**The productivity view**	The attainment of the desired outputs and outcomes.	***Resource input variables:*** Pupil-teacher ratio Teacher training	*(Matthew Carmona, 2001;*

Management, maintenance, energy and security costs More lettable area (higher densities) Competitive masterplan developments Regeneration and public support for development Responding to university mission and demand Supplementing place marketing and differentiating places and their prestige Satisfactory/productive student experiences 'life giving' mixed-use experiences Investment opportunities (Confidence in development opportunities and attracting grant monies from both the public and private sectors).		Output, outcome and impact indicators	Teacher experience Teachers' salaries	*Cowan, 2002; Davies & Nutley, 2000; Golkar, 2005; Halpern, 1970; Häyrinen-Alestalo, Snell, & Peltola, 2000; Hough & Kratz, 1983; Lichfield, Barbanente, Borri, Khakee, & Prat, 1998; Marginson & Rhoades, 2002; McGrath, 2002; Nijkamp et al., 2013; Scheerens & Bosker, 1997; Voogd, 1988)*
	The instrumental effectiveness view	Instrumental potential of certain levels and forms of inputs and processes, *i.e.* their degree of association with performance. Context, input and process (outcome) indicators more dynamic handles for policy	***Organisational factors:*** Productive climate culture Achievement for basic subjects Educational leadership Monitoring Co-operation Parental involvement Staff development	
	The adaptation perspective	Critical analysis of educational goals. conditions that allow for change, labour market outcomes, cultural capital	**Instructional conditions:** Opportunity to learn Time on task/homework Monitoring at classroom level Aspects of structured teaching: (cooperative learning, feedback, reinforcement, adaptive instruction)	
	The equity perspective	Equal or fair distribution of inputs, processes and outcomes among participants in education with different characteristics		
	The efficiency perspective	Achieving the highest possible outcomes at the lowest possible cost		
	The disjointed view	Whether or not specified elements are performing in an acceptable way or at an acceptable level	Teacher training / Space sizes/capacities/ Acceptability of planning strategies according to norms of good practice	

10.10 Appendix (10) : Multi Criteria Methods

Different theories exist within the context of MCA methods, that can be described as follows:

A) Utility function theory or performance aggregation-based approaches: the utility-based theory includes methods synthesizing the information in a unique parameter. It was introduced during the 1970s by *Keeney and Raiffa (1976).*

B) Outranking relation or preference aggregation-based approaches: the outranking relation theory involves methods based on comparisons between pairs of options to verify whether "alternative a is at least as good as alternative b" *(Roy and Bouyssou 1993).*

C) Sets of decision rules: the decision rule theory originates from the artificial intelligence domain and it allows deriving a preference model through the use of classification or comparison of decision examples (Greco et al. 2001). Many applications of MCA exist in the field of sustainability assessment and a broad overview can be found in *Munda (2005), Huang. et al. (2011), Cinelli et al. (2014).*

D) Multi-Attribute Value Theory (MAVT): which seems a particularly promising line of research in the field of strategic planning and environmental decision-making *(Ferretti et al., 2014b; Ferretti and Comino, 2014).*

E) Social Network Theory (SNT): an interdisciplinary endeavour and the information used focuses on the relationships between pairs of stakeholders in a network *(Dente, 2015).* With reference to Multicriteria

E) Analytic Network Process (ANP): represents a theory of relative measurement on absolute scales of both tangible and intangible criteria based on both the judgement of experts and on existing measurements and statistics needed to make a decision *(Saaty, 2005).* By including dependences and feedback, the ANP is able to capture what happens in the real world, thus providing effective support for the kind of decisions needed to cope with the future. There are 2 possible ways for structuring ANP: the complex Benefits-Opportunities-Costs-Risks (BOCR) network and the Benefits-Costs (BC) network.

