

Proceedings of the  
**Salford Postgraduate Annual  
Research Conference**  
(SPARC)  
2012

## Proceedings of the Salford Postgraduate Annual Research Conference (SPARC) 2012



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## Preface

Now in its 14<sup>th</sup> year, the Salford Postgraduate Annual Research Conference (SPARC) is a well established platform for showcasing research and exchanging ideas. Open to postgraduate researchers in all disciplines and at all stages of research, the conference offers participants the opportunity to discuss works in progress, receive feedback, and practise presenting in a supportive, academic environment, gaining valuable professional skills in the process. With a significant number of delegates drawn from other universities in the region, SPARC also provides students with excellent networking opportunities and a forum for critical discussion within the North West postgraduate research community.

Since its early days, SPARC has grown from a modest in-house conference to a large two day event. The 2012 conference, which took place on 30 and 31 May 2012, was no exception. It brought together over 130 student presenters and 200 delegates drawn from 14 universities. The 21 papers included in these selected proceedings provide a good indication of the impressive breadth of subjects areas covered at the 2012 conference, from Art, Social Sciences and Business, through to Engineering, Computing, Built Environment and Health Sciences. These extended papers here are from researchers who presented 15 minute presentations at the event, as part of 26 themed parallel sessions. In addition, several students presented their research through posters or high impact, five minute speed presentations. Abstracts from all presenters are available online on the conference website.<sup>1</sup> Experimenting with different presentation formats is just one way in which the conference has embraced innovation and sought to respond to the changing nature of academic conferences, and to the increasing need for researchers to communicate their work effectively to wide audiences, often outside their immediate specialism. As well as speed presentations, the conference has, in recent years, introduced PechaKucha and Three Minute Thesis competitions, 60 second pitches for posters, student-led workshops, and also encouraged participation from split-site and part time students presenting remotely through web streaming technology. The format of the proceedings has also changed to encourage wider availability. Since 2009, the proceedings have been freely available to download from Salford's institutional repository while hard copies can be obtained through print-on-demand online publishers. The open access ethos is very much in keeping with the spirit and aims of the conference, to share knowledge and encourage discussion.

SPARC is not only about sharing individual research projects and new discoveries, important though this is. The programme is also designed to encourage participants to reflect on the practical processes involved in the PhD journey and beyond. Research assessment, academic digital identity, getting published, and launching a career were just some of the topics covered in the two days of talks, panel discussions and workshops that helped make up SPARC 2012. Reflecting on such issues is valuable as it helps students to share common experiences with others, reflect on the broader communities of research to which they belong, plan their own professional identity within those communities, and identify and articulate the valuable transferable skills that are being honed throughout the PhD process. SPARC is just one event in a year-round calendar of training and development opportunities for early career researchers at Salford but its scale, cross disciplinary and cross institutional nature, combined with the commitment, enthusiasm and quality of its student presenters ensure that it remains a thoroughly engaging and rewarding highlight of the year for all involved.

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<sup>1</sup> See <http://www.salford.ac.uk/research/postgraduate-research/sparc/sparc-2012>

On behalf of the conference committee, we hope that you enjoy reading these papers, and that this publication encourages you to get involved in some way in future research conferences at Salford. More information about SPARC past and present and about other opportunities offered through Research and Innovation can be found online.<sup>2</sup>

**Dr Victoria Sheppard**

Chair of SPARC 2012 Conference Committee

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<sup>2</sup> The SPARC conference site is available here: <http://www.salford.ac.uk/research/postgraduate-research/sparc>  
Details of researcher training and development at Salford are available here:  
[http://www.pg.salford.ac.uk/pg\\_training](http://www.pg.salford.ac.uk/pg_training) and here <http://www.salford.ac.uk/research/our-vision/concordat>

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# Dexter: Psychopathic Monster, or Rational Response to Bewildering Modernity?

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## Abstract

Over the last 100 years or so, the figure of the psychopath has become increasingly central to fictional depictions, perhaps as a result of humankind's enduring fascination with narratives of monstrous villainy. Representations have made the transition from depictions of the psychopath as fiendish 'other', such as Dostoyevsky's Svidrigailov, to modern portrayals of the psychopathic murderer as hero, as portrayed in Jeff Lindsay's series of 'Dexter' novels. Lindsay offers a unique perspective on this trajectory in that he places his psychopath in the central, heroic role, thus subverting traditional morality. My paper will explore cultural fascination with the psychopath and question what the romanticisation - and the audience's ultimate acceptance - of this figure reveal about cultural responses to transgression within contemporary society. I will focus predominantly on the series of 'Dexter' novels but also examine the popular TV series for evidence of wider cultural trends.

Dexter is the embodiment of Kristeva's notion of the 'criminal with good conscience...the killer who claims he's a saviour' (1982, p.4). His actions are cast not as the indefensible deeds of an unknowable fiend, but as a rational response to bewildering modernity. This phenomenon, I suggest, emanates from the mainstreaming of deviancy in popular culture, a process which leads, ultimately, to the acceptance of characters like Dexter. I will examine this dramatic renegotiation of the rhetoric of 'evil' in Lindsay's novels, exploring the points of congruence and divergence between the novels and the TV series to ascertain what they reveal about twenty-first century society.

## Keywords:

Psychopath; Dexter; Modernity; Murder; Society.

If a society's interests are revealed in its literature, then wickedness and villainy must be amongst humankind's most enduring fascinations. Stories of transgression and monstrosity abound, from the earliest surviving works of Old English to the narratives of the modern day. And whilst literary treatments have changed in keeping with cultural developments, the appeal seems undiminished. Indeed, such is our interest in the darker side of human nature that contemporary popular culture abounds with anti-heroes whose actions are illegal and morally wrong, but who are cast as the heroes in the narratives they inhabit. Dexter Morgan, everybody's favourite serial killer, has become the poster boy for this curiously modern phenomenon and this paper will explore the cultural, social and psychological drivers for the emergence of such a character.

Dexter is the hero of a series of novels by Jeff Lindsay, and he has also been immortalised in the popular Showtime television series which bears his name. He is the embodiment of Kristeva's notion of the "criminal with good conscience...the killer who claims he's a savior" (1982, p. 4); the novels and the series plumb deep psychological territory, exploring sadism and conceptions of humanity. Structurally, Dexter occupies the role of the hero but, as a serial

killer who only kills other serial killers, he creates in the reader an unsettling ambivalence as we struggle to decide whether he is a monstrous, murderous psychopath, or a heroic avenger bringing justice to the streets of Miami. Dexter clearly is a psychopath; a cold and calculating predator, devoid of the empathy, remorse and self-awareness that are the usual markers of humanity. And his acts *are* monstrous — he stalks, abducts, tortures, kills and dismembers other human beings. Yet, as Stephanie Green notes:

a psychological ratification [is not] necessary for the story, since it is the way [*Dexter*] manipulates our attraction and revulsion as we engage with the subjectivity of a serial killer that is foregrounded (Green, 2011: 29).

Lindsay's novels (and the subsequent Showtime television series) mark the latest evolution of the serial killer genre in that they tell their story from the point of view of a killer who is friendly, charismatic, and — horror! — quite a lot like us. The texts explore the quotidian horrors and injustices of modern life and position the killer as a force for good. The first person narration of Lindsay's novels and intradiegetic narration in the series place the reader and viewer in close proximity to Dexter. This encourages us to identify with him and blurs moral boundaries to the point where the psychopath is no longer an inhuman and shadowy figure, but a recognised member of society. Significantly, Dexter's dual status as psychopathic killer and avenging angel forces us not only to question his version of humanity, but also to re-evaluate our own conceptions of good and evil.

Socially and culturally contingent, conceptions of evil have changed over time, varying from Plato's view of evil as the absence of goodness, to Freud's understanding of evil as a manifestation of the universal destructiveness at the core of human instinctual life (Stolorow, 2012). When confronted with a figure like Dexter, who challenges commonly held beliefs about the binary nature of good and evil, we are forced to address our moral and philosophical understanding of evil and consider what place there is within it for Dexter's particular brand of righteous transgression. Key to this is the consideration of the wider society that Dexter operates in. Miami (referred to by Dexter as Dahmerland, because of its bloodthirsty inhabitants and high unsolved murder rate) exemplifies Hannah Arendt's (1963) conception of the banality of evil. Edward S. Herman explains that the phenomenon relies on "normalizing the unthinkable", which is "the process whereby ugly, degrading, murderous, and unspeakable acts become routine and are accepted as 'the way things are done'" (1995: 97). In Dexter's Miami, violence and aggression are a way of life and this is nowhere more apparent than on the city's roads, where homicidal drivers pull dangerous manoeuvres, whilst screaming and shouting abuse at one another. Such behaviour is commonplace and mundane to the extent that when Dexter loses sight of the Ice Truck Killer's refrigerated truck during a hot pursuit, he begins to wonder whether it was actually the killer he had seen, or:

simply a stoked-up delivery boy playing macho head games with the only other driver on the road that night. A Miami thing that happened every day to every driver in our fair city. Chase me, you can't catch me. Then the uplifted finger, the waved gun, ho-hum and back to work (Lindsay, 2004: 85).

With "ugly, degrading, murderous, and unspeakable acts...routine...and accepted" (Herman, 1995: 97) in Miami, Dexter's own behaviour seems somehow less shocking. There is a strong sense that Miami functions as a microcosm for American society as a whole, with its lawless, licentious selfishness merely a symptom of modernity. In Lindsay's books and the TV show alike, Miami highlights contemporary fears about the breakdown of society, increasing levels of violent crime and the inability of the judicial system to deal effectively with those who offend. As Christiana Gregoriou notes in her thesis on contemporary American crime fiction, "there is a tendency to view America as grotesque, as a hellish vision of almost uncontrollable perversion, greed, and weakness" (2007: 103). The opening scenes of Season One, Episode One of Showtime's *Dexter* make this explicit — as Dexter drives through the



streets of Miami at night, the viewer is presented with a bewildering array of blurred, fast-moving images of decadence and consumption. The elaborate travelling shot works to make the viewer feel as alienated as Dexter and has the added effect of aligning us more closely with the titular hero, thus increasing our identification with, and empathy for, the killer.

This withdrawal from Miami society reflects the increasingly insular nature of modern life. Widened access to further and higher education plus improved transport have led to increased social mobility (in both a financial and geographical sense), meaning that many people live apart from their extended families. Long working hours and a culture of privacy mean we have less contact with friends, family and neighbours than previous generations. Even technology has had an impact — a telephone in every house (not to mention mobiles in every pocket) equals less face-to-face contact, whilst the advent of SMS and instant messaging has seen us texting rather than speaking to one another. The amazing popularity of social media such as Facebook has heightened the phenomenon — a person may have more than 200 people in their ‘friends’ list but not see any of them in person over the course of the average week. Add to this increasing hours spent in front of the television or playing videogames, and it is easy to see how disengagement has become a feature of modern life. Significantly, violence is also a deeply embedded part of modern culture, be it via television programmes, images from the ‘War on Terror’ or violent videogames — the unthinkable is being normalized in our living rooms on most days of the week. For Christopher Ryan, this is deeply worrying as:

the numbness to others’ pain, the anti-empathy that allows Dexter to dispassionately kill people...is something we all share, to an increasing degree. It’s a numbness that spreads in us as we progressively disengage from tangible life and death in favour of the virtual. (2010: 255)

Increasing insularity and exposure to heightened levels of violence have affected our empathic abilities. We are inured to the horrors of modern life, ready to accept not only monsters like Dexter but also our own complicity.

The question of complicity is an interesting one, particularly when considered in relation to post-9/11 America. The 2001 attacks have had a deep and lasting impact on the American psyche, highlighting as they did the vulnerability of a nation which had considered itself invincible. In the space of a single morning, the national mood changed from self-confident ebullience to fear and paranoia. In psychoanalysis, such a colossal, unexpected event results in trauma, as the subject is unable to assimilate the facts of what has happened. Robert D. Stolorow explains that:

the essence of emotional trauma lies in the shattering of...the *absolutisms of everyday life*, the system of illusory beliefs that allow us to function in the world, experienced as stable, predictable, and safe. Such shattering is a massive loss of innocence exposing the inescapable contingency of existence on a universe that is chaotic and unpredictable and in which no safety or continuity of being can be assured. Emotional trauma brings us face to face with our existential vulnerability and with death and loss as possibilities that define our existence and loom as constant threats. (2011, n.p.)

A typical psychic response to the shock of such trauma is a desire to reorientate oneself within the world via attempts to restore some of the lost illusory beliefs, through the creation of what Stolorow terms a ‘resurrective ideology’ (ibid.). However, Stolorow warns that in the aftermath of collective trauma, the rhetoric of evil — evil used to serve ideological purposes — can seem particularly appealing. In post-9/11 America, the key focus of resurrective ideology was the restoration of the country’s confidence, safety and supremacy, plus a

heightened desire for retribution. Within popular culture, this led to a proliferation of antiheroes like Dexter or *24*'s Jack Bauer both of whom worked within the system — Miami PD and the Counter Terrorism Unit respectively. They each used extra-legal means to achieve their ends and could protect Americans from harm and reinscribe the status quo. Acceptance of such figures depends on our approval of the resurrective ideologies that they offer. Lindsay's Dexter offers readers a vigilante hero who can rid society of the threats the judicial system is unable to neutralise; significant, perhaps, in a culture fretting over previously unimaginable dangers. For Joshua Alston (2009, n.p.), this vogue for antihero worship can be attributed to the post-9/11 political climate. He cites the Iraq war as being a key motivator for narratives exploring people doing bad things for good reasons:

in the midst of a war started with faulty intelligence, suspected terrorists sent to black sites and a domestic eavesdropping program, it's no wonder we would be interested in delving deeply into the true motives underlying the actions of powerful people.

For many, awareness of our complicity in this violence-for-the-greater-good — and the moral ambivalence it creates — is a large part of Dexter's appeal, both on the page and on screen. The texts force us to question our relationship with Dexter and query what our response to him reveals about our own true natures. This places us in an uneasy hinterland, torn between enjoyment of the texts and our understanding that murder is rarely justifiable. We valorise Dexter because he offers a solution to the most monstrous excesses of modern life. He eradicates the worst of the worst; the paedophiles and killers who prey on the weak, vulnerable and innocent and who have somehow escaped conventional justice. The victims are people like us and our children, and the crimes against them are so heinous, meaningless and vile that Dexter, by contrast, appears as a (our) saviour. This is why Lindsay is so significant when considered in relation to the trajectory of the fictional psychopath — he creates a situation where we can empathise with murder. The vigilante logic leaves Dexter with no choice but to take the law into his own hands. And we agree with this logic — he kills for us. We want him to kill the paedophile priests, the makers of snuff movies and the ruthless, murderous drug dealers as it is our way of fighting back against those who threaten us, and our families, and who make us feel powerless in real life. Although we could not condone Dexter's actions in actuality, within the protective frames provided by the novel or the TV screen, they appear as a necessary means of restoring order and getting results. Dexter supplies an alternative justice more effective and more fitting than the state-administered justice which appears flaccid by comparison. Dexter is vital, in both senses of the word. His drive towards death makes him seem more full of life; he is not restricted, stultified, as we and his fictional peers are. He is raw, animalistic and somehow very real. He performs a vital function in a floundering, chaotic society where the individual is encouraged to view him- or herself as more important than society as a whole. Yet the paradox of such extreme individualism is that the dominant fictions and supporting structures of society keep the individual constrained, as notions of 'common decency' and accepted morality demand that we do not acknowledge, let alone exercise, our darker impulses. Dexter, then, must act for us. We don't need to question Dexter's actions too closely, as he constantly judges himself. Via his frequent references to himself as a monster, he supplies the normative moral response and leaves us to ponder the more nuanced picture of right and wrong that the fictions present. The fact that he is a serial killer, who we are empathising with and mentally encouraging, can be easily overlooked provided that we focus instead on the texts' moral framework: the 'Code of Harry'.

The 'Code of Harry' is the set of rules given to Dexter by his foster father, Harry. Realising that Dexter's pathological urge to kill could not be suppressed, Harry decided to channel his son's impulses for the public good, by ensuring that he only killed other killers.

*Be careful*, Harry said. And he taught me to be careful as only a cop could teach a killer.

To choose carefully among those who deserved it. To make absolutely sure. Then tidy up. Leave no traces. And always avoid emotional involvement; it can lead to mistakes (Lindsay, 2004: 41).

The Code is what makes Lindsay's rhetoric of evil so compelling and acceptable. It positions Dexter as a force for good rather than a psychopathic murderer, thereby absolving the reader of any guilt they may (or should) feel at enjoying representations of violence and engaging with a serial killer. This process reduces what psychologists refer to as *cognitive dissonance*. As Jacovina et al. explain, "[c]ognitive dissonance occurs when people hold two conflicting ideas simultaneously" (2010: 236), in this case support for the actions of a fictional serial killer and an understanding that multiple murder can never be justified in real-life. Dissonance is uncomfortable but readers can reduce it by "conveniently glossing over the fact that Dexter kills to sate his thirst for murder" (ibid: 239), rather than a desire to do right, and focusing instead on the Code. Reducing dissonance in this way makes Dexter more sympathetic and underscores the righteousness of his rhetoric of evil, thereby validating the reader's and viewer's decision to follow it.

Although dissonance is unpleasant, Jacovina et al. tell us that it "is accompanied by a strong state of arousal...[which] within the context of a narrative...may actually be pleasurable" (2010: 240). Furthermore, "[w]hen people read for entertainment, higher levels of arousal are related to higher levels of enjoyment" (241). Despite the discomfort, then, it appears that readers enjoy the experience of dissonance and perhaps even actively pursue it by engaging with this kind of material. The suggestion of pleasure/pain brings to mind Lacan's concept of *jouissance*. In general usage *jouissance* refers to pleasure, but for Lacan it is "a way of referring to anything which is too much for the organism to bear... too much excitation, stimulation, or, perhaps, much too little" (Leader, 1995: 140). It can indicate a breaking of boundaries or a connection beyond the self, and also implies a desire to abolish the condition of lack. In the context of Lindsay's novels, the reader's *jouissance* is prompted by the conflict between our acceptance of Dexter (and his murders) and our conviction that his actions could never be condoned in real-life; we are moved to overcome our distaste at Dexter's moral bankruptcy and predatory nature and side with him, temporarily denying our usual beliefs. As Dexter's colleagues, in pursuit of the 'Bay Harbour Butcher', come close to catching him, we find ourselves in a fraught state — tacit acknowledgement of our own guilt and their function as an externalised superego. Our *jouissance* is consolidated by our decision to break the societal taboo surrounding murder so that we may identify with and accept Dexter.

In Seminar 17, Lacan also refers to *jouissance* as "the path toward death...a discourse about masochism" (2007: 18) – fitting, and perhaps significant, when considered alongside our tortured relationship with modernity's favourite fictional serial killer. The dissonance created by our acceptance of Dexter results in what Freud (1961) termed "moral masochism", as our reasoning, law-abiding ego comes under attack from our aggressive and sadistic superego. Significantly, this

turning back of sadism against the self regularly occurs where a *cultural suppression of the instincts* holds back a large part of the subject's destructive instinctual components from being exercised in life" (Freud, 1961:170, original emphasis).

In denying our own sadistic urges and vicariously enjoying Dexter's instead, we are subconsciously turning these urges against ourselves. Such masochistic behaviour ratchets instinctual tension up to titillating levels so we may embrace the pleasure/pain of the resultant *jouissance*. For the reader or viewer of transgressive texts such as *Dexter*, the masochism lies

in the dissonance created by our identification with Dexter's Dark Passenger, the primal and irresistible drive within him that compels him to commit his murderous acts. Although hopefully few of Lindsay's readers wish to slaughter other human beings, the struggle between the light and dark sides of the self is common to all. Our vicarious enjoyment of the dark doings of Dexter's unleashed id represents a seemingly risk-free way of exercising our own Dark Passenger, with the mediating frames of the novel and TV screen allowing us to distance ourselves from the conscious and subconscious drives being explored. Yet the process is not without its hazards. Moral masochism destroys moral consciousness, eroding our sense of right and wrong and making it easier for us to accept characters like Dexter. And, as Freud points out (*ibid.*),

[i]ts danger lies in the fact that it originates from the death instinct and corresponds to the part of that instinct which has escaped being turned outwards as an instinct of destruction

The *jouissance* we feel as the process plays out arises from the experience of enduring punishment and pain simultaneously with pleasure. This moral masochism alleviates the guilt we feel at enjoying representations of violence, helping us to disavow our own dark selves and deny our complicity in Dexter's actions. Taking pleasure from transgression in this way also offers reassurance to the beleaguered modern reader or viewer. Like Dexter, we too can feel adrift and alienated in a bewildering, fast-paced and aggressive modernity that at times seems to be spinning out of control. Our consumption of texts such as *Dexter* suggests transgression as a means of reinscribing the dominant social order. The masochistic pleasure we take from engaging with Dexter fetishizes our submissive role in society, thereby reinforcing the moral interdictions that suppress our destructive instincts.

The power of Lindsay's creation lies in his ability to simultaneously challenge and support the dominant fictions of society. The reader or viewer is radically split when dealing with Dexter. It is impossible to inhabit a single subject position — we are Dexter, the righteous avenger ridding society of the killers and paedophiles who threaten us and our children; we are also Dexter's victims' victims, the weak, powerless and downtrodden who are preyed on in a chaotic, nihilistic modernity. Dexter, then, is more than a dramatic monster or an expression of zeitgeist. He is the embodiment of our darkest desires and of our deep need to shore up the flagging social structures of the twenty-first century.

## References

- Alston, J., 2009. Too Much of a Bad Thing. *Newsweek*, [online] Available at: <http://www.thedailybeast.com/newsweek/2009/01/03/too-much-of-a-bad-thing.html> [Accessed 15 May 2012].
- Arendt, H., 1963. *Eichmann in Jerusalem: A Report on the Banality of Evil*. 2006. New York: Penguin.
- Brown, Simon and Stacey Abbott, 2010. *The Art of Sp(l)atter: Body Horror in Dexter*. In: D. Howard, ed. 2010. Ch.15.
- DePaulo, Bella, ed, 2010. *The Psychology of Dexter*. Dallas: Smart Pop.
- Freud, Sigmund, 1961. *The Standard Edition of the Complete Psychological Works of Sigmund Freud Volume XIX (1923-1925)*. 2001. London: Vintage.
- Freud, Sigmund, 1961. The Economic Problem of Masochism. In: *Complete Works of Freud Volume XIX*.
- Green, S., 2011. Dexter Morgan's Monstrous Origins. *Critical Studies in Television: Scholarly Studies in Small Screen Fictions*, Vol. 6. No. 1 (Spring 2011):pp. 22-35.