10.11 Appendix (11) : Data Excel Sheets

	University		University (General Description)									COS Description (Design features)									tions of stay /1 peak				Scores				Overall
	University	COS name	A1 University type	A2 Campus type	A3 Year	A4 university land	A5 Campus area	A6 No of UG FT Students	A7 Acceptance %	A8 University rank	A9 Avg Tuition (home+int)/2	B1 COS Area m²	B3 Seating %	B4 Enclosure %	B5 Circulation %	B6 Intersection /100	B7 Vegetation %	B8 Greenery %	B9 Shade %	B10 Site furniture %	<20 mins	20-40 mins	41-60 mins	>60 mins	C1 Frequency of	C2 Duration of stay	C3 Intensity of	B2 COS Cost	ES-COS
1	SDSU1	Hebner Mediterannean Garden	Public - Research (R2)	Urban - Compact. Scale : Large	1897	1.2	0.1	28,828	35	275	9,808	3750	32	90	28	0.9	22	70	15	28	107	33	21	8	0.5	0.3	0.9	60	1.32
2	SDSU2	Banana Quad	Public - Research (R2)	Urban - Compact. Scale : Large	1897	1.2	0.1	28,828	35	275	9,808	3500	20	70	37	0.8	6	57	12	20	116	42	11	4	0.5	0.3	0.8	55	1.25
3	USD1	Luncheon Immaculata Lawn	Private - Research (R2)	Urban - Compact & Gated. Scale : Medium	1949	0.7	0.4	8,905	50	156	36,050	1870	17	60	30	0.8	5	60	8	16	75	9	1	0	0.2	0.2	0.3	75	0.85
4	USD2	Bishop Maher Garden	Private - Research (R2)	Urban - Compact & Gated. Scale : Medium	1949	0.7	0.4	8,905	50	156	36,050	1680	11	75	35	1	22	62	38	15	46	5	2	1	0.1	0.2	0.2	70	0.56
5	SCU1	Art & Science Quad	Private - Catholic - Research (R2)	Urban - Compact & Gated. Scale : Small	1851	0.4	0.3	4,885	48	83	39,750	2400	15	55	40	0.9	2	56	8	37	40	4	0	0	0.1	0.1	0.1	95	1.11
6	UoL1	The Quadrangle	Public - Research	City (Civic university). Scale : Large	1881	0.4	0.2	22,735	77	27	13,875	3100	8	97	60	0.5	3	37	7	10	70	6	2	0	0.3	0.1	0.4	70	0.58
7	TUOS1	Durham Road Garden	Private - Research	City - Compact. Scale : Large	1828	0.4	0.1	19,610	84	22	13,875	1450	16	40	18	0.6	26	80	45	23	55	9	4	1	0.3	0.3	0.6	75	0.56
8	UOS1	Accommodation Quad	Public - Research	Urban - Compact. Scale : Large	1850	0.7	0.1	16,670	62	151	11,825	9500	18	40	6	0.1	3	94	6	5	24	0	0	0	0	0	0	40	0.41
9	UOS2	Central Quadrangle	Public - Research	Urban - Compact. Scale : Large	1850	0.7	0.1	16,670	62	151	11,825	950	20	25	70	1.4	20	56	15	20	32	5	0	0	0.7	0.2	0.9	80	0.61
10	SDSU3	Goldberg / Aztec Union	Public - Research (R2)	Urban - Compact. Scale: Large	1897	1.2	0.1	28,828	35	275	9,808	1250	48	95	75	1.9	20	5	63	62	300	80	35	7	1.1	2.1	3.2	100	0.97
11	SDSU4	Student Services East	Public - Research (R2)	Urban - Compact. Scale : Large	1897	1.2	0.1	28,828	35	275	9,808	1700	35	85	65	0.5	22	14	66	20	95	24	10	5	0.2	0.5	0.7	70	0.44
12	UCI1	Student Center & Event Services	Public - Research (R1)	Suburban. Compact. Scale: Large	1965	6	0.6	30,382	29	80	21,068	2200	50	93	38	1.8	5	5	60	60	318	87	20	7	0.8	1.1	1.9	80	0.58
13	POM1	Studio Art Hall	Private - Research (R2)	Suburban. Scattered. Scale: Small	1887	0.6	0.3	2,960	9	24	33,305	550	15	90	55	1.7	14	23	50	26	26	3	0	0	0.1	0.2	0.3	120	0.55