- Gregoriou, Christiana, 2007. *Deviance in Contemporary Crime Fiction*. 2009. London: Palgrave Macmillan.
- Herman, E.S., 1995. *Triumph of the Market: Essays on Economics, Politics, and the Media*. Boston: South End Press.
- Howard, D.L., ed. 2010. *Dexter: Investigating Cutting Edge Television*. London: I.B. Tauris & Co. Ltd.
- Jacovina, M.E. et. al., 2010 Dexter! Kill! Kill! In: B. DePaulo, ed. 2010. Ch. 17.
- Kristeva, J., 1982. *The Powers of Horror: An Essay on Abjection*. New York: Colombia UP.
- Lacan, J., 2007. *The Seminar of Jacques Lacan Book XVII: The Other Side of Psychoanalysis*. 1969-1970. Trans. Russell Grieg, 2007. New York: Norton.
- Leader, D. & Groves, J., 1995. *Lacan for Beginners*. Cambridge: Icon Books Ltd.
- Lindsay, J., 2004. *Darkly Dreaming Dexter*. London: Orion.
- Ryan, C. Being Dexter Morgan. In: B. DePaulo, ed. 2010. Ch.18.
- Schmid, D., 2010 The Devil You Know: Dexter and the “Goodness” of American Serial Killing. In: D. Howard, ed. 2010. Ch.10.
- Stolorow, R.D., 2011 The Meaning and Rhetoric of Evil: Auschwitz and Bin Laden. *The Huffington Post* [online] Available at: [http://www.huffingtonpost.com/robert-d-stolorow/the-meaning-and-the-rheto\\_b\\_884927.html](http://www.huffingtonpost.com/robert-d-stolorow/the-meaning-and-the-rheto_b_884927.html) [Accessed 15 May 2012].
- Tyree, J.M. Spatter Pattern. *Film Quarterly*, Vol. 62, No. 1 (Fall 2008): pp.82-85.

# ***Hotel Medea: Slowness and Self-Actualization in an Instant Culture***

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## **Abstract**

Henri Bergson, whose philosophy is seldom discussed in relation to performance, believed that there was no precise method of accurately measuring duration, asserting that to truly understand time, one must experience it in its rawness. He wrote that ‘...pure duration...excludes all idea of juxtaposition, reciprocal externality, and extension’ (1912:26), something that is explored in Brazilian performance collective Zecora Ura’s *Hotel Medea*, in which audiences experience a slow unfolding of the story through a participatory and immersive six-hour, overnight performance. In their storytelling, the performers allow for a non-reciprocal sense of duration to prevail, the story opening out over six hours, whilst asking the audience to stay awake throughout the night, fighting against their circadian rhythms.

Enveloped in the performance space, it seemed to me that the passing of time assumed a different quality to the pace of the external world, that of a Bergsonian duration. Through the ubiquity of modern technology we live in an age of high-speed communication, instantaneity of experience, and an omnipresent awareness of time. Standing in opposition to this instantaneity of contemporary Western living, the slow unfolding of *Hotel Medea* tests the quality of our phenomenological experience of time, increasing the possibilities for self-actualization. I examine how the ‘reciprocal externality’ of clock measured time becomes irrelevant in *Hotel Medea*; illustrating how through the experience of slowness and playfulness of actions undertaken in a performance of long duration we can go some way to achieving a Bergsonian sense of time and, in turn, to realising a positive state of self-actualization.

## **Keywords**

Bergson, duration, slowness, time, transformation.

Brazilian performance collective Zecora Ura’s *Hotel Medea* is described as an immersive, participatory performance, that uses technology to reinterpret our relationship with myth (Zecora Ura, 2012). Although the collective are active in developing new works, *Hotel Medea* has been their principal achievement in realising a performance. Whilst they are not concerned with duration in their works, artistic director Jorge Lopes Ramos wanted to ‘defy London’s convenient after-work theatre culture’, somewhat alluding to the disruption of temporal norms (Lopes Ramos, 2008). Zecora Ura are frequently referenced in relation to immersive and participatory theatre, although there is no other reading of their work in relation to duration. By challenging audience expectations, perceptions and the ‘after-work theatre culture’, *Hotel Medea* also challenges meaning making through its extended duration and nocturnal form. Susan Bennett’s work on theatre audiences cites Frank Coppieters’ conclusions regarding audience perceptions. Of the four general conclusions reached, he noted that ‘Perceptual processes in the theatre are, among other things, a form of social interaction’ (1997:91). His data was gathered from two performances in 1976 where the

usual frameworks of theatre were broken. Significantly, he also noted that audiences ‘generally felt frustration because they were denied the usual channels of making meaning’ (1997:91). So, whilst there are many examples of plays, musicals, operas and other cultural forms that do indeed exceed two hours, they challenge our comfortable levels of consumption, even when taking into account differing levels of enculturation in individuals. There can also be an expectation that a performance falling short of a particular duration offers less value.

Many durational works (that is, work with duration as a core element) allow audiences to drop in and out of the action. A significant aspect of *Hotel Medea* is that it is *not* primarily concerned with duration but as its length is beyond our comfortable levels of consumption and, given that the audiences are *not* permitted to drop in and out, *Hotel Medea* can be understood as having duration at its core.<sup>1</sup>

In *An Introduction to Metaphysics* Henri Bergson writes ‘...it is clear that fixed concepts may be extracted by our thought from mobile reality; but there are no means of constructing the mobility of the real with fixed concepts’ (1912:51). Bergson asserted that there was no adequate method of quantifying time and, like the notes of a tune, moments melt into one another. Through *Hotel Medea* Zecora Ura seemed to me to be saying something fundamental about the nature of time and of the possibility of transformation through participation in a six-hour performance. In his discussion of the nature of duration, Bergson commented that:

I shall have to say, for example, that there is, on the one hand, a *multiplicity* of successive states of consciousness, and, on the other, a *unity* which binds them together. Duration will be the “synthesis” of this unity and this multiplicity, a mysterious operation which takes place in darkness...In this hypothesis there is, and can only be, one single duration, that in which our consciousness habitually works.(1912:46)

The ‘multiplicity’ that he discusses suggests that there is no objective way of quantifying conscious existence, but that there is something that unifies these multiplicities; namely duration. Because of the ephemeral nature of Bergson’s ‘mysterious operation’ taking place in darkness, our individual durations may be rather like habits, ingrained into our consciousness. It is feasible that our own internal rhythms, resulting from these ingrained habits are the most accurate measurement of duration available to us. The duration, which is the result of the synthesis of multiplicities and states of consciousness described by Bergson, is the closest term we have for describing the passing of time in consciousness. So, it was the breaking of these habits that distinguished the quality of time passing for me in *Hotel Medea*, a performance that started outside venue number 26: Summerhall in Edinburgh on 12<sup>th</sup> August 2011.

As I waited in anticipation for a performance that I knew lasted six hours and would require me to stay awake until dawn, I reflected on Henri Bergson’s notion that the only way to understand duration is to experience it in its rawness. In *Time and Free Will* he wrote that, ‘Would not time, thus understood, be to the multiplicity of our psychic states what intensity is to certain of them, - a sign, a symbol, absolutely distinct from true duration?’ (1913:90). In an earlier essay, he asserted that ‘...pure duration...excludes all idea of juxtaposition, reciprocal externality, and extension’ (1912:26). Bergson was not only referring to time being measured against clocks, but against space. Using an example of an ‘infinitely small elastic body...in a constantly lengthening line’ (1912:26) he attempts to express the pure mobility of ourselves in duration. Whilst we are able mark points along this lengthening line, noting how much time has passed, we cannot accurately measure the intervals between these points.

The conclusion reached by Bergson is that pure duration *must* be something different. Bergson's notion of duration, that of a synthesis of a unity and a multiplicity of states of consciousness means that there can only be a single duration; duration is succession without distinction. For Bergson, time expressed as a homogenous medium is a spurious concept as it is 'nothing but the ghost of space haunting the reflective consciousness' (1913:99).

Throughout *Hotel Medea* I became aware of how clock-measured time was being altered through a playfulness of time as the story slowly unfolded. The company's decision to perform the piece throughout the night immediately distorts perception of the 'normal' passing of time. Imposing itself on the usually unutilized hours of the night, spectators were encouraged to participate in the wedding ceremony of Medea and Jason, get dressed up in pajamas and be read a bedtime story, even 'infiltrate' a 'secret' women's only club whilst wearing a wig and make-up. Throughout, the significance of clock-measured time became increasingly lost as I awaited the next part of the story or the role I would have to play in its realization. Reflecting on this now, it was not only the experience of being unable to mark effectively the passing of time on the 'increasingly lengthening line' described by Bergson, but that these points in the mobility of my duration lost their significance. The need to count directly in number and therefore in space was replaced by something different; that which Bergson defines as pure duration.<sup>ii</sup>

What struck me at first was the contrast in which the time taken to perform *Hotel Medea* stands in relation to our instant culture and its values. This experience was not for the impatient; I had to allow the story to unfold at its own pace, perhaps dwelling on moments that may, to some, have seemed less than significant narrative components. For example, *Zero Hour Market*, the first section of *Hotel Medea*, concentrated solely on the meeting and marriage of Jason and Medea. As spectators we were engulfed in the initial sparring and the resulting celebrations, chanting, dancing and taking a full part in the proceedings. As I looked around at the other spectator-participants I sensed some impatience and even unwillingness to submit to the experience. In particular, I noticed one man standing with his arms folded and back to the action. In contrast, a moment at the end of the performance fully engaged all of us as we placed flowers and toys on the bodies of the children. At this point, the participatory action was fluidly and ritualistically executed as the act of laying flowers and toys continued for some time, actions repeated with solemnity. Perhaps a transformation had occurred, or perhaps we had given in to our complete participation in the process. Like clock-measured time, it was difficult to stand outside of it.

Given a conventional understanding of the narrative structure of Euripides' original work, *Hotel Medea* stood at odds to expectation. In a conventional production of *Medea*, the narrative may unfold over a duration of around two hours, driven forwards by the text itself. In *Hotel Medea*, text gave way to experience; the story became part of a greater whole designed to immerse its audience in a series of encounters. It is this sensory rather than cerebral experience that draws comparison with Bergson's ideas on duration. If we can imagine text as representative of time and experience as representative of duration we have our starting point. When presented with linear, narrative text in performance we are able to expressly quantify our understanding. Putting aside wordplay and semantics, we are usually able to agree on a shared understanding of text. Experience, however, cannot be satisfactorily quantified in the same way; qualitative experience will produce manifold meanings. Such is the quality of duration, that which is distinguished from homogenous time. As consumers of theatre and performance, we have become conditioned to knowing when something is too long. Conversely, there is a certain expectation that when something is too long it is somehow boring; consciously or not, we make these judgments regarding the value of something based on its duration. There is a value that is associated with the duration



of a product, in the same respect that we associate time with money all too easily in our economically and technologically advanced Western culture.

In a world of instant communication, high-speed travel and an omnipresent awareness of time, the experience of *Hotel Medea* stands in opposition to a need for immediate temporal gratification.

The idea of juxtaposing a sense of duration with that of clock-measured time dissipates as *Hotel Medea* progresses, partly through being part of a participatory experience, and partly through the physical effort required to stay awake as night passes into early morning. As the performance moved on, I became progressively aware of a different sense of duration, one that was being drawn out and played with. As with Bergson's notion of duration as an 'infinitely small elastic body...in a constantly lengthening line' (1912:26), *Hotel Medea* was playing with both individual and collective senses of time.<sup>iii</sup> In the rooms of Summerhall, I had no sense of how much time had passed; even when looking at a wristwatch, mobile phone or clock, it did not seem to register that what I was seeing was the true time. It is fair to say that my experience of duration possessed a quality of slowness and playfulness that I felt was unusual and transformative; a state where self-actualization, a theory attributed to psychologist Abraham Maslow, may become possible.

In his 1943 paper 'A Theory of Human Motivation' Maslow suggested that individuals are able to reach self-actualization once all other needs have been satisfied. He believed that everyone has an ability to self-actualize as long as physiological, safety, esteem, cognitive and aesthetic needs have been fulfilled. By self-actualization, Maslow was referring to the possibility of undergoing peak experiences, which he likened to mystic encounters. In *Motivation and Personality*, he writes that peak experiences produce:

...feelings of limitless horizons opening up...of great ecstasy, wonder and awe, the loss of placing in time and space with...the conviction that something extremely important and valuable has happened, so that the subject is to some extent transformed and strengthened even in daily life by such experiences (1954:137).

Maslow identified one such quality of those most likely to self-actualize was being resistant to enculturation, in that more autonomous individuals are 'ruled by their own character rather than by the rules of society' (1954:145). It is this assertion that sits neatly with Bergson's desire to measure duration in a more truthful way than clock measured means. Furthermore, Maslow's assertion that this ability and desire to self-actualize is innate resonates strongly with Bergson's notion of wholly qualitative pure duration. In this respect, self-actualization is difficult to measure. When Bergson writes that pure duration 'might well be nothing but a succession of qualitative changes, which melt into one another, without any tendency to externalize themselves' he resonates with Maslow's view that peak experiences are transient and ephemeral. Like pure duration, self-actualization somewhat defies quantification.

Bergson is searching for something that relates to our inner selves, our circadian rhythms that have been degenerated by modern living. Whilst Bergson never explicitly discusses duration in terms of our circadian, nature led existence, he foreshadowed an absolute necessity to offer an alternative to our accelerated, clock driven culture. Experiencing a Bergsonian notion of duration, one that is pure and unified, is something that I am suggesting may be a factor in leading towards a state of self-actualization, or peak experience.

Anthropologist Victor Turner believed that 'ceremony indicates, ritual transforms' (1982:80). In *Hotel Medea* there were elements of both ceremony and ritual to undergo before the story could begin. On arrival, each guest was asked to check in their baggage, by placing it in a bucket and having it hoisted above our heads via a balcony, further adding to the belief that I was being prepared for an experience that was slow, deliberate and exact. The company's

decision to perform *Hotel Medea* throughout the night was significant; they wanted to create a piece of theatre that, according to their literature, stretched ‘beyond the boundaries of ordinary time and place, insisting on radical audience interaction, participation and immersion’ (Zecora Ura, 2012). The sense of going beyond the ordinary became apparent as the arriving audience was told that preparations were necessary. These included learning a few basic dance moves, chants and understanding of rules that should be followed during our ‘stay’ at the ‘hotel’. What this also did was to append a sense of ritual to the whole experience; one of the many actions that formed part of *Hotel Medea*, a component of the durational experience that defused my sense of time.

The quality of duration in *Hotel Medea* had specialness, underlined by witnessing the performance throughout the night. In this way, it defies our cultural norms and expectations. Throughout the performance I felt a sense of time being reclaimed by the subversive act of being awake when, in cultural norms, I should not be. *Hotel Medea*’s stark contrast to the pace of modern life was apparent; not only through its nocturnal performance, but also in that it allowed its spectators to defy normal performance conventions. In the second part of the trilogy, half of the spectators were led to our bunk beds where we were dressed in pajamas, given hot chocolate and a bedtime story. At this point we were told to sleep whilst the remaining spectators watched the story unfold further. What followed was a reversal of roles; pajamas and beds exchanged, we were then allowed to see what we had missed. The repetition of this scene once more played with our experience of time. I heard dialogue I recalled from only a few moments earlier, reminding me of the bed, pajamas and story. The time I had thought lost from the story was reclaimed, shifting backwards and confusing durations, something seldom possible in a modern culture where the instant *in the* instance dominates.

Bergson’s notion of pure duration was, as Mark Muldoon suggests, ‘a way back to the purity of things’ and a need for the ‘recognition of the intuition of duration’ (2006:74). Muldoon recognizes that Bergson regards intuition in contrast to intelligence and that it is to the question of intuition that Bergson constantly returns. In *Hotel Medea* the audience are asked to recognize this intuition, one that has been modified and tamed by the socio-economic constructs of apparently daytime and nighttime activities, allowing pure duration to be discovered. The regularity and precision of a world that insists on every second being accounted for has removed our innate sense of time, insisting that there is a time for everything. *Hotel Medea* offered a rare interregnum from the exactitude and rapidity of contemporary Western living. It delivers a room filled with individual personalities, each marking time in a way that cannot be disputed as incorrect outside of the ‘reciprocal externality’ of clock-measured time.<sup>iv</sup> This was something that Bergson describes as what happens when ‘pure perception and pure memory constantly intermingle’ (1910:71). For in *Hotel Medea*, the slow and playful way in which the story was delivered, coupled with a personal sense of tiredness, meant that what I witnessed became confused almost instantly with what had been before; pure perception and pure memory. In a mystical moment, confusion gave way to clarity of duration; I was no longer attempting to make sense of time in an ordered, linear way. The juxtaposition of slowness and instantaneity, intense activity and quiet reflection in the events of *Hotel Medea* meant that time became less distinct than duration.

Despite the slowness of *Hotel Medea*, the use of technology gave the performance a paradoxical quality. In the final act, ‘Feast of Dawn’ there is a prolonged sequence where Medea is ritualistically stripped, redressed and ‘made up’ as a raped and tortured victim of Jason’s anger. The slow pace at which this was performed stood in direct opposition to the use of video to deliver the narrative. From only a few feet away, we saw Medea. Directly in front was a camera feeding live pictures, projected onto the back wall. Whilst the video

narrative was delivered at the same pace as the live performance it seemed strangely different, the video apparently faster and further emphasizing the slowness of the live elements. As spectators, we were presented with the liveness of the event as it happened before us, whilst also being confronted with the same event in its mediated form. The fact that we could engage with the live event in a very intimate way was challenged by its simultaneous mediated presence. The instantaneity of the mediatized mode of presentation was, at this moment in *Hotel Medea*, showing us something being performed so slowly that it could be placed in neither the “classic” liveness nor live broadcast categories described by Philip Auslander (1999:61).<sup>v</sup>

For Auslander, ‘classic’ liveness relies on the co-presence of performers and spectators as well as the experience of the moment. Whilst this was true of this particular moment in *Hotel Medea*, the event itself became somewhat removed from the immediate temporal simultaneity of classic liveness through its use of broadcast liveness.<sup>vi</sup> It was the combined use of fast technology and slow performance that delivered a subjectivity of duration that was unable to be quantitatively measured.<sup>vii</sup> Unlike the use of mediated strategies in other contemporary performance where this is often done to create scale<sup>viii</sup>, *Hotel Medea* used it in a way that placed the live and the mediated in an unharmonious configuration.<sup>ix</sup>

In *Hotel Medea*, the reciprocal externality of the clock-measured, productivity driven external world was abandoned as slowness and playfulness began to dominate. This sense of playfulness was explored to its fullest extent in the latter stages of performance. Individual durations became metaphorically compartmentalized, as we were led away in small groups by one of Medea’s nursemaids. At this point, various temporalities co-existed – what Bergson would have described as ‘duration lived by our consciousness...a duration with its own determined rhythm (1910:272). Our own consciousnesses and rhythms that exist in an innate sense are suppressed by the clock-driven socio-economic structures of contemporary living.

With each group of ‘children’, a different performance was taking place, dictated to some extent by the individuals involved. Yet these co-existing pockets of temporality were compelled by the structure of the piece to last no longer than each other. The determinations of our rhythms were, seemingly, weaker than the march of time. Because of my awareness of this, my sense of individual duration was heightened. Was I becoming somewhat resistant to enculturation, somehow towards a peak experience? To use Maslow’s words, ‘...something extremely important and valuable had happened’, making me ‘transformed and strengthened’ (1954:137).

The final moments of *Hotel Medea*, again delivered slowly and deliberately, fully immersed its audience members in the participatory act of laying flowers and children’s toys over the bodies of the children. This was our opportunity to reflect on the night’s events and to look forward to fulfillment of our task as spectators and participants. This moment recognized what Bergson meant when he said that ‘*Practically we perceive only the past*, the pure present being the invisible progress of the past gnawing into the future’ (1910:194).

As a theatrical experience, *Hotel Medea* has been described as being like ‘sharing a secret...and a victory’ (Field, 2009). The secret, for me, was the unlocking of a different experience of time; the victory, of understanding Bergson’s notion of pure duration. Standing at opposite ends of a hundred years, both Bergson and *Hotel Medea* provide a space for duration to be explored, discovered and to offer transformation. In an instant culture, where slowness is synonymous with a lack of progress, and the immediateness of experience equals success, *Hotel Medea* successfully juxtaposes slow with fast to allow us to consider an alternative to homogeneous time. Despite Bergson’s relative obscurity within the broader field of performance studies, his notion of pure duration may become increasingly important in reading performance works in terms of perception, immersion, participation, and embodied

experience as well as facilitating ways of understanding our being in a world of strict temporal parameters.

## References

- Auslander, P (2008) *Liveness: Performance in a Mediatized Culture*: London: Routledge.
- Bergson, H (1912) *An Introduction to Metaphysics*: Indianapolis, Hackett Publishing Company.
- Bergson, H (1910) *Matter and Memory*: South Carolina, Forgotten Books.
- Bergson, H (1913) *Time and Free Will*: London: Elibron Classics.
- Field, A (2009) *Up all night: the intimacy of Hotel Medea*, Retrieved February 15, 2012, from <http://www.guardian.co.uk/stage/theatreblog/2009/feb/06/zecora-ura-hotel-medea-arcola>
- Lopes Ramos, J 2008 'Hotel Medea: Midnight to Dawn', *Total Theatre Magazine*, Vol 20, 3, August 2008, p. 18
- Maslow, A (1954) *Motivation and Personality*: New York, Harper & Row.
- Maslow, A (1962) *Toward a Psychology of Being*: London: Chapman & Hall.
- Maslow, A (1971) *The Farther Reaches of Human Nature*: New York, Arkana.
- Muldoon, M (2008) *Tricks of Time: Bergson, Merleau-Ponty and Ricour in Search of Time, Self & Meaning*: Pittsburgh, PA: Duquesne University Press.
- Schechner, R (1985) *Between Theatre & Anthropology*: Philadelphia, PA: University of Pennsylvania Press.
- Turner, V (1982) *From Ritual to Theatre: The Human Seriousness of Play*: New York, NY: PAJ Publications.
- Zecora Ura (2012) *Hotel Medea – an overnight experience*, Retrieved February 15, 2012, from <http://www.zecoraura.com/site/projects/>.

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<sup>i</sup> Forced Entertainment's 'Quizoola', and 'And on the Thousandth Night'; plan b's 'Bed Full of Songs' and 'How do you keep talking even when you've said everything you thought possible?' are examples of durational work that allow audiences to make their own decisions regarding length of stay.

<sup>ii</sup> It should be noted here that, although the perception of duration in any performance may be different for performers and spectators (as the performers know the pace and rhythm of a piece amongst other factors), in this instance I am concerned with *my* experience and perception of duration as a spectator.

<sup>iii</sup> I am not suggesting that this amplified awareness of duration was as a result of boredom or lack of engagement with the piece, but that I had gone beyond a rational, measured sense of time, having lost all 'reciprocal externality' with standardized measures of time.

<sup>iv</sup> Of course, one could argue that this is the case in every performance; varying levels of engagement undoubtedly have an impact on experience of duration.

<sup>v</sup> Type of Liveness                      Significant characteristics                      Cultural forms

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“Classic” liveness	Physical co-presence of performers and audience; temporal simultaneity of production and reception; experience in the moment	Theatre, concerts, dance, sports, etc.
Live broadcast	Temporal simultaneity of production and reception; experience of event as it occurs	Radio, television, Internet, etc.
Live recording	Temporal gap between production and production; possibly of infinite repetition	LP, CD, film, DVD, etc.
Internet liveness (Couldry 2004)	Sense of co-presence among users	Internet-based media
Social liveness (Couldry 2004)	Sense of connection to others	Mobile phones, instant messaging, etc.
Website “goes live”	Feedback between technology and user	Websites, interactive media, chatterbots, etc.

(Auslander 1999:61)

<sup>vi</sup> The experience of being in the moment, the physical co-presence of spectators and performers, and temporal simultaneity of production and reception gave this particular instance a liminal quality, somewhat akin to the betwixt and between of Bergson’s pure duration.

<sup>vii</sup> The moment was neither qualitative, fusional and continuous as in pure duration; nor numerical, homogenous and discrete, as in clock-measured time.

<sup>viii</sup> I am thinking here of The Builder’s Association and their use of large video screens, whereby they become the main focus of the production.

<sup>ix</sup> In the same year that Bergson’s writings on duration were first published in English, a monumental event took place that was to change the way in which time is viewed; it was to be the beginning of ‘global time’, meaning the world became more unified and synchronized as the pace of economic and technological advances accelerated. An example of this global time appeared on April 14<sup>th</sup> 1912, when RMS Titanic, a ship that took three years to build, sank in just under three hours. The time that it took for the news of this tragedy to reach the world marked the start of global time, as the telegraph carried bulletins almost instantaneously. Only twenty-eight years earlier, Greenwich Mean Time was established as the accepted meridian, yet it was the loss of the Titanic, a vessel trying to beat its own schedule, which heralded the start of an instant culture. Since that moment the pace of life in travel, communication, and expectation has increasingly accelerated and, whilst we can certainly ‘waste’ time, the marking of time is difficult to escape from. There are now few moments when we are able to lose a sense of time and experience a purer duration, such as that described by Bergson.

# **‘Fly-on-the-wall’: Social Class in the Art of Gillian Wearing**

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## **Abstract**

This paper offers a sociological and philosophical reading of the art of Gillian Wearing. Utilizing Pierre Bourdieu’s theories of habitus (1989) and capital (1986), Diane Reay’s emotional capital (2004), and the fieldwork and insights of Simon J Charlesworth (2000), I argue that the damaged psyches of Wearing’s subjects are a result of experiences that arise from their positions in the English class system.

## **Keywords**

Gillian Wearing, Social Class, English Class System, Cultural Capital, Emotional Capital

Charlesworth writes that ‘since the early 1980s, the gradual decline of the culture of the working class has been one of the most powerful, telling developments in British society.’ He observes that people who are now around the age of fifty are able to describe their lives in a logical way and have an understanding of ‘what has happened to the working class,’ but, amongst younger generations, one ‘encounters an arid individualism devoid of personal embedding in something beyond the ego.’ As a consequence, ‘the most dispossessed individuals understand their lives the least’ (2000:2) and ‘it is in the most personal dimensions of intimate life, that the cultural conditions of working class [lives] are most pronounced and most disturbing’ (2000:3-4).

In Wearing’s 1998 work, *A Woman Called Theresa* (Figs 1.1 and 1.2), some of the most disturbing dimensions of the intimate lives of lower class alcoholics are displayed through the objectifying gaze of photography and revealed through hand written statements which will be referred to later in this paper.

Jay Prosser has described Wearing’s work as ‘ethical realism,’ in part because of her reflexive methodology that acknowledges the problematic nature of documentary photography and allows her subjects a voice (2002). Through a close reading of two of Wearing’s works I consider whether or not her work challenges or reinforces perceptions of Britain’s underclass. Do the representation of the alcoholics in her work evoke sympathy and a deeper understanding of their plight? Or as Martha Rosler might say, ‘judged as *vile*, people who deserve a kick for their miserable choice’ (1992:322), reassuring ‘the predominantly ‘well educated’, ‘higher social classes’ that visit galleries (Stallabrass, 2006:302) about their relative wealth and social position?

Having established the scope of my paper, it is necessary at this point to explain the two key philosophical and sociological concepts I apply throughout the text.

## Habitus

Pierre Bourdieu is a sociologist, anthropologist and philosopher who is best known for his writings on social class. In *Social Space and Symbolic Power* (1989), Bourdieu uses the term habitus to describe

a system of schemes of perception and appreciation of practices, cognitive and evaluative structures which are acquired through the lasting experience of social position. (Bourdieu, 1989:19)

Bourdieu states that an individual's view of the world is 'carried out under social constraints' as the 'familiar', 'taken for granted' experience of the world which is perceived through habitus 'the mental structures' through which we view the world, which are a result of 'an internalization of the structures of that world.' Therefore 'perceptive dispositions tend to be adjusted to position' and 'even the most disadvantaged' are inclined 'to perceive the world as natural and accept it much more readily than one might imagine' (Bourdieu, 1989:19).

## Cultural Capital

Bourdieu (1986) conceived of the theory of cultural capital as a means to account for the unequal academic achievements of children from different social classes. According to Bourdieu cultural capital can exist in three forms:

- Embodied capital, embodied in the 'long-lasting dispositions of mind and body' of individuals.
- Objectified capital, present in 'cultural goods' such as 'pictures, books, dictionaries', etc and in the 'realization of theories or critiques of these theories'.
- Institutionalized capital is also 'a form of objectification' which can come in the form of 'educational qualifications'.

I will now offer a close reading of two of Wearing's works in order to demonstrate my working hypothesis that the experiences of Wearing's subjects arise from their classed positions.

Theresa is a lower class alcoholic who features in the work of the same name. Wearing presents individual photographs of Theresa with each of her seven sexual partners, juxtaposed with hand written statements produced by each of the men (Figs 1.1 -1.2). Unlike Wearing's video work *10 – 16* (1997) (Figs 2.1 -2.3), the identity of Theresa and her sexual partners are not protected through lip synching of their voices or through actors but instead, the realm of their most intimate lives are exposed through photographs for all to examine. According to Montagu, 'Theresa refused to make a statement about herself' (2001) so Wearing asked the men she was involved with to write a statement about her. As a result, the men within the photographs are given a voice about their relationship with Theresa through their writing displayed in the panels that accompany the photographs, but Theresa remains silent. Our value judgments about Theresa are made through the scrutiny of her mottled and bruised body in the photographs and through the mental snapshots of disorderly behaviour revealed through the handwritten accounts.

In relation to the body of Theresa and the men in Wearing's photographs, Julia Kristeva's theory of abjection (1982) can be applied. Kristeva formed the idea of the '*corps proper* – the clean and proper body, which is 'pure' and whole – as distinct from the abject body'. The '*corps proper*' does not really exist as it is 'an ideal form', and only exists as an abstraction. As Fuery and Mansfield state, we all 'are continually asked to measure our own imperfect

bodies against this ideal form' and of course, always fail to live up to it. 'In this failure is abjection and, [as a consequence this produces] the abject body' (2000:128). I propose that Theresa's overweight, neglected body and those of her sexual partners produce part of the abject functioning within this work.

Not only do they all fail to live up the idea of the 'clean and proper body', their bodies can also be said to signify what McRobbie would term as 'vilified meanings' (2007: 731-732). Meanings associated with the discourse of 'the chav' in popular culture, not only in the mass media but also in the political arena. 'Chavs' are portrayed and considered as 'immoral, repellent, abject, worthless, disgusting and even disposable' (Skeggs, 2005:977) and a drain on the country's scant resources.

Bev Skeggs argues that 'the excessive, unhealthy, publicly immoral white working-class woman, [...] epitomizes the zeitgeist of the moment – a crisis in middle-class authority and security, epitomized in the output of TV, concretized in criminal law and a handy figure for the government to deflect its cuts in welfare provision via the identification of a 'social problem' (2005:968).

I have noted the first layer of the abject is operating in this work through the bodies of its subjects now I will draw attention to the doubling of this abjection through the language and semiotics of the handwritten statements. It could be argued by observers such as Jay Prosser (2002) that the voice of the men revealed through their writing may appear in some way to compensate for the problematic nature of documentary photography that Rosler and many others have drawn attention to. But I would argue that the badly scrawled, grammatically incorrect writing reveals the lack of cultural capital that they each possess and points to their failure to work on their own development and accrue personal and economic value through education. As Kristeva states, 'it is not lack of cleanliness or health that causes abjection but what disturbs identity, system, order. What does not respect borders, positions, rules. The in-between, the ambiguous, the composite' (1984:4). It could also be said that the subjects in *A Woman Called Theresa* (1998) (Figs 1.1 -1.2) have not played by the rules of what it is to be a good and proper citizen according to middle class values, they have failed to better themselves through education and seem to wallow in their own squalidness, causing the viewer to consider 'how can they live like that?' But it is in the content of the writing where I would argue the strongest element of the abject is functioning within this work. Not only is it the obscene details of the dysfunctional sexual behaviour of the subjects but also in the revelation of Theresa's violence, deceit, criminality and dependency upon state benefits that all contribute to the abjection operating in this work. It can be said that it is within the harshness of the language that working class speech reveals the bitterness of experience. As Charlesworth states

[W]orking class speech issues from a world that is brutal; it is part of a dealing with this world which so often defiles us, and hence it tends to be unselfconsciously brutal causing the petit-bourgeois, whose existence is based upon a self-distancing from this kind of expressivity' to view the brutality present in working class speech... [as] a personal disposition towards inhumanity rather than the rendering of a world that is itself callous. (Charlesworth, 2000:218)

It is through the language of the men in the work *Theresa* that the brutality of their world is revealed, pointing again to the fact that they do not play by the rules of the state by aspiring to or being good, moral and proper, instead they live their lives disturbingly and chaotically.

My reading of the abject within this work has led me to consider the ethics of Wearing's representational strategy, as although she gives the male subjects a voice, the content of their writing (apart from one of the men who writes lovingly of Theresa) reveals lives of



degradation because of a deficit of emotional and social capital, which I would argue intensifies the semiotics of abjection functioning in the photographs. Their monologues illuminate the impoverished lives behind the images but the work fails to point to the socio-political forces behind their classed positions and does not reveal anything of the traumatic life experiences which have led them to be the way they are. On the whole the work can be said to reinforce negative perceptions gained from the pervasive media that the viewer may already have. This has led me to consider if *A Woman Called Theresa* (1998) (Figs 1.1 and 1.2) could be described as what Barthes terms a 'text of pleasure'. A text of pleasure according to Barthes is 'the text that contents, fills, grants euphoria; the text that comes from culture and does not break with it, it is linked to the comfortable practice of reading' (1973:14). The images of Theresa and her partners come from a culture of social trauma in the media, viewed on a regular basis by many for entertainment and do not break with its codes. The work does not challenge or disrupt preconceived views people may have about lower class alcoholics, and can be said to compound negative representations of the working classes that can be found in the abundance of reality TV programmes and in particular in a programme such as *The Jeremy Kyle Show* (2005 onwards). It can also be said that the mode of its display in the gallery space does not challenge the comfortable act of reading, as the use of photography and text has long been an accepted art form since the 'textual turn' of the 1970s (Foster, 1999:99).

I will now move on to offer an analysis of another of Wearing's works, *10 – 16* (1997) (Fig 2.1 – 2.3). Wearing's video projection *10 – 16* (1997) (Fig 2.1 – 2.3) does not explicitly indicate the socio-economic backgrounds of the children whose voices emanate from adult mouths, but does reveal a lot about the subjects' experiences and ways of thinking, or as Bourdieu would say their habitus, which are a result of class. To create the work, Wearing recorded interviews with a range of children from the age of ten to sixteen, transcribed the recordings into scripts and then filmed adult actors miming the scripts. Subsequently the video and audio recordings were synched together. As John Slyce says of the work:

It is the synching of voice and vessel – the joining of vehicle with tenor upon which metaphor relies – that enables us to temporalize those rites of passage experienced in language and project the vocalized traumas of the child into the hardened adult scar. (Slyce in Ferguson 1999:84)

As a result of my work in primary schools and from my research I would argue that the frustrations, resulting violent behaviour and implied social deprivation revealed by the child in '11' (Fig 2.1) is not untypical of those born into England's underclass. Her voice emanates from the first then second of two respectable looking women eating sandwiches in a park, who in contrast to the child's words they mime; appear to have access to more forms of capital. To illustrate, here is a transcription of the child's speech:

It's important to be tough, but every time I hit someone I think, 'Ow, why did I do that?' At first I hit people in the arm and then I kick 'em in the legs and then I punch them in the belly and I'd like to hit 'em harder, but then we get separated." "I don't think people like me that much, 'cause I had to move schools." [...] "Antoinette doesn't always like to play with me, [...]" "In fact, one day I'm gonna kill Antoinette – I'm gonna punch her in the gob." Everyone says I'm tough - just like my mum. But I think, 'No.' Me and my mum, I think we're much like our cat Rebecca, 'cause neither me or my mum change our clothes that much and we like sleeping lots and lots." [...] "Me and my cat climb scaffoldings [...] we look down and look at all the people. When we're looking down we see some funny people and I

throw stones off at 'em and Rebecca just sits there watching. (Eleven, 1997:136)

The fact that the child and her mother do not often change their clothes and she is allowed to roam the streets, climb scaffolding and throw stones at innocent passers-by reveals an impoverished home life. The violence she directs towards classmates and her feelings of being disliked, the fact she has been moved from school to school (probably as a result of an inability to behave in an acceptable way), demonstrates that even at an early age, children like her sense that they are stigmatized. As Charlesworth acknowledges:

A person devoid of respect will tend towards transgression of the accepted forms of valuation, because – since they cannot be invested with the value of the forms they cannot embody – their own strategy has to be that of subversion: of embracing and even celebrating their alienation as an emblem of what it is: their humanity, a human form that is degraded and stigmatized. (Charlesworth 2000:94)

In Bourdieu's terms the child within '11' does not question her habitus, her degraded way of life, she is unable to realise and may never realise that her home life which is lacking in economic, cultural and emotional capital may be the cause of her struggle to fit in with the middle class expectations of schooling and instead she is likely to blame herself. The child's struggle to settle in school and her mother's behaviour are taken for granted as natural as she has nothing to compare her life with (except perhaps for the portrayals of family life in the media). The lack of what Reay would term 'emotional capital' (2004) is revealed in the neglect of the child; as the child is allowed to wander the streets in dirty clothes. The inferred behaviour of the mother seems to stem from her own lack of economic, emotional, social and cultural capital; resources she just doesn't have to pass on to her child. The child says that 'everyone says [she's tough] – just like [her] mum' which also suggests that her mother behaves in an aggressive way, also pointing to a life of hardship and frustration. When considered in these terms, it is unsurprising that the child behaves as she describes within her account. I propose that *10 – 16* could be described as what Barthes terms as 'a text of *jouissance*'. Through the technical means of synchronising children's voices with adult bodies and not only by using an adult to mime the words, but also by the use of actors whose appearances appear to signify a whole different way of life than the one described by the child is where I would suggest the '*jouissance*' functions in this work.

Violent urges as a result of an unstable home life are again verbalized in '13' (Fig 2.2). "One of the things I do feel anxious about is my mother. And I'd love to kill her very much, as I found out that she is a lesbian." The child's voice for '13' emanates from a naked dwarf sitting in a bath. The child describes how his or her mother sprang the news of her lesbianism by way of saying that she fell in love with a "big white swan", and how he or she had been sent to meet his or her mother's lover at the station and had waited for two hours before returning home to find that "the big white swan was already there", "guzzling cakes" and how he or she felt "appalled" and wanted them "dead very much". As Ferguson states:

Wearing knows that the most pervasive traumas take place in the context of people's own families, and she returns again and again to that inescapable nexus of angst. It is out of the family context that each individual has to assert his or her own individuality. And it is thus and inevitable site of conflict and intense emotion. (Ferguson 1999:59)

In contrast an obviously middle class child in '12' (Fig 2.3), describes a comfortable and stable home life that the other two children could only dream about:

I am happy and I don't really need worries and I am a bit laid back really. Um, because I am at a lovely school. Um, where I have lots of friends and, um, and I'm in a lovely home and, um, that's all. (Twelve, 1997:137)

Such a stable and happy lifestyle means that her only worries are getting upset about "how many tigers there are left in the world" and about through learning about babies in science, "the way people have abortions now, a lot" (Twelve, 1997:137). The stability of her background means that instead of investing all of her mental energies in worrying about the present, she is free to be able to consider wider, more philosophical issues connected to her learning in school. This example is almost a microcosm of what has been written by Charlesworth of how the working classes are able unable to distance themselves from the world 'through the resources that affluence secures' (Charlesworth, 2000:170).

Without the cultural and economic resources to found some security and without the symbolic resources to create a frame of secure and positive self-interpretations, trapped in a world of trying to get by. (Charlesworth, 2000:170)

## Summary

The aim of this paper was to argue that the damaged psyches of Wearing's subjects emanate from their class positions. This has been demonstrated through a close reading of two of Wearing's works, highlighting the classed nature of the experiences of her subjects that arise from their lack of and lack of access to, different forms of capital because of their social class.

I have also argued that although Wearing in some way acknowledges the problematic nature of documentary photography by allowing her subjects a voice she does so in a limited way and her representational strategies may actually serve only to reinforce negative stereotypes of the lower classes that can be found in the media. I have demonstrated this through reference to the concept of abjection operating in a work such as *A Woman Called Theresa* (1998) (Figs 1.1 and 1.2).

I have also highlighted the differences between what Barthes terms as texts of *jouissance* and texts of pleasure. I proposed that *A Woman Called Theresa* (1998) (Figs 1.1 and 1.2) is a text of pleasure as it comes from a culture of social trauma as entertainment and does not break with it, it reveals nothing of the social or economic conditions that have lead the subjects to be the way they are. I also proposed that *10 – 16* (1997) (Figs 2.1 – 2.3) is a text of *jouissance* because it unsettles the viewing experience of the audience through the technical device of lip synching children's voices through adult's mouths.

## References

- Barthes, R (1976) *The Pleasure of the Text*. Jonathan Cape Ltd, London.
- Bourdieu, P (1986) *The forms of capital*. In J. Richardson (Ed.) *Handbook of Theory and Research for the Sociology of Education* (New York, Greenwood), 241-258.
- Bourdieu, P (1989) *Social Space and Symbolic Power*. *Sociological Theory*, 7:1; 14-25.
- Charlesworth, S.J (2000) *A Phenomenology of Working Class Experience*. Cambridge University Press, Cambridge, UK.
- Ferguson, R, Salvo, D, D, Slyce, J (1999) *Gillian Wearing*. Phaidon Press Ltd, London.

Fuery, P, Mansfield, N (2000) *Cultural Studies and Critical Theory*, second edition. Oxford University Press, Australia.

Foster, H (1999) *The Return of The Real: The Avant-Garde at the End of the Century*. MIT Press, USA.

Molon, D, Schwabsky, B (2002) *Gillian Wearing: Mass Observation*. Museum of Contemporary Art, Chicago, USA and Merrell Publishers Ltd, London.

Reay, D (2000) *A Useful Extension of Bourdieu's Conceptual Framework?: Emotional Capital as a Way of Understanding Mothers' Involvement in Their Children's Education?* The Editorial Board of the Sociological Review, 2000:568-585. Blackwell Publishers, Oxford and USA.

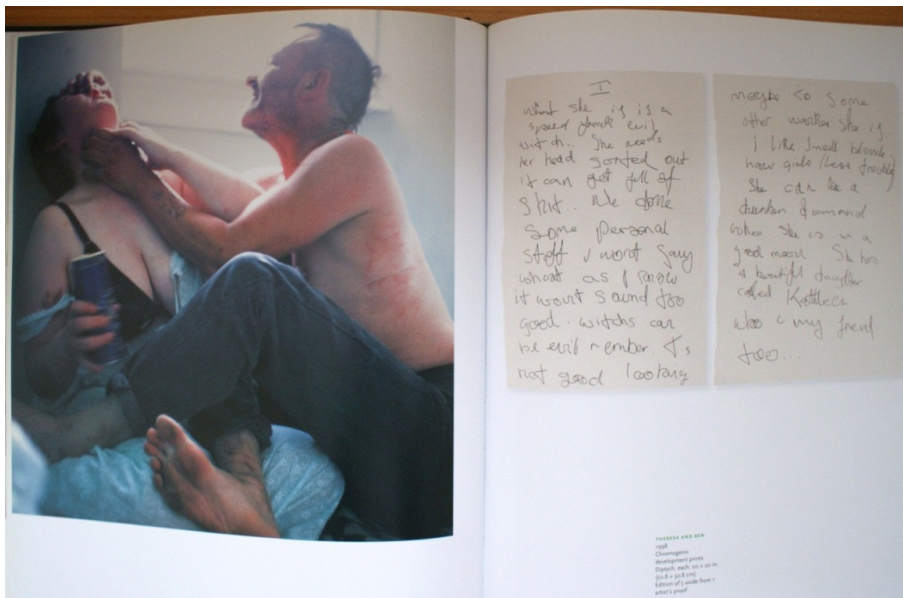
Reay, D (2004) *Gendering Bourdieu's Concept of Captials? Emotional Capital, Women and Social Class* in Adkins, L and Skeggs, B *Feminism After Bourdieu*, pp. 57-71. The Editorial Board of Sociology Review, Blackwell Publishing Ltd, Oxford, UK.

Skeggs, B (2005) *The Making of Class and Gender through Visualizing Moral Subject Formation*, *Sociology*, 39 (5), 968-982

## Illustrations



**Fig 1.1.** Wearing, G (1998) *A Woman Called Theresa*. Photographed from the book, Gillian Wearing (1999) Russell Ferguson, Donna De Salvo and John Slyce.

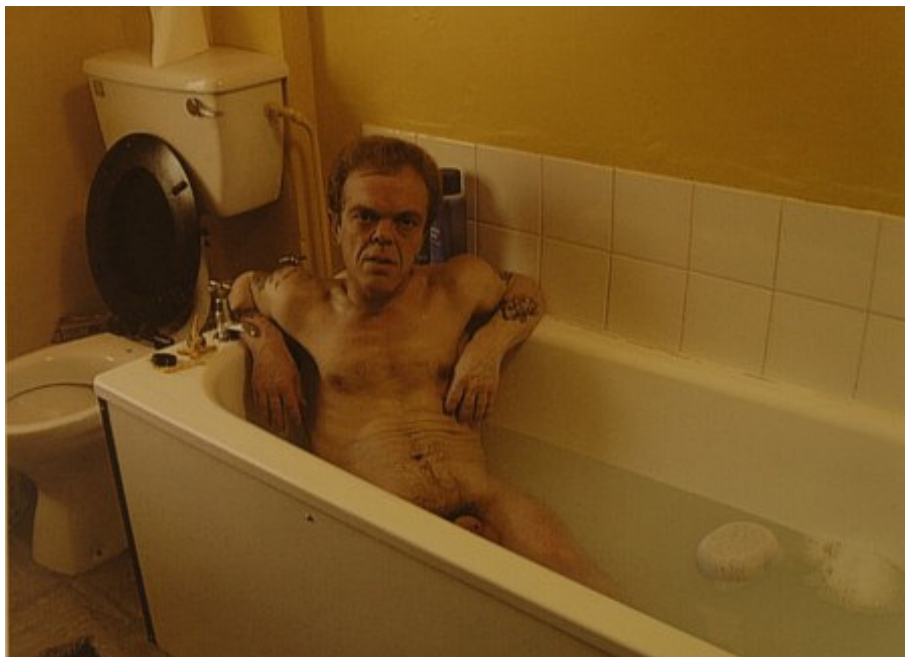


**Fig 1.2.** Wearing, G (1998) *A Woman Called Theresa (Theresa with Ben)*. Photographed from the book, *Gillian Wearing* Russell Ferguson, Donna De Salvo and John Slyce.