14	TUOS2	Firth Court	Private - Research	City - Compact. Scale : Large	1828	0.4	0.1	19,610	84	22	13,875	1400	15	100	23	0.4	10	73	2	25	33	8	1	0	0.2	0.1	0.3	85	0.27
15	SDSU5	Centennial Mall	Public - Research (R2)	Urban - Compact. Scale: Large	1897	1.2	0.1	28,828	35	275	9,808	12800	38	50	65	0.9	2	30	5	24	320	55	14	3	0.2	0.2	0.4	90	1.22
16	SDSU6	Campanile Mall	Public - Research (R2)	Urban - Compact. Scale: Large	1897	1.2	0.1	28,828	35	275	9,808	7000	27	89	58	1.1	7	20	20	40	350	95	30	8	0.7	0.4	1.1	98	1.98
17	UCSD1	Library Walk	Public - Research (R1)	Suburban. Scale : Large	1960	8.7	0.6	34,979	36	39	22,043	9170	40	48	74	0.3	6	12	6	22	315	36	6	2	0.3	0.2	0.5	75	0.68
18	UCSD2	Warren mall	Public - Research (R1)	Suburban. Scale : Large	1960	8.7	0.6	34,979	36	39	22,043	9500	10	85	68	0.5	10	28	8	15	230	32	9	2	0.3	0.1	0.4	68	0.63
19	UCR1	Shaded corridor of Tomas Rivera Library	Public - Research (R2)	City - Compact. Scale: Large	1954	4.9	0.2	22,055	57	192	21,018	1700	5	30	95	0.6	2	5	90	25	30	0	0	0	1	0.1	1.1	90	0.92
20	CHAP1	University Drive	Private - Christian Church - Research (R2)	Urban - Compact. Scale: Medium	1861	0.3	0.3	9,392	57	171	32,160	3500	22	85	60	0.8	23	38	10	25	41	3	0	0	0.3	0	0.4	100	1.46
21	MMU1	Jenjkinson Street	Public - Research	City (Civic University). Scale : Large	1970	0.2	0.1	24,726	71	126	12,375	2000	1	47	83	0.5	15	17	2	20	55	2	0	0	0.9	0.1	1	85	1.36
22	UOS3	The Avenue	Public - Research	Urban - Compact. Scale : Large	1850	0.7	0.1	16,670	62	151	11,825	4500	22	75	65	0.8	5	35	25	35	190	32	9	2	0.4	0.3	0.7	148	1.22
23	UOS4	Broadwalk 1	Public - Research	Urban - Compact. Scale : Large	1850	0.7	0.1	16,670	62	151	11,825	1200	0	75	99	0.3	0	1	62	3	18	0	0	0	0.8	0.1	0.8	105	0.55
24	UOS5	Broadwalk 2	Public - Research	Urban - Compact. Scale : Large	1850	0.7	0.1	16,670	62	151	11,825	5100	20	20	73	0.5	6	22	3	0	245	30	4	0	0.3	0.2	0.5	110	1.34
25	SDSU7	Sycamore Plaza	Public - Research (R2)	Urban - Compact. Scale: Large	1897	1.2	0.1	28,828	35	275	9,808	5700	10	65	80	0.2	3	10	18	15	80	6	1	0	0.3	0.1	0.4	75	0.72
26	USD3	Plaza De San Diego (Colachis Plaza)	Private - Catholic - Research (R2)	Urban - Compact & Gated. Scale: Medium	1949	0.7	0.4	8,905	50	156	36,050	10500	41	80	60	1.5	19	36	26	68	305	185	55	25	0.2	0.4	0.6	210	2.89
27	UCSD3	York Hall (Revelle) Plaza	Public - Research (R1)	Suburban. Scale : Large	1960	8.7	0.6	34,979	36	39	22,043	7300	18	75	75	0.5	3	18	5	30	295	50	10	2	0.5	0.2	0.8	85	0.75
28	STAN1	Stanford Main Quad	Private - Research (R1)	Urban - Gated. Scale : Large	1885	33	1	16,914	5	3	36,240	12900	15	99	83	0.5	10	17	17	12	228	4	0	0	0.2	0.1	0.2	65	0.94

29	UCLA1	Bruin Plaza	Public - Research (R1)	Urban. Scale : Large	1919	2.5	1.2	40,428	16	17	20,660	3530	18	80	84	0.4	14	13	25	20	350	58	12	4	1	0.6	1.6	75	0.33
30	UCR2	Student Commons & market street	Public - Research (R2)	City - Compact. Scale: Large	1954	4.9	0.2	22,055	57	192	21,018	6000	52	40	45	1.7	14	18	38	63	735	260	80	35	0.6	1.2	1.8	180	2.79
31	CHAP2	Attallah Piazza	Private - Christian Church - Research (R2)	Suburban - compact. Scale : Medium	1861	0.3	0.3	7,505	57	171	32,160	3300	23	72	59	1.2	14	38	23	35	110	10	3	0	0.2	0.2	0.4	140	1.41
32	TUOS3	Student Union	Private - Research	City - Compact. Scale : Large	1828	0.4	0.1	19,610	84	22	13,875	6800	12	78	63	0.8	5	25	36	38	265	35	7	3	0.3	0.2	0.6	130	1.48
33	MMU2	Brooks	Public - Research	City (Civic University). Scale : Large	1970	0.2	0.1	24,726	71	126	12,375	5800	18	50	40	0.7	5	60	4	32	210	20	3	0	0.2	0.2	0.3	80	1.37
34	UOS6	Chapman Square	Public - Research	Urban - Compact. Scale : Large	1850	0.7	0.1	16,670	62	151	11,825	8000	32	25	63	0.8	11	32	24	50	358	78	15	3	0.2	0.3	0.5	150	1.65
35	SDSU8	ENS Playfield	Public - Research (R2)	Urban - Compact. Scale: Large	1897	1.2	0.1	28,828	35	275	12,419	12150	1	65	5	0.1	1	95	1	4	55	5	0	0	0	0	0	35	0.26
36	UCLA2	Wilson Park & Janss Steps	Public - Research (R1)	Urban. Scale: Large	1919	2.5	1	40,428	16	17	20,660	17500	25	40	25	0.4	36	75	26	24	655	170	50	22	0.1	0.3	0.4	75	0.52
37	UCI2	Aldrich Park	Public - Research (R1)	Suburban. Scale: Large	1965	6	0.6	30,382	29	80	21,068	61000	36	35	16	0.2	33	83	25	12	650	230	100	45	0	0.1	0.1	70	1.24
38	SFSU1	SFSU Meadow	Public - Research (R2)	Urban - Compact. Scale: Large	1899	0.6	0.2	24,215	71	401	9,720	11600	20	30	18	0.5	32	80	26	8	178	27	13	2	0.1	0.1	0.2	60	0.64
39	UoL2	Abercromby Square Park	Public - Research	City (Civic University). Scale : Large	1881	0.4	0.2	22,735	77	27	13,875	8900	5	95	28	0.4	5	67	24	13	100	22	12	2	0.1	0.1	0.2	50	1.09
40	UOM1	Brunswick Park	Public - Research	City (Civic University). Scale : Large	1824 (Red brick univ	0.51 Sackville	0.3	26,967	56	9	14,625	6100	22	70	11	0.5	5	87	7	15	305	35	4	0	0.1	0.2	0.4	110	0.37
41	MMU3	All Saints Park	Public - Research	City (Civic University). Scale : Large	1970	0.2	0.1	24,726	71	126	12,375	7600	25	80	15	0.3	15	82	35	18	210	31	8	5	0.1	0.2	0.3	110	1.07
42	UOS7	Peel Park	Public - Research	Urban - Compact. Scale : Large	1850	0.7	0.1	16,670	62	151	11,825	77800	32	40	18	0.3	20	85	18	21	300	135	90	30	0	0.1	0.1	158	1.86
43	SDSU9	Plaza Scripps Terrace	Public - Research (R2)	Urban - Compact. Scale: Large	1897	1.2	0.1	28,828	35	275	12,419	8500	45	15	38	1.6	42	55	60	52	450	240	140	45	0.1	0.9	1	110	2.31