**Fig 2.1** Wearing, G (1997) *10 – 16, (11)*. Single channel video. Tate. Presented by the Patrons of New Art through the Tate Gallery Foundation © the artist and Maureen Paley.





**Fig 2.2** Wearing, G (1997) 10 – 16, (13). Single channel video. Tate.  
Presented by the Patrons of New Art through the Tate Gallery Foundation  
© the artist and Maureen Paley.



**Fig 2.3.** Wearing, G (1997) 10-16, (12) Single channel video. Photograph  
taken of photograph in the book *Gillian Wearing* (1999:137) Russell  
Ferguson Donna De Salvo, John Slyce.

# 3D Modeling of the Human Heel Pad

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## Abstract

The aim of this work is to develop a three dimensional (3D) finite element model of the human heel area in order to simulate the biomechanical behavior of the heel pad under compression. This model is built based on the MR images of the right foot of a 34 year-old female subject. In our model, we included the skin, micro-chamber layer, macro-chamber layer, plantar fascia, stiff tissues (where parts of several foot bones are considered fused together), tendon Achilles and the muscle group. This anatomically detailed heel pad model can be utilised to study the effects of the external factors on the heel tissues without the need for expensive and slow experimental tests on real subjects. Further, this model can be used to improve the understanding of the biomechanical characteristics of the skin, micro-chamber and macro-chamber layers, and also, their contributions on the biomechanical behavior of the heel pad.

## Keywords

Heel pad, macro-chamber layer, micro-chamber layer, three-dimensional model

## Introduction

The human heel pad is subject to repetitive loading associated with locomotion. It plays an important role as a shock absorber reducing the impact forces generated during gait and in weight bearing. Like many other biological soft tissues, the human heel pad shows visco-elastic biomechanical behavior under loading (Zhang, 2007). The viscoelastic materials show behavior which is a mixture of the viscous and the elastic behaviors.

The heel pad has a composite biological structure consisting of the fat pad and the skin. The fat pad tissue is composed of a superficial micro-chamber layer and a deep macro-chamber layer (Bletschschmidt, 1982; Hsu et al., 2007). Detailed information about the mechanical behaviour of each component of the heel pad contributes to the investigation of the mechanical functionality of the foot, and also, development of the model simulating the biomechanical behavior of the heel pad under loading.

Modeling the heel pad provides an opportunity to test the effects of the external factors, such as choice of insole or foot wear materials, on the stress experienced by the heel tissues, without the need for slow and expensive experimental tests on real subjects. Thus models could be one part of decision making process in insole and footwear design, directly informing orthotics prescription. Developing pathology (disease) or even person (patient) specific models would be critical to ensuring outcomes were relevant for clinical practice.

There is an increasing awareness that the pathological changes, aging and overloading may affect the heel pad stiffness and its biomechanical behavior. Therefore, they are important factors in development of the heel and the foot problems. An improved understanding of the biomechanical characteristics of the human heel pad sub-layers would contribute further to the foot biomechanics research.

Finite element foot modeling has been recently used in the insole and footwear design (Qiu et al., 2011; Luo et al., 2011; Cheung et al., 2008). It also has been utilized to investigate the effects of the heel pad geometry, external factors such as compression loading rate and properties of the insole and footwear on the stress in the heel pad under compression (Spears et al., 2006; Goske et al., 2006; Cheung et al., 2005; Antunes et al., 2008). In most of these studies, the heel pad was assumed as a linear elastic homogeneous material. Only few studies modeled the heel pad as a non homogenous two-layer structure (Gu et al., 2010; Spears et al., 2007; Spears et al., 2006) and a nonlinear material (Chokhandre et al., 2012; Gu et al., 2010; Erdemir et al., 2006).

The finite element 3D model of the foot can simulate the realistic behavior of the heel pad if it represents the real subject-specific geometry of the heel pad and precise material properties of the heel pad tissue. The purpose of this work is to develop an anatomically detailed 3D finite element model of the human heel region in order to determine the nonlinear mechanical properties of the heel pad components including the macro-chamber, micro-chamber and skin layers, and then simulate the biomechanical behavior of the heel pad sub-layers under compression.

## **Materials and Methods**

In this project a finite element 3D model of the human heel region with the size of 9.25 cm from the back of the foot and 4.5 cm from the bottom of the foot was generated. Development of the 3D model of the heel region had two main stages. At the first stage, the surface geometries of the heel region components were generated based on the unloaded MRI data. At the second stage, the solid geometries were developed using the surface geometries. The unloaded MRI Scans were taken from the right foot of a female subject (age at the time of study 34 year, height 167 cm, weight 63 kg, shoe size 5 UK) in coronal view at neutral position using Philips scanner (1.5T), 3D fast field echo with field of view of 250 mm, coverage 100 mm. The images with dimensions of  $0.28 \times 0.28 \times 1.25$  mm (TR=20 and TE=5.1 ms) were found to be optimal in terms of quality and scanning time.

The  $9.25 \times 4.5$  cm dimension of the model was obtained based on a pilot work that carried out on the heel pad. In this experimental work, the subject was in prone position with the foot hanging over the edge of the examination table. The heel pad was then compressed with a flat rigid plate and simultaneously deformations of the heel pad were recorded using ultrasound modality. To determine the superior boundary of the 3D model of the heel region, the ultrasound probe was placed vertically at the back of the foot to visualise the deformations of the heel pad in the inferior/superior direction (Fig. 1). In the next observation the ultrasound probe was placed under the heel pad in posterior/anterior direction while the heel pad was being compressed in order to determine the anterior boundary of the 3D model (Fig. 1).

The ultrasound imaging data showed that the deformations of the heel pad under compression do not extent more than 4 cm and 7 cm in the inferior/superior and posterior/anterior directions respectively and the heel pad deformations were restricted with the stiffer tissues. The  $9.25 \times 4.5$  cm dimension was used to stay in a safe side.



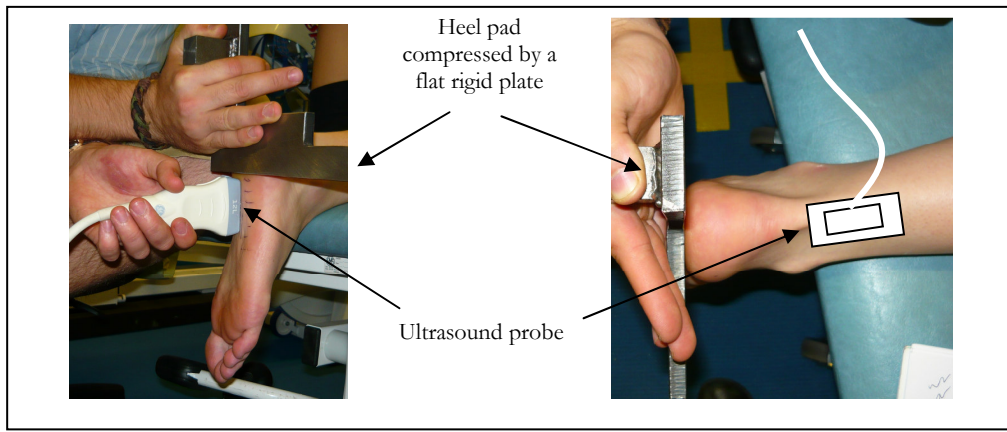


Fig. 1. Pilot study to identify the required dimensions for the 3D model.

- **Development of the surface geometries**

This process starts with importing the MRI data with DICOM format into the image processing software, SIMPLEWARE®-ScanIP v3.1 (Simpleware Ltd, Exeter, UK) and continues with segmentation. Segmentation is a process to identify a region by grouping appropriate pixels and define the boundaries of the region. It is a very important step because the accuracy of the final model mostly depends on the initial segmentation. The skin of the heel pad is the first tissue to be distinguished and segmented.

Different automated, semi-automated and manual segmentation tools such as the threshold, region growing, floodfill and paint are used to step by step identify and segment the skin layer. After performing the segmentation operations on all of the MRI slices, and segmenting the region of interest in all of the MRI images, the ScanIP can generate the 3D surface model of the skin layer based on the stack of the images. The segmentation process of the skin layer is shown in Fig. 2. Surface geometries for the other components of the heel region model including the micro-chamber layer, macro-chamber layer, plantar fascia, tendon Achilles, muscle group and stiff tissues (where parts of several foot bones and tendon Achilles are considered fused together) were generated using the same procedures.

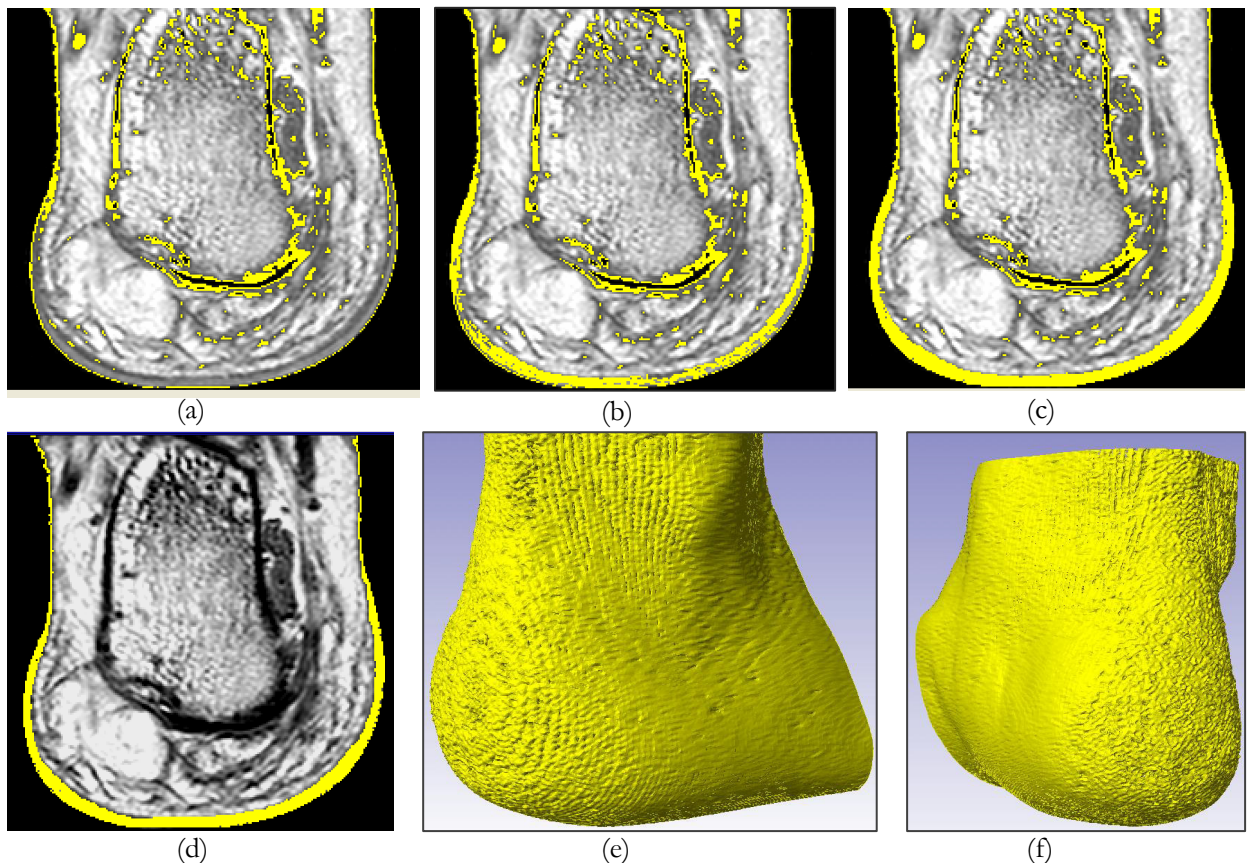


Fig. 2. Segmentation process of the skin layer in the ScanIP. (a) The automatic threshold based segmentation to identify the boundary of skin layer, (b) The semi-automatic region growing based segmentation to select the most of pixels belong to skin layer, (c) The FloodFill segmentation tool to fill the cavities in the skin layer, (d) The manual Paint tool to remove the selected pixels which are not part of the skin layer, (e,f) 3D surface model of the skin layer from the back.

- **Development of the solid geometries**

To develop the 3D solid model of the heel region, the surface geometries generated in the previous section were saved as the STL format and exported to the SolidWorks 2010 which was used as a CAD design software in this project.

The ‘loft’ is the main feature in the SolidWorks which was used for construction of the 3D solid geometries. Some profiles and guide curves were required to define the outline of each of the structure. The loft feature creates the model by making transitions between profiles following the guide curves. This feature was used in the SolidWorks to develop the smooth solid models for each of the skin, micro-chamber, macro-chamber, plantar fascia, muscle group and stiff tissues. This process is illustrated for the skin layer in Fig. 3. It shows how the surface geometry was used as a base and solid model was made over it.

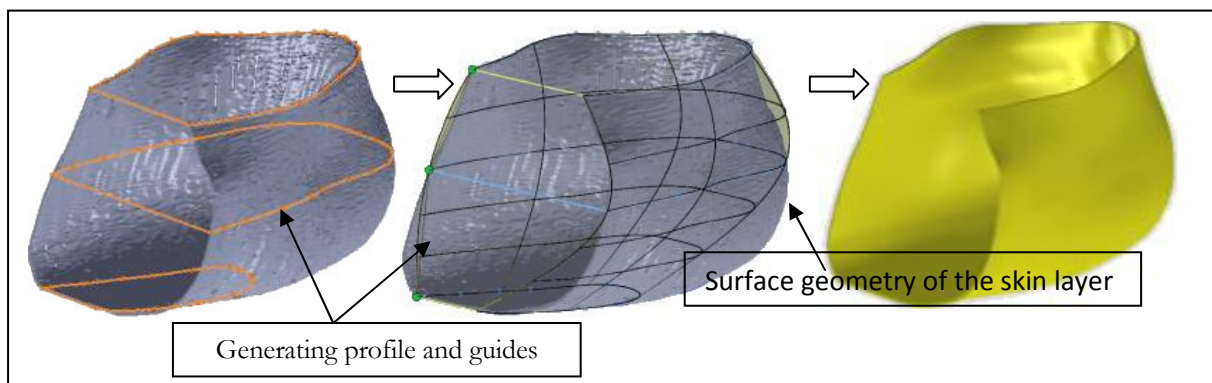


Fig. 3. Development of the solid geometry for the skin layer.

The solid models for the other parts of the heel region model were then assembled together to form a complete model in order to be imported into ABAQUS for meshing (Fig. 4). The complete meshed model will be exported into the Ls-Dyna for finite element analysis and determining the material properties of the heel pad components.

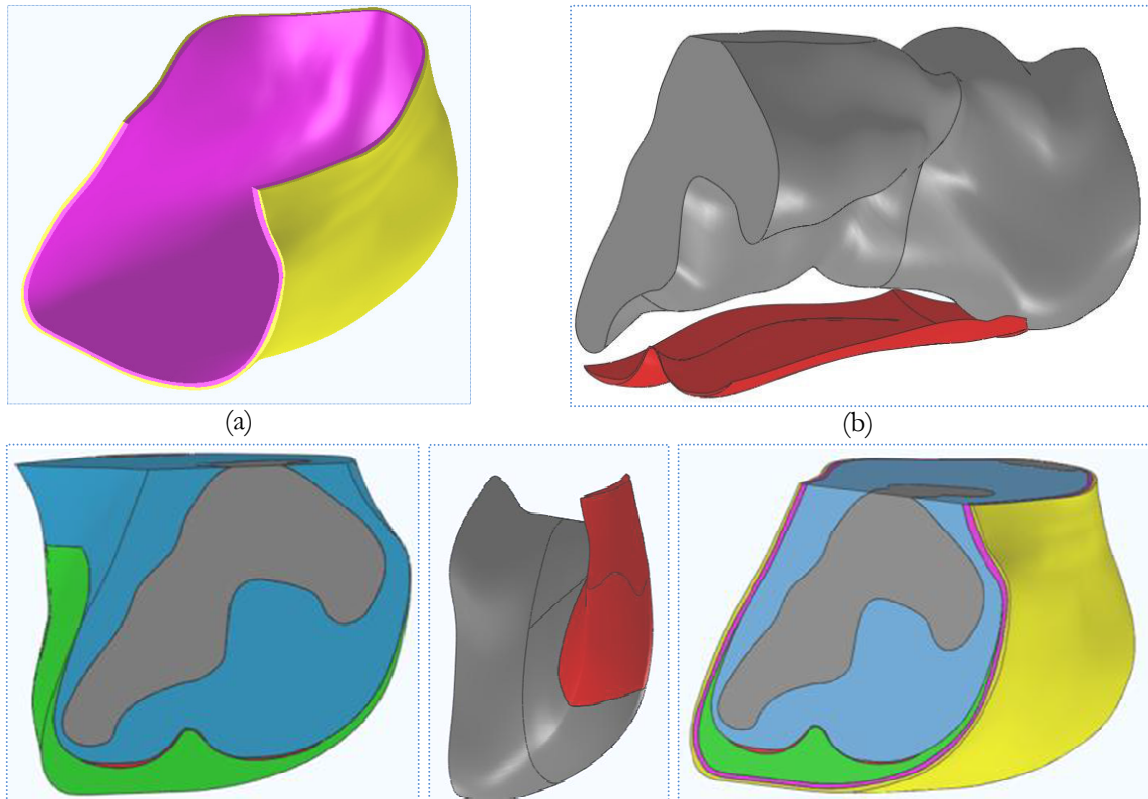


Fig. 4. The components of the 3D model of the heel area. (a) Micro-chamber and skin layers, (b) Stiff tissues and plantar fascia, (c) Muscle group surrounded by macro-chamber layer, (d) Tendon Achilles at the back of calcaneus, (e) The complete 3D model.

## Results and Discussion

A detailed 3D subject-specific model has been developed to form an anatomically detailed three-layer heel pad region. This model will be used to determine the hyper-elastic and visco-elastic properties of the macro-chamber, micro-chamber and skin layers through the inverse finite element analysis. The model with accurate estimates of the corresponding material properties can simulate the behavior of the heel pad under compression at different conditions.

According to the literature the stiffness of the heel pad sub-layers are affected by different factors such as pathological changes and age. This results in changes in the biomechanical behavior of the heel pad. Very limited studies have been conducted to investigate the effects of the properties of the heel pad sub-layers on the biomechanical behavior of the heel pad. Hsu showed that the micro-chamber layer in diabetic patients exhibits significantly less stiffness than that in healthy persons, while the macro-chamber layer in diabetic patients exhibits opposite results. A decrease in micro-chamber stiffness may result in reduced ability of the micro-chamber layer to confine the macro-chamber layer. Moreover, an increase in the stiffness of the macro-chamber can lead to transferring stress from the calcaneus to the skin (Hsu, 2009). Our model can be used to study the effects of the variations in the stiffness of the macro-chamber, micro-chamber and skin layers on the biomechanical behavior of the heel pad. Using sensitivity tests, it is possible to make each of the heel pad sub-layers softer and stiffer than their normal form and study how these changes affect the biomechanical behavior of the heel pad.

The foot orthoses have been found to be effective in reducing the plantar pressure. However the contribution of different orthoses design factors on this reduction is not very clear. Rather than using slow and expensive experimental tests on real subjects, our finite element model can be used to evaluate different design factors on the plantar pressure relief.

A challenging part in modeling of the heel area for us has been the identification of the boundaries of the heel pad components including the boundaries of the macro-chamber and micro-chamber layer for segmentation. We have used prior knowledge about the anatomy of these two structures to improve the segmentation results and deal with poor image contrast and missing boundaries.

## References

- Antunes, P.J., Dias, G.R., Coelho, A.T., Rebelo, F., Pereira, T. (2008). Non-linear finite element modeling of anatomically detailed 3D foot model. *MIA* 2207
- Bletschmid, E. (1982). The structure of the calcaneal padding. *Foot Ankle* 2, pp. 260-83
- Cheung, J.T., Zhang, M., Leung, A.K., Fan, Y. (2005). Three-dimensional finite element analysis of the foot during standing-a material sensitivity study. *Journal of Biomechanics* 38 (5), pp. 1045-54
- Cheung, J.T., Zhang, M. (2008). Parametric design of pressure-relieving foot orthosis using statistics-based finite element method. *Medical Engineering & Physics* 30 (3), pp. 269-277
- Chikhandre, S., Halloran, J.P., Bogert, A.J., Erdemir, A. (2012). A three-dimensional inverse finite element analysis of the heel pad. *Journal of Biomechanical Engineering* 134.
- Erdemir, A., Viveiros, M.L., Ulbrecht, J.S., Cavanagh, P.R. (2006). An inverse finite-element model of heel-pad indentation. *Journal of Biomechanics* 39, pp. 1279-1286
- Goske, S., Erdemir, A., Petre, M., Budhabhatti, S., Cavanagh, P.R. (2006). Reduction of plantar heel pressures: insole design using finite element analysis. *Journal of Biomechanics* 39 (13), pp. 2363-70
- Gu, Y., Li, J., Ren, X., Lake, M.J., Zeng, Y. (2010). Heel skin stiffness effect on the hind foot biomechanics during heel strike. *Skin Research and Technology* 16, pp. 291-6
- Hsu, C. C., Tsai, W. C., Wang, C. L., Pao, S. H., Shau, Y. W., Chuan, Y. S. (2007). Microchambers and macrochambers in heel pads: are they functionally different? *Journal of Applied Physiology* 102, pp. 2227-2231
- Hsu, C. C., Tsai, W. C., Hsiao, T.Y., Tseng, F. U., Shau, Y. W., Wang, C. L., Lin, S. C. (2009). Diabetic effects on microchambers and macrochambers tissue properties in human heel pads. *Clinical Biomechanics* 24, pp. 682-686
- Luo, G., Houston, V.L., Garbarini, M.A., Beattie, A.C., Thongpop, C. (2011). Finite element analysis of heel pad with insoles. *Journal of Biomechanics* 44 (8), pp. 1559-65
- Qiu, T., Teo, E., Yan, Y., Lei, W. (2011). Finite element modeling of a 3D coupled foot-boot model. *Medical Engineering & Physics* 33 (10), pp. 1228-33
- Spears, I.R., Miller-Young, J.E. (2006). The effect of heel-pad thickness and loading protocol on measured heel-pad stiffness and a standardized protocol for inter-subject comparability. *Clinical Biomechanics* 21, pp. 204-12
- Spears, I.R., Miller-Young, J.E., Sharma, J., Ker, R.F., Smith, F.W. (2007). The potential influence of the heel counter on internal stress during static standing: A combined finite element and positional MRI investigation. *Journal of Biomechanics* 40, pp. 2774-80
- Zhang, W., Chen, H.Y., Kassab, G.S. (2007). A rate-insensitive linear viscoelastic model for soft tissues. *Biomaterials* 28(24), pp. 3579-86

# **Can photography aid understanding and communication in chronic pain patients and their families?**

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## **Abstract**

Around 7.8 million people in the UK are affected by chronic pain, which can have devastating effects on their and their families' quality of life. Studies suggest that children may show lower than average social skills and higher levels of pain complaints, whilst partnerships show a lack of intimacy and social interaction as argued by Snelling (1994), Evans et al (2007), Ireland and Pakeham (2010) and Closs et al (2009). Families experience disruption to their everyday life through role shifting within the family unit, financial difficulties, exhaustion, resentment, helplessness and lack of communication and understanding (Roy, 1992). However, conventional treatment routes are limited and often only available to patients themselves excluding family members leaving them to cope with a dis-located family life on their own.

My research addresses these issues within those families. I suggest it may be improved through the help of imagery, similar to the methods which have been used successfully for the treatment of phantom limb pain and most recently in patients with chronic facial pain at London's University College Hospital (Padfield, Zakrzewska, 2011a). I suggest that some of these feelings may be eased by photography depicting all of those emotions, sharing the experiences without the need of words.

In conclusion, I am proposing to create a body of photographic images by translating this sheaf of emotions into pictures which may provide sufferers and their families with a tool to improve understanding, communication and ultimately family life.

**Keywords:** Chronic Pain, Communication, Families, Photography, Understanding

## **1. Do pictures really say a thousand words?**

Arthur Brisbane, editor of the New York Evening Journal said in 1911: "Use a picture. It's worth a thousand words", (Bouch, 2009) a phrase widely used in the English language and suggests that a rather complicated thought can be successfully communicated by using just one image.

Most of us think feel, and recall memories not in words directly, but rather in iconic imagery: inner, silent thought-pictures, and visual codes and concepts. All of these make up the mental maps that we use when later trying to cognitively communicate about things, whether using words or artistic symbolic representations of them (Weiser, 1999)

We are accustomed to read images daily, everywhere we go and whatever we look at. Pictures are everywhere: in newspapers, magazines, in advertising, on the TV and the internet. We read images without thinking about it. We are getting information from images which we often take in quite subconsciously. Depending on our cultural background we extract different information from these images and without being knowledgeable in art we can understand and process the information we are given in the images.



Therefore I would like to explore whether images conveying certain emotions experienced by chronic pain patients and their families would help the families get a better insight into each other's predicament, on the basis of recognition rather than the intellectual understanding of the situation, without having to try to express these experiences verbally. If these images can express their fears and frustrations, their guilt and their anger, their sadness and helplessness and the parent, the child or the patient sees how the other family members feel, they might be able to acknowledge these and start the conversation they were too scared to have previously. Imagery can be a useful source to extend our understanding and beliefs (Walden, 2010) (Lopes, 1996) and it has been used successfully in treating phantom limb pain and more recently in helping chronic facial pain patients in expressing how they experiencing their pain, what it feels like and how bad the pain is.

It (pain) requires a language which works on a more instinctual and primal level than words. One such language is visual language- with its ability to contact the unconscious in maker and viewer (Padfield, 2003)

We are equipped to acquire an understanding of the world without using words as language: people with visual impairments use their ears and touch, and people with hearing impairments use their eyes. Images can convey messages, which we might not be able to put into words, not meaning we don't understand them. They often trigger emotions which we experience very clearly giving us a good understanding of the stories being told. "I wanted to explore (the photograph) not as a question (a theme) but as a wound: I see, I feel, hence I notice, I observe, and I think" (Barthes, 1993)

## **2. Background and Methodology**

The aim of the study is to produce a photographic body of work based on the research into the impact of parental chronic pain on family life through interviews with patients, their partners and their children (above the age of 12). Moreover, I will explore whether potential issues can be alleviated or dealt with in more effective ways with help of the much more immediateness of photographic imagery over an intellectual understanding on the basis of text or speech which would then answer my overarching research question.

My study consists of a literature review on clinical research concerned with parental chronic pain, a philosophical review on the phenomenological key concepts of Husserl, Heidegger and Merleau-Ponty which are pertinent to the lived experience of chronic illness, as well as hermeneutics by Heidegger, Schleiermacher and Gadamer. Further, it comprises of interviews with families who are suffering from parental chronic pain, the analysis of the collected data using interpretative phenomenological analysis and the picture making process on found themes in the interview data. In order to do this, I am researching other artists who have dealt with illness and pain in their work and how they have approached the subject. This will support my own approach to the image making process. Once this is completed, I will invite all participants as well as other sufferers and their families to discuss the images for their feedback and to establish if the images resonate with their experiences. The process and findings will be recorded in my PhD Thesis. The images are going to be exhibited and then hopefully made available to patients, their families and medical practitioners in form of a publication.

In order to conduct my study I had to seek Ethics approval from the North-West NHS Ethics board in Lancaster which was approved in March 2012. Their main concern was for the participants well being and they asked for a counsellor to be on stand-by in case of any emotional distress caused by the interview process. The process of attaining ethics approval

has been valuable and extremely helpful as I was forced to be very clear about my study in terms of constructing my research model, methodology, aim and output. In-depth consideration and rigour have been vital in the application process which enabled me to have an intelligible view of the direction of my research. Being able to give precise descriptions about my research to a lay audience was crucial as none of the NHS panel members had an art background; defending my study in front of Lancaster's NHS Ethics Board has given me confidence to pursue my project and to publicise the issues I am working on further.

### **3. Chronic Pain in Parents – Impact on Families**

#### ***3.1 The patient***

Generally, chronic pain patients suffer from constant pain which needs to be managed but in most cases can never be cured; depending on the condition this pain can be localised or widespread throughout the body. Due to the complexity of chronic pain patients suffer a multitude of physical, mental and social symptoms such as lack of sleep – patients tend to sleep little as finding a comfortable position is often a problem. Being in pain over any length of time is exhausting and constant fatigue the result. Patients find their mental capacity is reduced from lack of sleep. They experience poor memory and concentration; they lack patience, are irritable and suffer from mood swings. Due to their life-changing circumstances their social life structure is greatly affected too. Patients are often forced to reduce their working hours or even give up their job, which can cause a loss of their social network, financial difficulties and low self esteem (Kemler, M.A.; Furnée, C.A., 2002) (De Souza, L., Frank, A.D., 2011). Patients feel depressed, anxious, angry, frustrated, and sad. They are grieving for the person they lost and worry about becoming a burden to their family. Chronic pain sufferers often lose touch with their circle of friends as they are unable to socialise like before. They struggle to take part in a number of everyday activities such as play with the children and intimacy with their partner.

#### ***3.2 The partner***

Partners often feel helpless, because there is very little they can do to alleviate their loved one's pain. They go through stages of feeling angry and frustrated, sad, lonely, rejected and compromised. They have to take on extra hours at work to make up for the financial loss, or give up work to care for their ill partner (Söderberg, S. et al., 2003) (Silver, 2004). They too miss out on socialising with friends, give up other past times such as sports and days out. Suddenly, the responsibility and their role in the family unit has taken on a very different shape than it was planned for in the past. For them it is a big commitment and worry to bring up children, provide for the family and care for their partner almost single handed whilst rarely having the opportunity to express how they are affected by these life-changing events, how they are struggling or coping and are usually not offered any help and support through the healthcare system. (Flor, H., Turk, D.C., 1985) This puts an enormous amount of stress on the healthy partner often more so than on the ill spouse. (Kerns, R.D., Turk, D.C., 1984) But the uncertainty of life with a chronic pain condition and the impact it has on the patient's and family's day-to-day life as well as the consequences of a long-term prognosis can lead to psychiatric illness in the partner too. (Roy, 2001)

#### ***3.3 The children***

Studies have shown that children growing up in a family with parental chronic pain show lower than average social skills, much higher levels of pain complaints, anxiety and

depression. They can suffer mood swings and become increasingly difficult (Dura, J.R.; Beck, S.J., 1988) (Evans, S. et al., 2006) (Kaasbøll, J.; et al., 2012) (Chun, D.Y.; et al., 1993). Boys seem to be especially affected, showing a drop in performance at school and feeling insecure. Children are often missing out on family play time, days out and holidays due to financial hardship, pain in their parent or the well parent having to work more. But they also have to content with irritability in their parents, impatience, frustration and general anxiety. Some children need to take on extra - sometimes even inappropriate responsibilities like caring for their parent. This will have a profound impact on their development, their school life, their opportunity and ability to form meaningful friendships with peers. Family structures are completely reversed and the oldest child is possible the most affected through taking on the care of the parent and the younger siblings.

#### **4. Why is Communication so difficult?**

For most adults living in a relationship with a chronically ill partner, communication can become tense and challenging (Silver, 2004). Neither partner want to hurt the other by saying what is on their mind which can range from anger to frustration, helplessness and sadness to resentment and grief. Initially or shortly after falling ill these issues are easily discussed, but once the illness onset has passed and life has to carry on the patient often does not want to be a burden or be known as moaning or needy; the partner however is often taking on extra responsibilities and might feel burdened, angry and resentful because of it but feels guilty because they are not the ones who have to live with the pain. The dynamics of the relationship change and when communication becomes difficult resentment on both sides builds. If the mother is suffering with chronic pain, partners often struggle to take on new responsibilities if they are used to providing for the family in financial ways rather than in ways of home-making. Frustration and anger, bitterness and hostility develop but none would voice their aggravation to keep the peace. It is a very testing situation for any relationship as chronic pain needs adjusting to, patients need to pace themselves in order to manage the pain and keep flair-ups at bay. Partners and children need to adjust to this life too which can be very demanding on all family members. With the added strain of friends and family moving on with their life and any social life coming to a standstill, finances are tight and intimacy dies down, relationships are challenged and communication compromised.

Children are often unable to express how they feel simply because they struggle to understand the situation they are faced with. They frequently react to rather than voice what they are experiencing. This might become apparent when they “play up” at home or in school. Children express their feelings of anger, frustration and sadness at the “loss” of a healthy parent in their behaviour. In turn this causes parents to be angry at their children for being inconsiderate, and they find themselves reacting by shouting, being impatient and angry which causes more friction and tension in a family home. Soon family life becomes stressful and unhappy (Chun, D.Y.; et al., 1993) (Dura, J.R.; Beck, S.J., 1988).

The translation of these issues into images has to be sensitive yet poignant and emotive. Much like the work of Judith Fox (2009) who portrays life with Alzheimer’s in a moving and expressive photo essay. Photographs need to be emotionally charged in order to decipher the psychological and physical pain these families are experiencing.

#### **5. Interviews**

I am currently interviewing families recruited through chronic pain support groups, affected by parental chronic pain, in order to find out how they are affected by chronic pain and where the differences lie in the way they are affected individually. I am hoping to gain better insight into each family member’s experience of life with chronic pain, how they cope and how they



feel they are communicating about issues as a family. I am asking how they would describe their experiences in a picture and whether they can think of any metaphors, symbols or analogies to illustrate their understanding of chronic pain. I am enquiring what shades and colours best portray the intensity of their experiences as this will help me to translate these into photographic images. I am looking for descriptive pictures with plenty of detail of the participants and what these mean to the individuals. I invite participants to talk about anything they feel is relevant to their life with their understanding and their knowledge of chronic pain with the aim of providing the participants with a platform to voice what they have probably never been asked previously. The more detailed information I can obtain from the families, the more I can build up a picture of what life is like for them and the easier it will be to translate these complex experiences into images.

### ***5.1 Interview Parameters***

The interviews are taking place in the participant's home and each family member is interviewed separately to ensure each member can speak freely and openly without the worry of upsetting other family members.

The inclusion criteria for participants were originally families with parental chronic pain with children 12 years or older living at home. This has been adjusted to allow families with children no longer living at home to take part through lack of participants. There is counselling available for all participants, should they feel they need to speak to someone professional after the interview took place. The counselling is offered by Nicola Wilson, Senior Lecturer and Programme Leader for CBT and Psychological Interventions at the University of Cumbria at a location convenient for the participants or via Skype. All participants have been given participant information sheets prior to the interview and each participant needs to sign a consent form before the interview can take place. Children below the age of 18 sign an assent form which is counter-signed by a parent.

The interviews are voice recorded and transcribed verbatim after each family has been interviewed. All data is handled confidentially and all names of participants have been changed to protect their identity. Each interview lasts between 60 to 90 minutes. I also make a few handwritten notes during the interview and straight after the interview whilst the experience is still fresh in my mind. I note down anything I feel is important and what I would not be able to extract from the interview transcription such as body language, eye contact etc. The transcriptions are analysed once all interviews are completed alongside the picture making process.

The interviews are semi-structured to allow the participants to tell their story but are asked a few guiding questions which will help me establish how each person feels about the pain, about their role within the family unit, how they feel about themselves and how they feel the illness has changed them and the family dynamics, but allowing for questions to develop fluidly to suit each interviewee.

### ***5.2 Initial Outcome***

The participating patients have been very matter of fact about their abilities and disabilities and how their life has changed over the course of their illness. They seem to feel their communication skills with their immediate family are very good and they thought they were open and honest about their emotional and physical problems. I also found the patients seemed prepared for what they wanted to tell me, their answers were almost pre-fabricated whereas the adult-children were much more emotional and stated that they did not quite know how and what to say as nobody had ever asked them before. They also felt that communication was quite poor and that they often did not get the chance to share how they feel and cope with the family situation. Although they repeatedly said they were very close to

their parent in pain and they would do anything in their power to alleviate some of that pain even for a very short while, they felt they needed an outlet for their emotions and did not really get the opportunity to talk to their parents. They felt that their problems in comparison to their chronically ill parent were minimal and therefore disregarded their need to voice their complex emotions.

It seemed to me that the hardest part of being a child-carer (even as an adult) is the responsibility they feel towards their parent. They find themselves in a reversed role situation, where they are looking after the parent often from an early age rather than the parent looking after them. Consequently, they have to grow up at lightning speed in order to fulfil that role (Aldridge, J.; Becker, S., 1999).

But does this role become any easier once the children reach adulthood? What implication does this have on their adult life and their own relationships? On their work and social life? How do they cope with guilt for wanting their own life? These questions deserve further exploration in a second study.

The adult-children I have been speaking to so far reported that at no stage of their parent's illness they have been offered counselling or family therapy in order to deal with their family's illness situation, no provisions have been made whilst they were still at school and their well parent had to work full time to provide for the family. They had to adjust to the situation the best they could and now as adults they still try to do just that. They haven't given up on their responsibilities they took on when their parent fell first ill; they still look after their parent daily, although some have left home. They choose not to go on holiday because they feel they cannot leave their well parent to look after the ill parent on their own. They feel guilty if they enjoy themselves too much.

The wife of one of the patients, I call her Anne, feels angry and frustrated about the system that is in place to help families trying to adjust and cope with their new life-long situation. She explained how difficult life has been since her husband was suffering from chronic pain after a car accident and how often she considered leaving him. Not only had she taken on the full responsibility of providing for the family but she and her children had to cope with the strain of living with a husband and father who was angry and depressed and trapped in a "black hole" with no way out. She described her husband to have been aggressive and angry all the time, frequently shouting and 'biting her head off' for no apparent reason. He turned to drink to ease the pain as well as to numb the feeling of having lost the life he knew. Anne is angered that there is no support out there for families, nobody who gives families a helping hand, some tools to deal with the difficult times ahead. Nobody who explains what she can most likely expect from the progression of her husband's illness and how to cope. During an assessment of her husband's condition, years after the onset of his problems, a doctor asked Anne how she was feeling and coping with the situation. Being considered by this medical professional triggered a well of tears and made Anne aware of just how badly she had been managing.

## **6. Photographic Process**

Having these conversations with the participants is giving me the opportunity to get a deeper understanding of what kind of experiences and emotions I will need to capture in my images and how to visualise them. I am hoping to create pictures that will depict what these families are going through without encroaching on them personally. I am anticipating finding metaphors and symbols which will convey situations experienced by the families regularly. The images will need to have prevalence to families suffering from parental chronic pain in order to trigger and support understanding and open channels of communication. Being a chronic pain sufferer myself, I can empathise with the participants on a very personal level, allowing me an insight into the fluctuating conditions that come with chronic pain. Moreover,

I get a more comprehensive understanding of my own family's circumstances, which will feed into my picture-making process.

My photographic work will therefore be based on the participants' first hand experiences, my own experience as a chronic pain sufferer, and experience as an artist of creating images which have the scope to convey lived experience (Moss, 2012). Consequently, the images are based on how I see or visualise the participants' lives - hence making the work an artistic illustration. However, since I am approaching the project as a fellow sufferer and most of what I am being told resonates with my own personal experience, I hope my work has the capacity to emulate the illness narratives of the participants in a particularly meaningful way.

Artistic works in music, dance, and visual arts are a media for expressions of meaning and the 'voice' to suffering which is inadequately expressed in words. Artistic expressions are the conduit to personal and universal experiences of suffering and, in return, provide relief and give meaning to that experience (Davis, A.A.; Davis, M.P., 2010, p. 266).

Furthermore, I will base my research on other artists' work dealing with chronic illness and pain. Jo Spence, who famously published work on her struggle with cancer and patient care in order to break a conversational taboo, and to raise awareness of choices in care, as well as artists such as Hannah Wilke, Bobby Baker, Dr. John Darwell, Frida Kahlo and Robert Pope who all made work on their own personal experience of chronic illness. Additionally, I will examine the works by artists who made work of family members suffering chronic illness such as Lesley McIntyre, Judith Fox, Annabel Clark, Leonie Hampton, Sally Mann, Amber Shields, Henrik Malmström and others. Finally I will explore the works of artists who created imagery on non-related people suffering chronic pain or long-term illness i.e. Mary Ellen Mark, Alexa Wright, Kirill Kuletski, Adi Lavy, and Amy Elkins. This will allow me to develop a birds-eye view as well as being closely involved with the experiences of the participants, ultimately helping me to create work which will be equally true for patients and their families. However, unlike most of the artists mentioned before, I am moving away from a figurative approach to representation in order to leave the greatest possible room to the viewer to explore and engage with the images. This way I am allowing each person to identify areas in the work that resonates with them on some level. As with pain, emotional responses to art are entirely subjective; depending on our background, our cultural upbringing and our life experiences we bring different aspects and characteristics of ourselves to the picture causing diverse responses to the art we are looking at.



**Fig. 1 Bobby Baker Diary Drawings**

Once the photographic work is completed I am aiming to establish whether patients and their families would feel any benefit by looking at imagery which conveys the emotions and

feelings they are experiencing by living with chronic pain. This will be done by presenting the images to chronic pain support groups, followed by an open discussion or through handing out a short questionnaire. Further, I need to review with the participants whether their understanding of each other's feelings has improved and whether they feel it would also help them communicating more successfully. I am looking to find out from the participants if they consider the images to be more helpful than reading self-help literature and whether they feel less isolated with the way they are experiencing chronic pain.

## References

- Aldridge, J.; Becker, S. (1999). Children as carers: the impact of parental illness and disability on children's caring roles. *Journal of Family Therapy*, 21(3), 303-320.
- Baker, B. (2010). *Diary Drawings. Mental Illness and Me*. London: Profile Books Ltd.
- Barthes, R. (1993). *Camera Lucida*. London: Vintage.
- Bouch, J. (2009). A picture is worth a thousand words. *Advances in psychiatric treatment*, 15, 81. doi:10.1192/apt.15.2.81
- Chun, D.Y.; et al. (1993). Children of chronic pain patients: risk factors for maladjustment. *Pain*, 52, 311-317.
- Clark, A.; Redgrave, L. (2004). *Journal. A mother and daughter's recovery from breast cancer*. NY: Umbrage Editions, Inc.
- Closs, S. J. et al. (2009). The impact of neuropathic pain on relationships. *Journal of Advanced Nursing*, 65(2), 402-411.
- D. Padfield, Prof. J. Zakrzewska. (2011). Retrieved August 9, 2011, from [www.uclh.org: http://www.uclh.org/HP/GPNEWS/Pages/Hopetopatientswithexcruatingfacialpain.aspx](http://www.uclh.org/HP/GPNEWS/Pages/Hopetopatientswithexcruatingfacialpain.aspx)
- D. Padfield, Prof. J. Zakrzewska. (2011a). Retrieved August 9, 2011, from [www.uclh.org: http://www.uclh.org/News/Pages/Easingthepainthroughart.aspx](http://www.uclh.org/News/Pages/Easingthepainthroughart.aspx)
- Davis, A.A.; Davis, M.P. (2010). Art in medicine and the art of grief. *Progress in Palliative Care*, 18(5), 266-269.
- De Souza, L., Frank, A.D. (2011). Patients' experiences of the impact of chronic back pain on family life and work. *Disability and Rehabilitation*, 33(4), 310-318. doi:10.3109/09638288.2010.490865
- Dura, J.R.; Beck, S.J. (1988). A comparison of family functioning when mothers have chronic pain. *Pain*, 35, 79-89.
- Evans, S. et al. (2006). The relationship between maternal chronic pain and child adjustment: the role of parenting as a mediator. *Journal of Pain*, 7(4), 236-243. doi:10.1016/j.jpain.2005.10.010

- Evans, S. et al. (2007). Psychosocial adjustment and physical health of children living with maternal chronic pain. *Journal of Paediatrics and Child Health*(43), 262-270. doi:10.1111/j.1440-1754.2007.01057.x
- Flor, H., Turk, D.C. (1985). Chronic illness in an adult family member: pain as prototype. In D. Turk, & R. Kerns (Eds.), *Health, Illness, and Families. A life-span perspective* (pp. 255-278). NY, Chichester, Toronto, Brisbane, Singapore: John Wiley & Sons.
- Fox, J. (2009). *I still do. Loving and living with Alzheimers*. NY: powerHouse Cultural Entertainment, Inc.
- Hampton, L. (2011). *In the shadow of things*. Rome: Contrasto.
- Ireland, M.J., Pakenham, K.I. (2010). Youth adjustment to parental illness or disability: The role of illness characteristics, caregiving, and attachment. *Psychology, Health & Medicine*, 15(6), 632-645. doi:10.1080/13548506.2010.498891
- Kaasbøll, J.; et al. (2012). Psychological symptoms in children of parents with chronic pain - the HUNT study. *Pain*, 153, 1054-1062.
- Kemler, M.A.; Furnée, C.A. (2002). The impact of chronic pain on life in the household. *Journal of Pain and Symptom Management*, 23(5), 433-441.
- Kerns, R.D., Turk, D.C. (1984). Depression and chronic pain: The mediating role of the spouse. *Journal of Marriage and the Family*, 845-852.
- Lopes, D. (1996). *Understanding Pictures*. Oxford: Oxford University Press.
- Majmström, H. (2010). *On Borrowed Time*. Henrik Malmström.
- McIntyre, L. (2004). *The time of her life*. London: Random House.
- Moss, P. (2012). *Projects: Pat Moss Photography*. Retrieved from Pat Moss Photography: <http://www.patmossphotography.com/>
- Padfield, D. (2003). *Perceptions of Pain*. Stockport: Dewi Lewis Publishing.
- Pope, R. (1991). *Illness & Healing*. Nova Scotia: Lancelot Press Ltd.
- Roy, R. (1992). *The social context of the chronic pain sufferer*. Toronto, Buffalo, London: University of Toronto Press Inc.
- Roy, R. (2001). *Social relations and chronic pain*. New York: Kluwer Academic / Plenum Publishers.
- Silver, J. (2004). *Chronic Pain and the Family*. Cambridge, Massachusetts, London: The Harvard University Press.
- Smith, J.A., Flowers, P., Larkin, M. (2009). *Interpretative Phenomenological Analysis. Theory, Method and Research*. London, Thousand Oaks, New Dehli, Singapore: Sage.
- Snelling, J. (1994). The effect of chronic pain on the family unit. *Journal of Advanced Nursing*, 19(3), 543-551.