44	UCSD4	Challenge Course	Public - Research (R1)	Suburban. Scale : Large	1960	8.7	0.6	34,979	36	39	22,043	7700	10	0	25	0.1	18	82	14	30	50	15	10	10	0	0.1	0.1	40	0.23
45	USD4	Student Live Pavilion	Private - Catholic - Research (R2)	Urban - Compact & Gated. Scale: Medium	1949	0.7	0.4	8,905	50	156	36,050	1500	38	30	57	1.6	15	26	28	42	185	20	6	2	0.3	0.7	0.9	115	1.21
46	UCR3	Picnic Hill	Public - Research (R2)	City - Compact. Scale: Large	1954	4.9	0.2	22,055	57	192	21,018	6550	28	80	25	0.4	40	90	68	15	30	15	8	8	0	0.1	0.1	60	0.49
47	USC1	Alumni Park	Private - Research (R2)	Urban - Gated - compact. Scale : Large	1880	0.9	0.6	36,487	16	66	29,995	6500	23	40	40	0.8	15	60	22	20	138	30	17	5	0.3	0.2	0.4	145	0.3
48	PLNU1	Sunset Deck (on the campus mall)	Private - Research (R2)	Urban - compact. Scale : Small	1902	0.1	0.2	3,595	69	345	33,170	1500	38	50	40	1.1	25	35	10	20	24	7	2	0	0	0.1	0.2	125	0.95
49	UOS8	Faith-centre Square	Public - Research	Urban - Compact. Scale : Large	1850	0.7	0.1	16,670	62	151	13,275	250	30	25	45	2.1	24	25	15	24	98	2	0	0	0.5	1.4	1.9	120	0.26
50	SDSU10	The Bridge (South gate)	Public - Research (R2)	Urban - Compact. Scale: Large	1897	1.2	0.1	28,828	35	275	12,419	800	0	1	100	0.2	0	0	1	10	26	0	0	0	1.6	0.1	1.8	115	0.38
51	SDSU11	SDSU Transit Plaza	Public - Research (R2)	Urban - Compact. Scale: Large	1897	1.2	0.1	28,828	35	275	12,419	3300	30	35	70	1	15	30	25	38	380	70	8	2	0.9	0.7	1.6	125	1.26
52	UCB1	Sather Gate-Rd & Upper Sproul Plaza	Public - Research (R1)	Urban - Compact. Scale: Large	1868	5	0.6	40,174	16	34	20,530	7000	22	35	75	1.3	17	26	25	45	670	170	12	3	1	0.6	1.6	1115	0.09
53	STAN2	Stanford Oval / Palm Dr	Private - Research (R1)	Urban - Gated. Scale: Large	1885	33	1	16,914	5	3	36,240	18000	25	0	7	0.3	12	93	7	12	180	17	2	0	0	0	0.1	45	0.76
54	USFCA1	Lone Mountain Main Building Gate	Private - Research (R2)	Urban. Scale : Medium	1855	0.1	0.1	5,852	71	156	35,970	11000	10	0	15	0.3	65	75	25	15	21	0	0	0	0	0	0	130	0.99
55	UOS9	Campus-Crescent Entrance	Public - Research	Urban - Compact. Scale : Large	1850	0.7	0.1	16,670	62	151	11,825	9700	10	40	35	0.7	13	60	8	20	115	20	5	0	0.1	0.1	0.2	95	1.06
56	UOS10	Station Square	Public - Research	Urban - Compact. Scale : Large	1850	0.7	0.1	20,289	62	151	11,825	2100	2	25	92	0.5	2	5	2	4	24	0	0	0	0.3	0	0.3	50	0.59

10.12 Appendix (12) : List of Publications

Conference proceedings

Gabr M., Heysham N., Farzin M., Iheme M., and Adeniyi I. (2019). The Development of a GIS-Based Model for Assessing Universities Outdoor Space Design. Sustainable Built Environment (SBE) 2019 Seoul Smart Building and City for Durability & Sustainability; Dec 12-14, 2019.

Gabr M., Elkadi H., and Trillo C. (2019). Recognizing greenway network for quantifying students experience on campus-based universities: Assessing the campus outdoor spaces at San Diego State University. Proceedings of the Fábos Conference on Landscape and Greenway Planning 6 (1), 51.

Presentations

Gabr M., Elkadi H., and Trillo C. (2018). The Effectiveness of University Campuses to Enhance the Student Experience. PLACE 2018, University of Alberta, Canada.

Gabr M., Elkadi H., and Trillo C. (2018). Exploring Innovation in Campus Outdoor Spaces: Lessons from Leading US Universities. SPARC 2018, University of Salford.

Gabr M., Elkadi H., and Trillo C. (2018). The Effectiveness of University Campuses to Enhance the Student Experience (Poster presentation). SPARC 2018, University of Salford.

Gabr M., Elkadi H., and Biscaya S. (2017). Utilizing Innovation potentials on Campus Outdoors - For the Development of the University of Salford. IPGRC 2017, University of Salford.

Gabr M., Elkadi H., and Biscaya S. (2017). Re-interpretation of the Contextual Values. Innovative Campus Outdoors as a Platform for Enhancing the Student Experience in UK Higher Education Sector (Poster presentation). IPGRC 2017, University of Salford.

Gabr M., Elkadi H., and Trillo C. (2017). Campus Spaces as Actors of Innovation: Recognising the Campus Outdoor Physical Environment as Cognitive Typologies to Outfit the Student-Community Innovation (Session Talk). SPARC 2017, UOS.

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