- Söderberg, S. et al. (2003). Living with a woman with Fibromyalgia from the perspective of the husband. *Journal of Advanced Nursing*, 42(2), 143-150.
- Spence, J. (1995). *Cultural Sniping. The art of transgression*. NY, London: Routledge.
- Walden, S. (Ed.). (2010). *Photography and Philosophy. Essays on the pencil of nature*. Chichester: John Wiley & Sons.
- Weiser, J. (1999). *Phototherapy Techniques: Exploring the Secrets of Personal Snapshots and Family Albums*. Vancouver: PhotoTherapy Centre Press.

## **Figures**

### **FIG. 1 BOBBY BAKER DIARY DRAWINGS**

[HTTP://WWW.WELLCOMECOLLECTION.ORG/WHATS-ON/EXHIBITIONS/BOBBY-BAKERS-DIARY-DRAWINGS.ASPX](http://www.wellcomecollection.org/whats-on/exhibitions/bobby-bakers-diary-drawings.aspx)

# Decision-making: two schools of thought or one?

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## Abstract

There are many theories of decision-making, and in general these are grouped into two categories – normative and behavioural. The consensus is that normative models are logical and structured, and produce ‘correct’ decisions; whereas behavioural models are more intuitive and reflect how decisions are actually made, but they are prone to error.

The present study adopted a grounded theory methodology to investigate how decisions are actually made within a large UK local authority. By observing how managers made decisions and then discussing this in detail with those concerned, it was found that in the ‘real world’ these distinctions are somewhat artificial and that the boundaries between these two schools of thought are blurred. This paper therefore casts doubt on the widely accepted distinction between normative and behavioural approaches to decision-making, and suggests that the ‘true’ distinction lies in the degree of conscious application of particular models. As such, this paper represents an important contribution to the decision-making literature.

## Keywords

Behavioural, decision-making, heuristic, normative

## 1. Introduction

People make decisions on a daily basis (Kahneman, 2011). These may range from the small-scale, such as ‘what am I going to have for tea tonight?’ to large-scale strategic decisions involving thousands of people (Buchanan and Huczynski, 2004). It is, therefore, unsurprising that the topic of decision-making has been extensively studied, with researchers seeking to improve the quality of decisions (e.g. Barnard, 1938; Fayol, 1963) or to understand how decisions are made (e.g. Tversky and Kahneman, 1974; March and Simon, 1993). Although recent research has tended to focus on the role of consciousness in decision-making (for instance Kahneman, 2011; Waroquier et al., 2010), for many, decision-making should be a logical sequence of steps and a process of evaluation that results in the best alternative being chosen (Bekker, Putters and Van der Grinten, 2004; Patton, 2003). Consequently, a number of ‘normative’, or ‘rational’ models have been developed that use a structured approach to prescribe the way in which decisions ‘should’ be made, and these include Cynefin (Snowden and Boone, 2007) and Brunswik’s Lens Model (Brunswik, 1952; 1956).

However, some authors suggest that normative methods do not describe how decision makers *actually* function (North, 1993; Quackenbush, 2004). For instance, they assume that complete information is available to the decision-maker (Tarter and Hoy, 1998), whereas in reality, information may be needed which is both difficult to collect and to categorise (Miller, Hickson and Wilson, 2002). Thus, it is rarely possible to consider *all* the alternatives (Buchanan and Huczynski, 2004), and potential solutions may be hard to recognise and may in turn create new problems (Miller, Hickson and Wilson, 2002). In view of this, an alternative approach has been developed, called the behavioural approach. Again, a number of different models have been proposed, all of which seek to describe the way in which

decisions are actually made. Typical of these models are Bounded Rationality (March and Simon, 1993; Simon, 1991) and Naturalistic Decision-Making (Klein, 2008; Zsombok, 1997).

The usual assumption is that normative decision-making is 'correct' (Hutchinson and Gigerenzer, 2005; Jost, 2001; Patton, 2003) whereas behavioural models are flawed and are prone to error (Kahneman and Frederick, 2002; Kahneman and Tversky, 1982), although this view is not universally accepted (Gigerenzer and Gaissmaier, 2011; Gigerenzer and Todd, 1999). As will be shown below, this paper is based on empirical research which examined how decisions are made in the 'real world', and it was found that the normative/behavioural distinction is somewhat artificial, and that the reality can be better explained by the degree of consciousness involved when making a decision.

The present paper is derived from a grounded theory study (Glaser and Strauss, 1967; Glaser, 1978). It is common for such works to follow a 'non-standard' format with, for example, the methodology being presented before the literature review (Fernández, 2004) and the findings and discussion elements being interwoven to aid the flow of the argument (Scott, 2007); and this paper follows this convention. It begins by outlining the methodology used in this study and this is followed by a general literature review covering several of the major theories of decision-making, and this leads into a discussion of the fundamental concern of the study; namely whether or not current theories adequately account for observed behaviour.

## **2. Methodology**

This study examined how senior managers (defined as those earning more than £40k per annum) make decisions in a large UK local authority. The author is himself a senior manager within the organisation, and therefore from the outset it was clear that if he was to understand the thought processes of these managers, it would be necessary to understand the subjective realities of those involved, and this underpinned the ontological and epistemological framework of the study, and mandated that a qualitative approach should be taken to the research. Grounded theory (Glaser, 1978; Glaser and Strauss, 1967) was chosen for several reasons. Firstly, because the author was researching inside his own organisation, prior to the commencement of this study he already had considerable experience of both the organisation and of much of the work undertaken. This meant that a methodology was needed that enabled him to manage this experience and minimise the risk of introducing bias into the study. Grounded theory was ideal because the researcher's own assumptions and knowledge can be treated simply as data (Fernández, 2004; Glaser, 1978). These data can then be compared with other data from the study, thus validating, modifying, or rejecting the researchers' observations (Fernández, 2004; Glaser and Strauss, 1967). Secondly, the study was intended to explore the process of decision making from the perspective of individual managers as well as seeking to understand this data to explain the 'big picture'. Miller and Fredericks (1999) recommend grounded theory as a suitable approach since it affords considerable flexibility in being able to investigate both macro- and micro-level issues. In addition, since decisions in organisations are made in a social context (Geiger and Turley, 2003) and are subject to constraints related to the context in which they are made (Miller, Hickson and Wilson, 2002), the methodology was appropriate for this research because a grounded theory investigation allowed information to be incorporated about the world in which the decisions are made. For instance, the particular properties of the various business units were incorporated into the emerging theory, and the processes which were affected by these could be identified (Pettigrew, 2002).



The author began by observing what happened in the field. Observational notes were supplemented by notes taken during semi-structured interviews and informal discussions, which were used to probe managers' thoughts and ensure the author understood what was happening (Glaser, 1978). All interview notes, as well as observational data and other relevant documents were coded line by line (Charmaz, 2000; Glaser and Holton, 2004) by approaching the data from as many angles as possible (Charmaz, 1994) without a preconceived set of codes (Glaser, 1978). Often this involved assigning multiple codes to a single sentence. In other words, the author sought to identify common patterns and themes from the data (Corbin and Strauss, 1990; Glaser and Strauss, 1967; Lings and Lundell, 2005). Constant comparison was at the heart of the process (Gummesson, 2000; Locke, 2001). Further data revealed further information, and these data were constantly compared to the earlier data, merged into new concepts, and eventually renamed and modified (Walker and Myrick, 2006). As the analysis continued, the codes began to coalesce into categories, with similar themes being identified and grouped. Over time, a 'core category' emerged – cognitive heuristics. This became the main theme of the research (Glaser, 1978), and was pivotal in the development of the emerging theory (Douglas, 2005; Fernández, 2004). At this point, coding ceased for other categories so that all effort was focused on this core category (Glaser and Strauss, 1967; Glaser, 1978).

Throughout the study, the author noted his thoughts in memos. These served to record his ideas in relation to the data, their codes, and their relationships during the research (Glaser, 1978; 1998), and to conceptualise that which to this point had been purely descriptive (Boychuk Duchscher and Morgan, 2004). Memos were produced constantly from the beginning of the analysis process until the very end (Fernández, 2004; Glaser, 1978). Theoretical sorting was also used in tandem with memo writing to decide how the theory should be structured (Glaser, 1978; Glaser and Strauss, 1967). As memos were written, they were grouped to put the fragmented data back together and then sequenced in whichever order best illustrated the emerging theory (Glaser and Strauss, 1967). As new ideas emerged during sorting, these were themselves recorded in memos (Glaser, 1978).

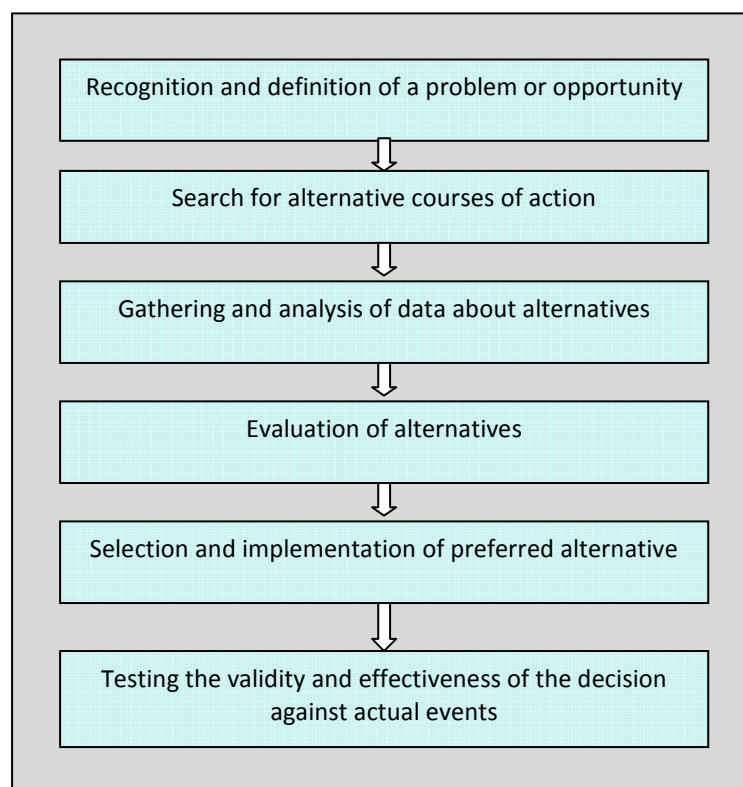
Literature has a different role in grounded theory from that in other methodologies. Grounded theory provides a systematic approach that considers theory but is not driven by it (Glaser and Strauss, 1967; Urquhart, 2001). Hence, general background reading around decision making was undertaken prior to the commencement of this study (Lings and Lundell, 2005; Starrin et al., 1997), but a detailed literature review of the core category – cognitive heuristics – was delayed until the research was well underway (Glaser, 1978; Glaser and Holton, 2004). By this time the concepts, subcategories, and categories for all data sets had been developed (Strauss and Corbin, 1998), and this approach avoided giving the author preconceptions about what might be discovered (Glaser, 1978). Indeed, as Gummesson (2000: 63) notes, "the researcher must not force preconceived categories and concepts on reality, even if these are well established in extant theory". The literature was read as a source of more data to be compared with existing data (Fernández, 2004; Glaser, 1998), and therefore was coded and treated in exactly the same way as 'other' data (Glaser, 1992). Thus, the same basic approach of data-collection (from the literature), coding and memoing was followed. It is possible that some may construe this "*as a neglect of the literature*" (Glaser, 1998: 360), but "*nothing can be farther from the truth*" (Fernández, 2004: 10). The literature was used to broaden the author's understanding of what was being studied (Parahoo, 2009), and the literature review was delayed in order to keep the researcher as free as possible of influences that could restrict the freedom required for theoretical discovery, not to ignore extant and relevant knowledge (Glaser, 1998).

### 3. Theories of decision-making

#### 3.1 Normative models

Normative models prescribe how decisions ‘should’ be made (Hutchinson and Gigerenzer, 2005). Although there are many different tools used in normative decision making, for instance decision trees (Buchanan and Huczynski, 2004) and statistical techniques (Kahneman and Tversky, 1973), they typically possess certain common features which include a list of steps, and a logical framework (Buchanan and Huczynski, 2004). Some models specify how individuals should tackle a problem, while others specify which decision-making styles should be effective in different situations (Buchanan and Huczynski, 2004). It follows that two people, given the same skills, the same objectives and values, the same knowledge and information, can rationally decide only upon the same course of action (Hicks, 1991).

The Rational Economic model is typical of normative models, and assumes that decision-making is a logical process. To arrive at a decision, a manager must define the purpose of the action, list the options available, choose between the options, and then turn that choice into action (Heller and Hindle, 1998). Versions of the rational economic model have been studied in contexts as diverse as motivation (Rowley, 1996), strategic policy making (Kørnøv and Thissen, 2000), fraud (McKeever, 2012), and energy management (Greene, 2011). The process is illustrated below:

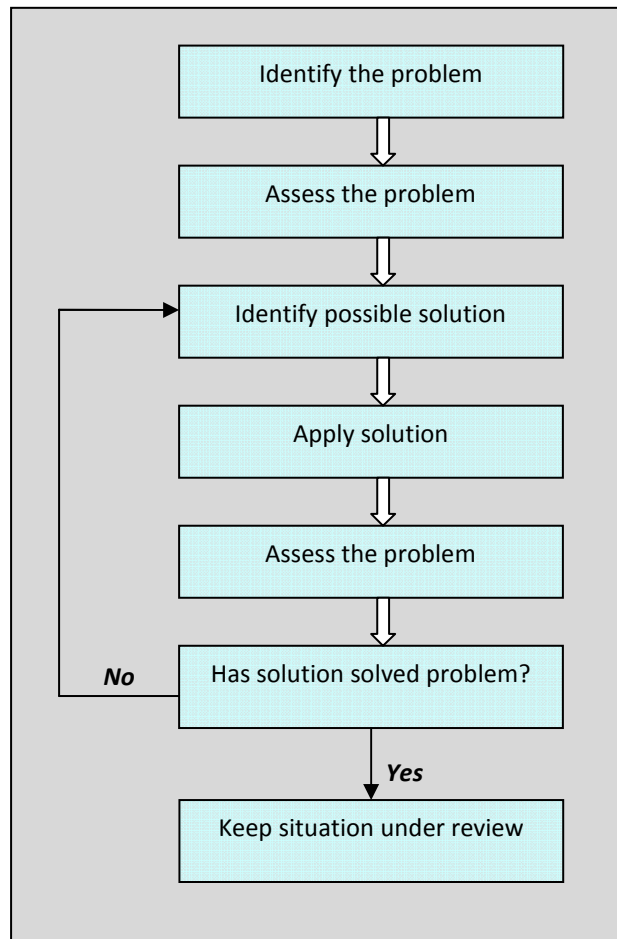


Source: Adapted from Buchanan and Huczynski (2004); Drucker (2001)

Fig. 1. Rational Economic Model

Another normative model, incrementalism, was developed by Lindblom (1959), who emphasises its rational nature by arguing that it ‘sits above’ behavioural theories (Lindblom, 1959). Incrementalism suggests that decisions are rarely made at a fixed point in time, and

instead slowly evolve in a series of gradual steps, each of which builds upon the last (McElhinney and Proctor, 2005). The outcomes of each change are monitored and further changes are made as a result, and the process continues until a suitable solution is found (Tarter and Hoy, 1998). This has been described as the “*science of muddling through*” (Lindblom, 1959: 79). Incrementalism has been researched in a number of contexts including how people choose careers (Gati, Gadassi and Mashiah-Cohen, 2012), health-care technology (Claxton et al., 2011), marketing (Wierenga, 2011), and crowd behaviour (Kameda et al., 2011). This process is illustrated below:



Source: Adapted from Vongprasert et al., 2011; Zobell and Wanke, 2009).

Fig. 2. Incrementalism

### 3.2 Behavioural models

Behavioural models refer to the way in which decisions are ‘actually’ made, regardless of their efficiency, wisdom or practicality (Hill, 1979). They accept that other factors such as emotional response, altruism or prejudice may all have a significant part to play in the decision-making process (Amaldoss, Bettman, & Payne, 2008). Typical of behavioural models are cognitive heuristics (Douglas, 2005; Payne, Bettman and Johnson, 1993). These can be defined as “*simplifying strategies*” (Payne, Bettman and Johnson, 1993: 2), “*rules of thumb*” (Greenberg and Baron, 2008: 400) or even simply as “*shortcuts*” (Atkinson et al., 1996: 306; LeBoeuf and Shafir, 2005: 126). For example, people may use stereotypes when making a decision on the basis that a focus on general characteristics can help to simplify

complex problems (Tversky and Kahneman, 1982). Essentially, therefore, cognitive heuristics are general rules that are useful in guiding a search for a path to the solution of a problem. Heuristics tell decision-makers what to pay attention to, what to ignore and what strategy to take (Carlson, Martin and Buskist, 2004).

Whereas flow charts have been derived to explain the workings of normative models, as shown above, previous research has failed to develop flow charts that describe the way in which heuristic decision-making takes place. Indeed, the development of such charts is one of the key contributions to knowledge of the present study, since this aids understanding of the processes involved. Examples of flow charts are presented in the following pages.

## **4. Findings and discussion**

### **4.1 *Weighted additive (WADD) heuristic***

In a decision-making environment, there is normally a range of alternatives (i.e. choices) and each alternative has a series of attributes (i.e. 'things that describe the alternative', such as height, colour, or price). The WADD heuristic considers each alternative by assessing (i.e. weighting) the relative importance of each attribute (Payne, Bettman and Johnson, 1993). All attributes are given a 'score' that reflects how important each one is to the decision-maker, and the weighted 'scores' are summed to yield the overall value (Lee and Geistfeld, 2000; Shah and Oppenheimer, 2008). As an example, when purchasing a car, a customer could consider range of factors such as price, fuel efficiency, or reliability. Each of these factors could be weighted by the consumer to reflect their relative importance to him/her. Suppose that reliability was felt to be the most important attribute, with a low price also being desirable. In this case, reliability would receive the highest weighting, and price would receive a lower weighting (Cimarosti, 2009).

This heuristic was used in the organisation under study – but always in a procurement context. To quote a single example, a decision was made to procure a major corporate contract whose total value was approximately £250m. A key stage in this process was the evaluation of tenders received from prospective bidders. There were many criteria that the organisation considered to be important, but some were more important than others and therefore the criteria were weighted to reflect their relative importance. The author observed the decision-making process in action, and supplemented his observations with a series of discussions with the relevant managers. This allowed a flow chart to be developed which identifies the key stages, and this is presented below, with typical quotes from those involved being used to support the individual elements.

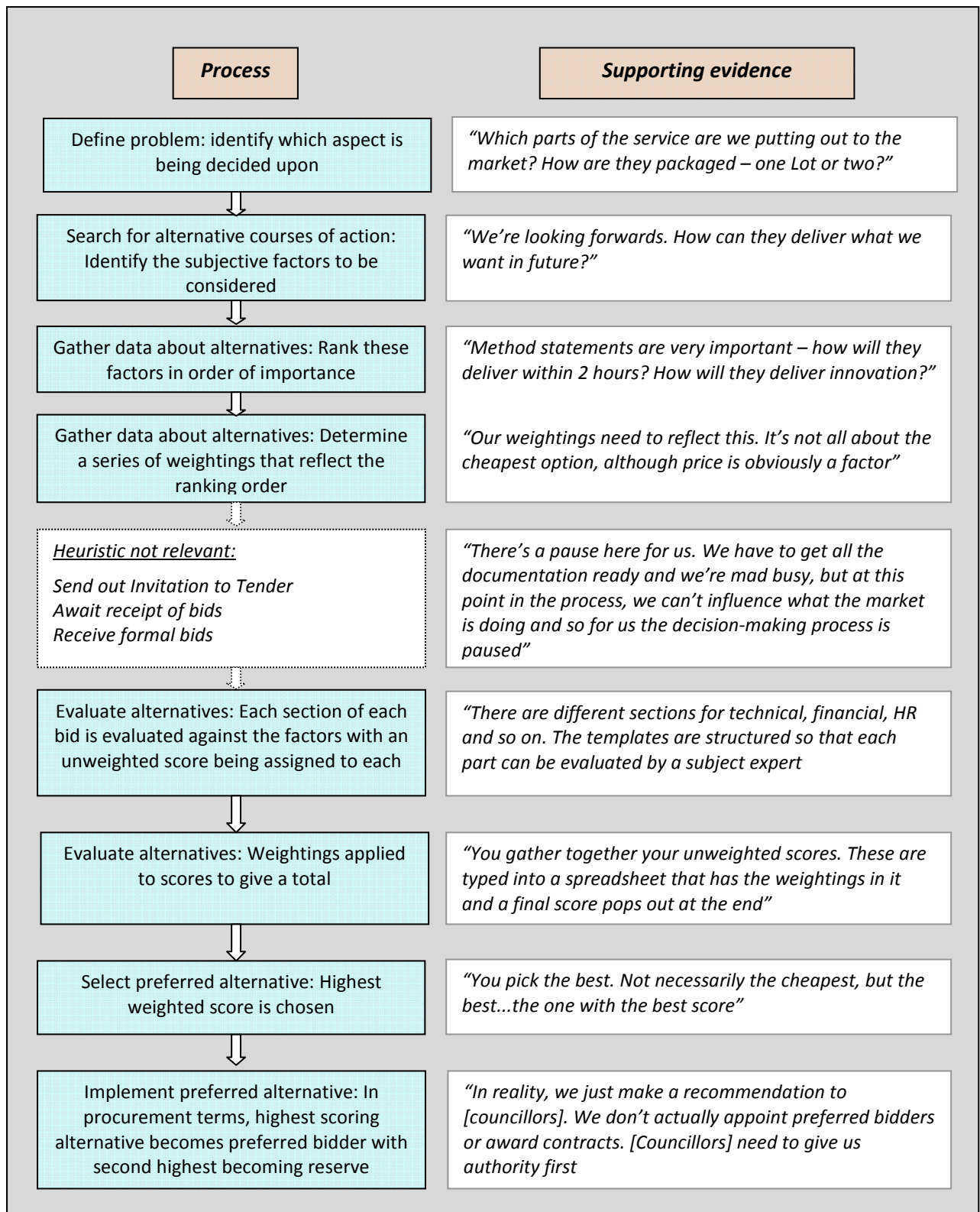


Fig. 3. Use of the weighted additive heuristic within the procurement process

It should be noted that the above diagram is the result of respondent validation whereby the author discussed the developing model with the managers concerned, and it is therefore the

last of several iterations. It will be seen that the above diagram (which shows a heuristic – i.e. a behavioural model) displays the characteristics of a normative model. Indeed, when the processes for the Rational Economic model and the WADD heuristic are placed side by side, this becomes even more evident and it is clear that there are significant similarities, as the following diagram illustrates:

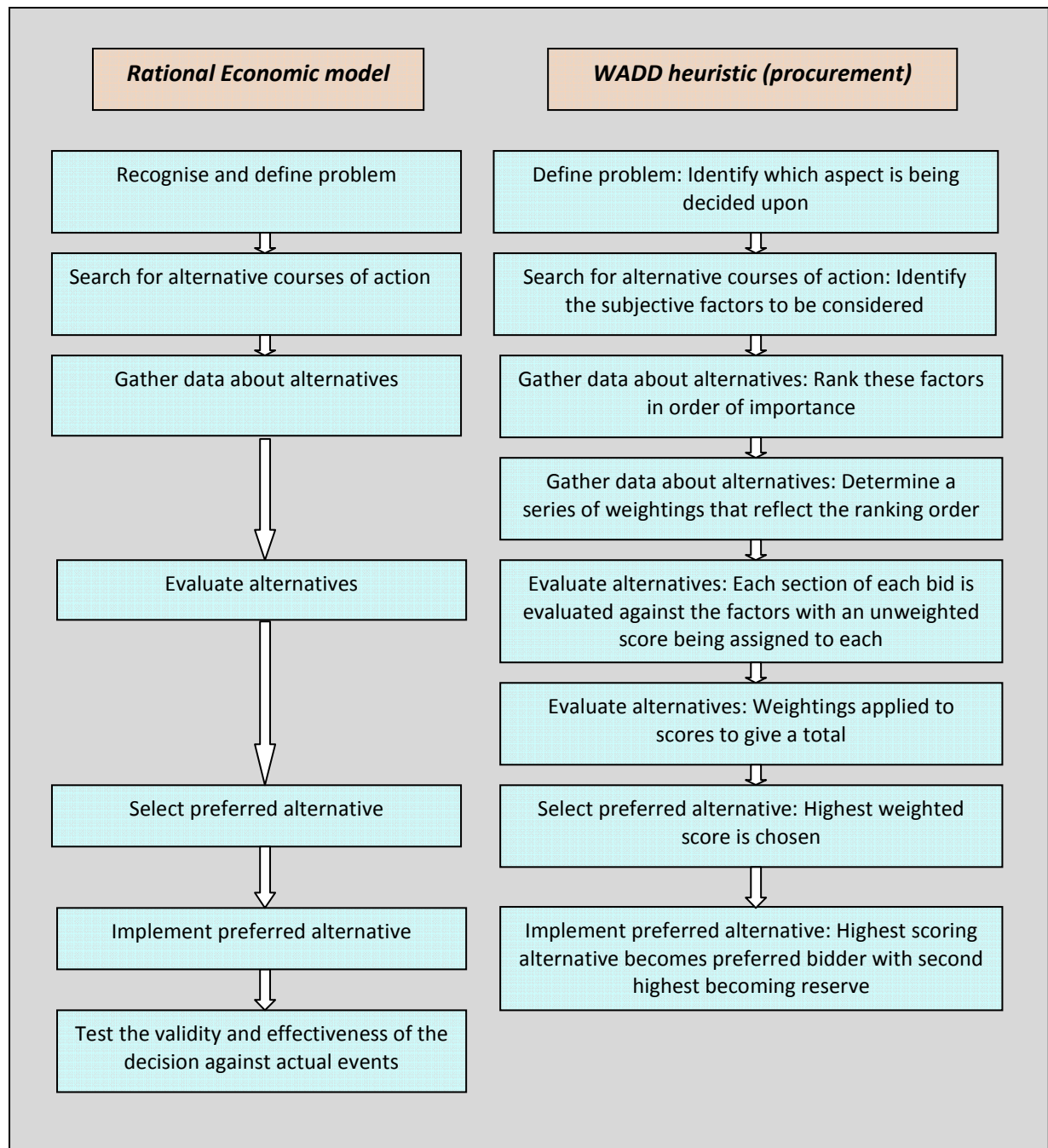


Fig. 4. Comparison of the Rational Economic model with the WADD heuristic

Although two different processes are followed, even at first glance it is apparent that in each case a logical and structured series of steps leads to a decision. However, upon closer examination, this similarity is even more marked. In both cases, a number of alternatives are identified, they are evaluated, and the final decision directly involves choosing the best

alternative from this evaluation. In other words, both models are rational (i.e. normative). This view is endorsed by managers from the organisation under study. The following quote from the corporate procurement manager was typical.

*“You’ve got one process here, not two. All you’ve got are two variants of the same thing. They’re both rational decision-making models”*

To some extent, this view is echoed within the literature. Some researchers argue that the WADD heuristic is rational (Hauser, 2010; Tversky, 1972) or partially rational (Payne, Bettman and Johnson, 1993) in its processes, and this is reflected in rationality in the ordered use of attributes (Payne, Bettman and Johnson, 1993). Such an argument supports the findings of the present study. However, as noted above, heuristics are generally regarded as being a behavioural model (Douglas, 2005; Payne, Bettman and Johnson, 1993), and therefore the present study casts doubt on this viewpoint.

#### **4.2 Anchor and adjustment heuristic**

Another commonly found heuristic was the anchor and adjustment heuristic, which can be defined as the making of “*estimates by starting from an initial value that is adjusted to yield the final answer*” (Tversky and Kahneman, 1982: 14). Individuals try to get ‘close’ to the right answer and then make adjustments from the initial point by obtaining and using additional information as it becomes available (Hardin, 1999; Presutti, 1995). To cite a single example from the literature, participants in an experiment were asked to estimate the percentage of African countries in the United Nations. Respondents gave different answers depending upon whether they given 10% or 65% as a ‘starting point’ (Tversky and Kahneman, 1974). Results showed that because the initial value provided an anchor from which they could adjust, the estimated percentages were significantly higher when people were initially exposed to a high number rather than a low number. This example has been cited by several authors (see for instance LeBoeuf and Shafir, 2009; Simmons, LeBoeuf and Nelson, 2010), and although this concept was first illustrated by Tversky and Kahneman (1974), it has been confirmed many times since (see for instance Chapman and Bornstein, 1996; Wong and Kwong, 2000).

There is an abundance of research to explain the *effects* of the anchor and adjustment heuristic (see for instance Epley, 2004; Mussweiler and Strack, 2004; Plous, 1989), but as Epley and Gilovich (2006) observe, there is less research into the *process* of anchoring and adjustment. Although the literature frequently shows the heuristic in action, it rarely shows *how it is used* in the decision-making process – an issue addressed in this paper. Indeed, this heuristic was used across the organisation in a range of situations, as illustrated by the following examples. In the first case, the Bereavement manager gave this explanation for how a key decision was made:

*“I had to design a maintenance programme to survey and manage our headstones, and to make safe the dangerous ones. But, I had no idea how many headstones we actually had, and it was important to get a figure so I could design the programme properly. In the end, I found a value that was pretty accurate when it was taken, but it was about four or five years old. So I used this value as my baseline and then adjusted it upwards by a few thousand to account for the burials we’d done since then”.*

The same process was followed during the procurement of new IT systems. Managers began by examining their current systems, and then adjustments were made to the specification to

try to obtain a more fit-for-purpose system. Again, a single illustration is representative of all, and the following quote was provided by a manager involved in business process re-engineering:

*“When you start to look at a new IT system, you start off by looking at what you’ve got at the moment and trying to improve on it. You take the spec for what you’ve got now and you make adjustments to it. You don’t start with a blank piece of paper”.*

These examples are in the same vein as the examples quoted throughout much of the literature (see for instance Epley and Gilovich, 2006; Tversky and Kahneman, 1982). The following diagram outlines the process that was followed within the organisation under study, and the flowchart is again supported by quotations. On this occasion, the data are drawn from across the organisation, as shown in brackets after the quotes.

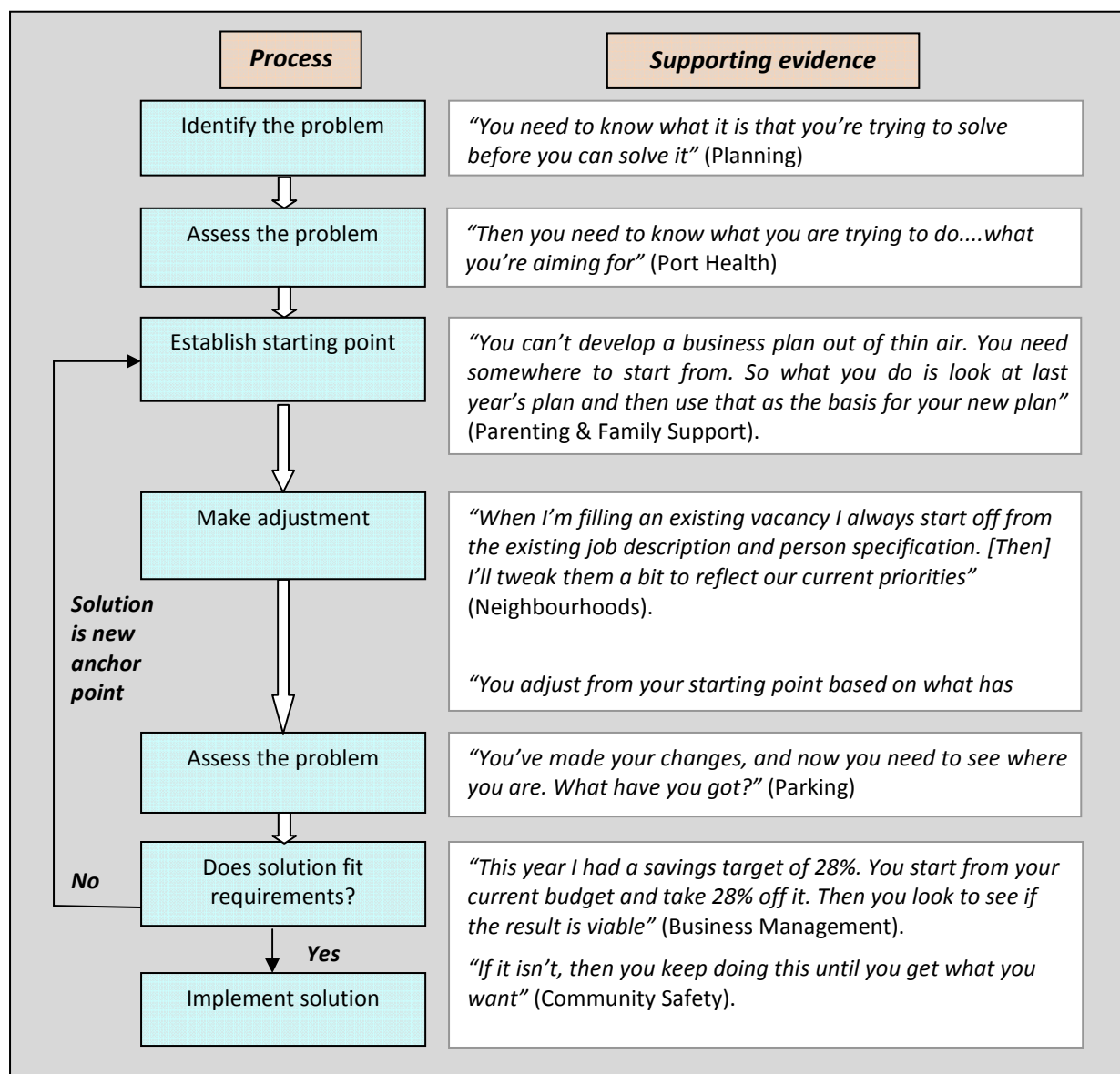


Fig. 5. Use of the anchor and adjustment heuristic



Once again, the above diagram is the result of respondent validation and is based on observational data and subsequent discussions between the author and a number of senior managers. When the processes for incremental decision making are compared with those of the anchor and adjustment heuristic, again it becomes clear that there are significant similarities, as the following diagram illustrates:

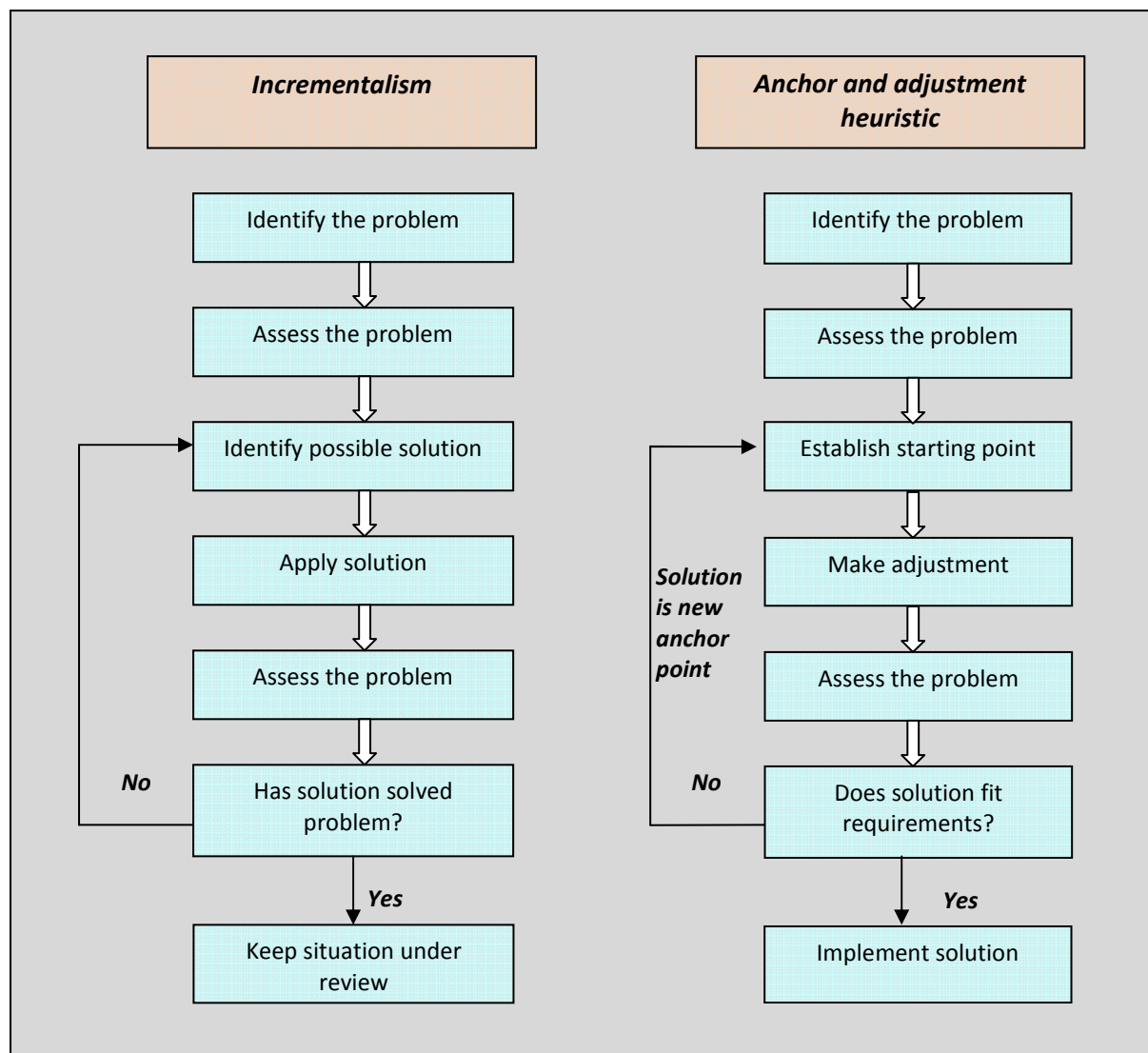


Fig. 6. Comparison of incrementalism with the anchor and adjustment heuristic

In each model, there is a problem that needs to be solved and there is a starting point from which the decision develops. In both cases the decision develops incrementally in small stages and there is a feedback loop back to the starting point. On this evidence the two approaches are therefore different manifestations of the same process. In one, the steps are applied unconsciously (anchor and adjustment) but in the other the same steps are applied consciously (incrementalism). This was supported by managers from across the organisation, as the following quotes illustrate:

*“You’ve got a single process, not two. What’s happening is that one is applied consciously and one is applied unconsciously...but it’s the same process” (Internal Audit)*

*“That’s right. Risk management is a conscious process, and writing a new job description based on an existing one is a conscious process. But you’re taking the same steps when you’re estimating growth, and you do that unconsciously. It’s the same process, though” (Planning).*

The evidence from this study is that therefore the important factor is the degree of conscious deliberation involved. In spite of an exhaustive search of the literature, the author has been unable to find previous research that makes such a linkage.

## 5. Conclusions

This paper shows that there are many theories of decision-making and that these are often grouped into two categories – normative and behavioural. Indeed, these distinctions are dominant within the literature and are generally understood and widely accepted. The findings of this paper relate directly to these established theories, and at first glance they appear to strongly support the literature because they are shown to work in practice in precisely the way they are described in the theory. This was shown, for instance, in the discussion of both the WADD and anchor/adjustment heuristics, where the flow charts exactly mirror the steps in the academic definitions. However, a closer assessment of this paper reveals that the distinction between the two is not as clear-cut as the literature suggests, and that the normative/behavioural distinction may be somewhat artificial and does not describe how decisions are made in reality.

There are strong similarities between normative models and the WADD heuristic. Indeed, the supposedly behavioural WADD heuristic actually acts as though it is a normative model and its processes are inherently similar to those of the Rational Economic model. This questions the commonly held belief that heuristics are a behavioural model. This paper therefore recommends that further research should be undertaken to establish whether WADD is the only heuristic that behaves in this way or whether other heuristics are similarly affected. This blurring of boundaries further increases when the incremental model of decision-making is contrasted with the anchor and adjustment heuristic, and this study proposes that the incremental model of decision-making and the anchor and adjustment heuristic are actually different manifestations of the same phenomenon – the difference lies in the degree of conscious application rather than a normative/behavioural distinction.

This casting of doubt on the normative/behavioural categorisation has important implications for theory. For example, the usual assumption is that normative decision-making is ‘correct’ and ‘error-free’ whereas behavioural models are prone to error. In other words, the literature implies that it is the *process* that leads to the degree of error. However, when viewed from the perspective of this paper this assumption makes no sense. This paper posits that behavioural heuristics such as anchor and adjustment are merely a different manifestation of a normative process (namely incrementalism) – the same steps are taken in the same order. If this is indeed the *same* process, then either *the process* leads to error or it does not – it cannot do both. The degree of error must relate to how the process is *applied*. The difference in application is that one is conscious (normative) and one is unconscious (behavioural). This is hitherto under-researched and therefore could fruitfully be a topic for future research.

Consequently, this paper represents an important contribution to the decision-making literature.

## References

- Amaldoss, W., Bettman, J. R., & Payne, J. W. (2008). Biased but Efficient: An Investigation of Coordination Facilitated by Asymmetric Dominance. *Marketing Science*, 27(5), 903-921.
- Atkinson, R. L., Atkinson, R. C., Smith, E. E., Ben, D. J. & Nolen-Hoeksema, S. (1996). *Hilgard's Introduction to Psychology (12<sup>th</sup> edn.)*. Fort Worth: Harcourt Brace.
- Barnard, C. I. (1938). *The functions of the executive*. Cambridge, MA: Harvard University Press.
- Bekker, M. P. M., Putters, K., & Van der Grinten, T. E. D. (2004). Exploring the relation between evidence and decision-making A political-administrative approach to health impact assessment. *Environmental Impact Assessment Review* 24, 139-149.
- Boychuk Duchscher, J. E. & Morgan, D. (2004). Grounded theory: reflections on the emergence vs. forcing debate. *Journal of Advanced Nursing*, 48(6), 605–612.
- Brunswik, E. (1952). *The conceptual framework of psychology (International Encyclopedia of Unified Science, Volume 1, Number 10.)* Chicago: University of Chicago Press.
- Brunswik, E. (1956). *Perception and the representative design of psychological experiments (2d edn.)*. Berkeley, CA: University of California Press.
- Buchanan, D. A. & Huczynski, A. (2004), *Organizational Behaviour: An Introductory Text (5th edn)*, Harlow: Pearson Education
- Carlson, N. R., Martin, G. N. & Buskist, W. (2004). *Psychology (2<sup>nd</sup> European edn.)*. Harlow: Pearson.
- Chapman, G. B., & Bornstein, B. H. (1996). The more you ask for, the more you get: Anchoring in personal injury verdicts. *Applied Cognitive Psychology*, 10, 519–540.
- Charmaz, K. (1994). The Grounded Theory Method: an explanation and interpretation. In B. G. Glaser (Ed). *More grounded theory methodology: a reader*. Mill Valley, Ca.: Sociology Press pp95-115.
- Charmaz, K. (2000). Grounded Theory: Objectivist and Constructivist Methods. In N. K. Denzin & Y. S. Lincoln (eds.) *Handbook of Qualitative Research (2<sup>nd</sup> edn)*. Thousand Oaks, Sage, pp 509-535.
- Cimarosti, A. (2009). *Survey Answering Behavior in Conjoint Analysis*. University of Bern: Masters Thesis.
- Claxton, K., Paulden, M., Gravelle, H., Brouwer, W. & Culyer, A. J. (2011). Discounting and decision making in the economic evaluation of health-care technologies. *Health Economics*, 20(1), 2-15.
- Corbin, J. & Strauss, A. L. (1990). Grounded theory research: Procedures, canons, and evaluative criteria. *Qualitative Sociology*, 13, 3-21.
- Douglas, D. (2005). The human complexities of entrepreneurial decision making: a grounded case considered. *International Journal of Entrepreneurial Behaviour and Research*, 11(6), 422-435.

- Drucker, P. F. (2001). The Effective Decision. In Anonymous, *Harvard Business Review on Decision Making*. Boston: Harvard Business School Publishing Corp.
- Epley, N. (2004). A tale of tuned decks? Anchoring as adjustment and anchoring as activation. In D. J. Koehler & N. Harvey (Eds.), *The Blackwell handbook of judgment and decision making*. Oxford: Blackwell. pp 240-256.
- Epley, N. & Gilovich, T. (2006). The anchoring and adjustment heuristic: Why the adjustments are insufficient. *Psychological Science*, 17(4), 311-318.
- Fayol, H. (1963). *General and Industrial Management* (trans. by C. Storrs). London: Pitman & Sons.
- Fernández, W. D. (2004). *The grounded theory method and case study data in IS research: issues and design*. Paper presented at the Information Systems Foundations: Constructing and Criticising Workshop at The Australian National University from 16 to 17 July 2004. Retrieved 24 December 2012 from [http://epress.anu.edu.au/info\\_systems/mobile\\_devices/ch05s05.html](http://epress.anu.edu.au/info_systems/mobile_devices/ch05s05.html)
- Gati, I., Gadassi, R. & Mashiah-Cohen, R. (2012). Career decision-making profiles vs. styles: Convergent and incremental validity. *Journal of Vocational Behavior*, 81(1), 2-16.
- Geiger, S. & Turley, D. (2003). Grounded theory in sales research: an investigation of salespeople's client relationships. *Journal of Business & Industrial Marketing*, 18(6/7), 580-594
- Gigerenzer, G. & Gaissmaier, W. (2011). Heuristic Decision Making. *Annual Review of Psychology*, 62, 451-482
- Gigerenzer, G., & Todd, P. M. (1999). Fast and frugal heuristics: The adaptive toolbox. In G. Gigerenzer, P. M. Todd, and the ABC Research Group (Eds.), *Simple heuristics that make us smart*. New York: Oxford University Press pp3-34.
- Glaser, B. G. (1978). *Theoretical sensitivity: Advances in the methodology of grounded theory*. Mill Valley, CA: Sociology Press.
- Glaser, B. G. (1992) *Basics of grounded theory analysis: emergence vs forcing*. Mill Valley, Ca.: Sociology Press.
- Glaser, B. G. (1998), *Doing Grounded Theory: Issues and Discussions*. Mill Valley, CA: Sociology Press.
- Glaser, B.G & Strauss, A. L. (1967). *The discovery of grounded theory: strategies for qualitative research*. Chicago: Aldine.
- Glaser, B. G. & Holton, J. (2004), Remodelling Grounded Theory, *Forum Qualitative Sozialforschung/ Forum: Qualitative Social Research [Online Journal]*, 5(2), Art 4. Retrieved 28 August 2009 from the FQS Web Site: <http://www.qualitative-research.net/index.php/fqs/article/view/607/1316>
- Greenberg, J. & Baron, R. A. (2008). *Behavior in Organizations (9th edn.)*. London: Pearson Education.
- Greene, D. L. (2011). Uncertainty, loss aversion, and markets for energy efficiency. *Energy Economics*, 33(4), 608-616.
- Gummesson, E. (2000). *Qualitative Methods in Management Research (2nd edn.)*. Thousand Oaks: Sage.
- Hardin, W. III. (1999). Behavioral research into heuristics and bias as an academic pursuit: Lessons from other disciplines and implications for real estate. *Journal of Property Investment & Finance*, 17(4), 333-352.

- Hauser, J. R. (2010). *Consideration-set heuristics*. Draft paper submitted to Journal of Business Research in December 2010.
- Heller, R. & Hindle, T. (1998). *Essential Manager's Manual*. London: Dorling Kindersley.
- Hicks, M. J. (1991). *Problem Solving in Business and Management*. London: Thomson Business Press.
- Hill, P. H. (1979). Introduction. In P. H. Hill (ed). *Making Decisions: A Multidisciplinary Introduction*. Reading Massachusetts: Addison-Wesley
- Hutchinson, J. M. C., & Gigerenzer, G. (2005). Simple heuristics and rules of thumb: Where psychologists and behavioural biologists might meet. *Behavioural Processes*, 69, 97-124.
- Jost, P.-J. (2001). Crime, Coordination and Punishment: An economic analysis. *International Review of Law and Economics*, 21, 23-46.
- Kahneman, D. (2011). *Thinking, Fast and Slow*. New York: Farrar, Strauss and Giroux.
- Kahneman, D. & Frederick, S. (2002) Representativeness revisited: Attribute substitution in intuitive judgment. In T. Gilovich, D. Griffin & D. Kahneman (Eds.) *Heuristics and biases: The psychology of intuitive judgment*. Cambridge: Cambridge University Press pp. 49–81.
- Kahneman, D. & Tversky, A. (1973). On the psychology of prediction. *Psychological Review*, 80(4), 237-251.
- Kahneman, D. & Tversky, A. (1982). The simulation heuristic. In D. Kahneman, P. Slovic & A. Tversky (eds.) *Judgement under uncertainty: Heuristics and Biases*. Cambridge: Cambridge University Press pp201-208.
- Kameda, T., Tsukasaki, T., Hastie, R. & Berg, N. (2011). Democracy under uncertainty: The wisdom of crowds and the free-rider problem in group decision making. *Psychological Review*, 118(1), 76-96.
- Klein, G. A. (2008). Naturalistic Decision Making. *Human Factors*, 50(30), 456-460.
- Kjørnø, L., & Thissen, W. A. H. (2000). Rationality in decision-and policy-making: implications for strategic environmental assessment. *Impact Assessment and Project Appraisal*, 18(3), 191-200.
- LeBoeuf, R. A. & Shafir, E. (2005). Anchoring on the Here and Now: Insufficient Adjustment in Time and Distance Estimates. *Advances in Consumer Research*, 32(1), 126-127
- LeBoeuf, R. A. & Shafir, E. (2009). Anchoring on the 'here' and 'now' in time and distance judgments. *Journal of Experimental Psychology: learning, memory and cognition*, 35(1), 81-93.
- Lee, J. & Geistfeld, L. V. (1998). Enhancing Consumer Choice: Are We Making Appropriate Recommendations? *The Journal of Consumer Affairs*, 32(2), 227-251.
- Lindblom, C. E. (1959). The Science of Muddling Through. *Public Administration Review* 19, 79-99.
- Lings, B. & Lundell, B. (2005). On the adaptation of Grounded Theory procedures: insights from the evolution of the 2G method. *Information Technology & People*, 18(3), 196-211
- Locke, K. (2001). *Grounded Theory in Management Research*. London: Sage.
- McElhinney, D. & Proctor, T. (2005). Concept of entrapment and decision-making. *Management Decision*, 43(2), 189-202

- McKeever, G. (2012). Social Citizenship and Social Security Fraud in the UK and Australia. *Social Policy & Administration*, 46(4), 465-482.
- March, J. & Simon, H. A. (1993). *Organizations (2nd edn)*. Oxford: Blackwell
- Miller, S. I. & Fredericks, M. (1999). How Does Grounded Theory Explain? *Qualitative Health Research*, 9(4), 538-551.
- Miller, S. I., Hickson, D. J. & Wilson, D. C. (2002). Decision-making in Organizations. In G. Salaman (Ed) *Decision Making for Business*. London: Sage
- Mussweiler, T. & Strack, F. (2004). The Euro in the common European market: A single currency increases the comparability of prices. *Journal of Economic Psychology*, 25, 557-563.
- North, D. C. (1993). What do we mean by rationality? *Public Choice*, 77(1), 159-162.
- Patton, J. R. (2003). Intuition in decisions. *Management Decision*, 41(10), 989-996
- Payne, J. W., Bettman, J. R. & Johnson, E. J. (1993). *The Adaptive Decision Maker*. Cambridge: Cambridge University Press.
- Pettigrew, A. M. (2002). Decision-making as a Political Process. In G. Salaman (Ed) *Decision Making for Business*. London: Sage.
- Plous, S. (1989). Thinking the unthinkable: The effect of anchoring on likelihood estimates of nuclear war. *Journal of Applied Social Psychology*, 19, 67-91.
- Presutti, A. H. (1995). Anchor and adjustment heuristic effect on audit judgement. *Managerial Auditing Journal*, 10(9), 13 - 21.
- Quackenbush, S. L. (2004). The Rationality of Rational Choice Theory. *International Interactions*, 30(2), 87-107.
- Rowley, J. (1996). Motivation and academic staff in higher education. *Quality Assurance in Education*, 4(3), 11-16.
- Scott, H. M. P. (2007). *The Temporal Integration of Connected Study into a Structured Life: A Grounded Theory*. PhD thesis: University of Portsmouth.
- Shah, A. K. & Oppenheimer, D. M. (2008). Heuristics Made Easy: An Effort-Reduction Framework. *Psychological Bulletin*, 134(2) 207–222.
- Simmons, J. P., LeBoeuf, R. A. & Nelson, L. D. (2010). The effect of accuracy motivation on anchoring and adjustment: Do people adjust from provided anchors? *American Psychological Association*, 99(6), 917-932.
- Simon, H. A. (1991). Bounded Rationality and Organizational Learning. *Organization Science*, 2(1), 125-134.
- Snowden, D. J. & Boone, M. E. (2007). A Leader's Framework for Decision Making. *Harvard Business Review*, 85(11), 68-76
- Starrin, B., Dahlgren, L., Larsson, G. & Styrborn, S. (1997). *Along the Path of Discovery: Qualitative Methods and Grounded Theory*. Lund: Studentlitteratur,.
- Strauss, A. L. & Corbin, J. (1998). *Basics of qualitative research: Techniques and procedures for developing grounded theory (2nd edn)*. Thousand Oaks, CA: Sage.
- Tarter, C. J. & Hoy, W. K. (1998). Toward a contingency theory of decision making. *Journal of Educational Administration*, 36(3), 212-228.
- Tversky, A. (1972). Elimination By Aspects: A Theory of Choice. *Psychological Review*, 79(4), 281-299.

- Tversky, A. & Kahneman, D. (1974). Judgment under uncertainty: heuristics and biases. *Science*, 185, 1124-1131.
- Tversky, A. & Kahneman, D. (1982). Judgement under uncertainty: heuristics and biases. In D. Kahneman, P. Slovic & A. Tversky (eds.) *Judgement under uncertainty: Heuristics and Biases*. Cambridge: Cambridge University Press pp3-22.
- Urquhart, C. (2001). An Encounter with Grounded Theory: Tackling the Practical and Philosophical Issues. In E. M. Trauth (ed.), *Qualitative Research in IS: Issues and Trends*. Hershey, PA: Idea Group.
- Vongprasert, J., Srisa-ard, B., Piromjitpong, S. & Shutiman, N. (2011). The Development of Iterated Weighted Jackknife Method and Regression (IWJR) for Estimating Missing Data. *European Journal of Social Sciences*, 25(1), 96-102.
- Walker, D. & Myrick, F. (2006). Grounded Theory: An Exploration of Process and Procedure. *Qualitative Health Research*, 16(4), 547-559
- Waroquier, L., Marchiori, D., Klein, O. & Cleeremans, A.. (2010), Is It Better to Think Unconsciously or to Trust Your First Impression? A Reassessment of Unconscious Thought Theory. *Social Psychological and Personality Science*, 1(2), 111-118.
- Wierenga, B. (2011). Managerial decision making in marketing: The next research frontier. *International Journal of Research in Marketing*, 28(2), 89-101.
- Wong, K. F. E., & Kwong, J. Y. Y. (2000). Is 7300 m equal to 7.3 km? Same semantics but different anchoring effects. *Organizational Behavior and Human Decision Processes*, 82, 314–333.
- Zobell, S. & Wanke, C. (2009). *Deferability: A Concept for Incremental Air Traffic Management Decision Making*. MITRE Corp. Retrieved 10 September 2012 from the MITRE Web Site:  
[http://www.mitre.org/work/tech\\_papers/tech\\_papers\\_09/09\\_3749/09\\_3749.pdf](http://www.mitre.org/work/tech_papers/tech_papers_09/09_3749/09_3749.pdf)
- Zsombok, C.E. (1997). Naturalistic decision making: where are we now? In C. E. Zsombok & G. Klein, *Naturalistic Decision Making*, Mahwah, NJ: Lawrence Erlbaum.

# Nordic walking and well-being of senior walkers

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## Abstract

Walking is the most common daily physical activity. Nordic Walking is a form of exercise, based on marching technique. It makes an active use of specially designed poles. The growing interest in Nordic Walking endorsed researchers' attention to activity and its effects on human body. However, none research findings have explained its benefits on mental well-being. The key focus of this research study is to investigate potential influence of Nordic Walking on mental well-being in later life. Using the socio-ecological approach this research explores well-being of elderly people in the North West England and provides insight into determinants contributing to regular participation in Nordic walking. This longitudinal study draws on data from semi-structured interviews with Nordic walking leaders and teachers and close-ended questionnaires distributed three times over 12 weeks to chosen Nordic walking groups in the North West England. Questionnaires measure mental well-being with use of Short Warwick Edinburgh Mental Wellbeing Scale (SWEMWS) and the socio-environmental factors influence regular participation in the activity. The outcome of this study will produce some new evidence on the potential influences of regular participation in Nordic walking on mental well-being of elderly people. The research will also be an independent and original contribution to knowledge based on its socio-ecological approach, as it will be the first to investigate the socio-ecological influences on regular participation in the Nordic walking that may affect the growing popularity of Nordic walking in the North West England.

## Keywords

mental well-being, Nordic walking, older people, socio-ecological perspective

### 1. Walking and Nordic walking as a Leisure Time Physical Activities

Walking is the most common form of physical activity and it is a part of our everyday lives. Moreover, walking is the most frequently reported daily activity among adults who meet recommendations for at least 30 minutes regular daily physical activity, which makes it a lifestyle activity (DoH, 2005, French et al., 2005 cited in: Darker, Larkin et al. 2007). Walking as a means of transport is well-established in our history and culture, however the idea of leisure walking has rather a short history. The concept is associated with being active during free time to achieve or maintain mental and physical well-being (Shove and Pantzar, 2005) that is why leisure walking has received recent attention of scientists and healthcare based on its health benefits (Siegel et al., 1995; Blacklock et al., 2007; Darker et al., 2007; Caperchione et al., 2011). Leisure walking is proven to be preferred by adults across all socioeconomic groups (Merom et al., 2006; Kruger et al., 2008; Ramblers Association, 2010) and especially by older adults who enjoy this type of lower intensity exercise (Tully et al., 2005). Walking behaviour is a goal itself; ramblers and pilgrims enjoy the experience of moving outdoors in attractive environments to achieve healthy physical and spiritual sensations (Green, 2009). Through walking people create their own style and pace according



to their social and cultural identities and positions or rankings in society (Kavanagh et al., 2008; Cerin et al., 2009; Green, 2009; Edensor 2010). Individual walking levels are influenced by many individual, social, cultural and environmental factors. (Darker and French, 2007; Granner et al., 2007; Cerin et al, 2009; Cerin et al, 2010). Special kind of leisure walking, among popular in England, rambling and hiking, is new type of walking activity called Nordic walking. Nordic Walking, also known as walking with poles, is a cross between classic-style cross-country skiers and fitness walking.

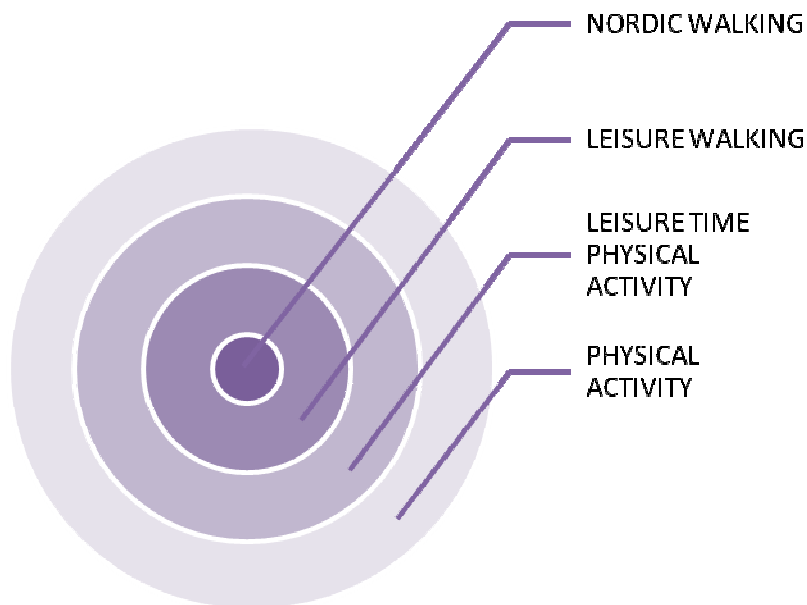


Fig. 1. Place of Nordic walking in physical activity.

Similar to walking, Nordic Walking is easy to learn and can be practiced throughout the year. However in comparison to everyday walking, which uses only 70% of body muscles, Nordic Walking engages around 90% of body muscles and apart from strengthening only lower body it also improves the upper body performance such as mobility of neck and shoulders (Piech and Raczynska 2010; Hagen et al. 2011). The origins of the activity date back to the 1930s when in summer time the Finnish cross-country skiers used skiing poles to exercise and prepare for winter season. Since the 1990s, Nordic walking has spread to countries all over the world, becoming a popular leisure activity. In the United Kingdom Nordic walking started to develop since 2001, when the first classes began in South West London. With the growing popularity of this activity in the country came the need for more instructors around the country. Therefore, in 2004 the British branch of INWA was established and started instructor training courses. Nordic walking is a chameleon-like walking activity. It varies from being non-competitive to competitive, from individual to group walk. It can be practiced at three levels of advancement: health, which focuses on weight management and well-being by socializing with people; fitness, which also involves exercising with poles to improve endurance and strength; and sport which is competitive activity and focuses on individual performance during sports events such as Nordic walking marathons. Increasing interest in Nordic Walking as a leisure physical activity among people around the world has encouraged researchers' attention to the activity and its effects on the human body. The up-to date research findings prove Nordic walking to be a safe and

effective form of physical activity for elderly people (Sokeliene V. et al., 2011) and it has also been introduced into various rehabilitation programs (Kocur et al., 2009; Antosiewicz, 2010; Morgulec-Adamowicz et al. 2011).

## 2. The Socio-Ecological Perspective

The concept of walking is associated with physical, social and cultural environment we live in which influence our decision to walk. Exploration of correlation between humans and their environments introduced the concept of social ecology in mid 1960s and early 1970s. Social ecology brought an attention to the social, institutional and cultural contexts of people - environment relations (Stokols 1996). It also integrated person-focused effort to modify persons' health behaviour with environment-focused interventions to enhance their physical and social surroundings (Stokols 1996) and reduce serious and prevalent health problems (Sallis, Owen et al. 2008). Since the 1970s there has been an increased interest in ecological perspectives due to their comprehensive approaches for understanding multiple and interacting determinants of health behaviours, including physical activity behaviour.

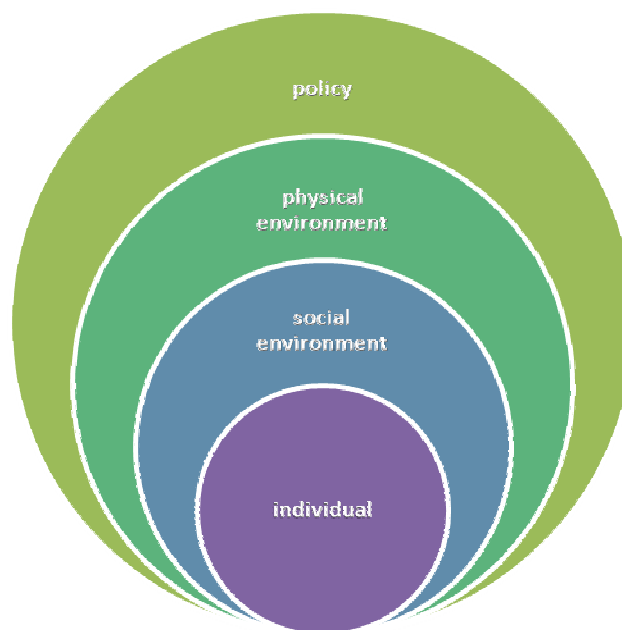


Fig. 2. The socio-ecological model of physical activity. Adopted from Stokols (1996)

In the ecological model of physical activity individual factors, such as age, sex, level of education, socio-economic status, employment status, self-efficiency, attitudes, behaviours, beliefs, motivation, personal barriers, skills, abilities, injuries or disabilities determine levels of physical activity. Applying the theoretical model to practice to change levels of physical activity at this stage of influence, practitioners need to implement education and mentoring programs to develop skills and change attitudes towards physical activity. In the model, second level of influences refers to social environment, which includes schools, workplaces, social support networks and authority of health professionals. In every community individuals are surrounded by other individuals who form social groups such as family,

friends, neighbours, class mates, work colleagues. Those small or large, formal or informal groups affect changes in attitudes towards physical activity. At this level, participation in physical activity may be influenced by community education, support groups, workplace incentives and social campaigns. The next level of influences in the socio-ecological model is physical environment, which consists of weather conditions, geographical features, aesthetics, safety, access to facilities such as parks, playgrounds, walking and cycling paths, land use, urban density and public transport. Stokols (1996) divides physical environment into natural and built. Both types of environment determine the amount and type of physical activity, however built environment, with its amenities, like built leisure and sport facilities, provides more opportunities for intervention in comparison to natural environment. At this level, engagement in physical activity may be improved by providing access to walking, cycling paths, build sport facilities and promoting community safety. The last level of influences on physical activity in the model is policy. Policy influence is the biggest layer as it takes, other layers: individual attitudes together with social and physical environment to create reliable and sound formal policies. Policies such as health polices, environmental policies, urban planning polices, education policies, and active transport policies are being created and improved to positively influence participation in physical activity. In the United Kingdom, NHS and Department of Health (DoH) are responsible for public health policies. They collaborate with others in creating and managing many health programmes and movements on both national and local levels, such as “Walk England” and Walk4Life”. The socio-ecological model of physical activity is not only used for demonstrating the interventions for improving levels of physical activity. It the provides the framework for understanding how those factors affect leisure walking behaviour as it offers a comprehensive theoretical explanation or dynamic interactions between personal, behavioural and environmental correlations (Alfonzo, 2005; Lee and Moudon, 2006).

### **3. The Research Study**

As mentioned earlier, great interest has been paid to the beneficial aspects of Nordic walking on the human body, however none of research findings have explained its benefits on mental well-being. Therefore, the main focus of the research is to discover the potential influences of regular participation in Nordic walking on mental well-being in later life (Fig. 3). In order to complete the research study and answer the research questions, the appropriate and efficient research plan needs to be established and implemented. Evaluation of the existing literature on the socio-ecological perspective on physical activity, sociological perspective on walking activity as well as history of Nordic walking and its benefits on human body has helped to define the theoretical background of the research, general keys of terms and definitions. Exploration of the literature in the fields of health promotion, leisure time physical activity, walking behaviour and Nordic walking resulted in shaping concepts and directions of the research, establishing research objectives and discovering the existing gaps in knowledge.

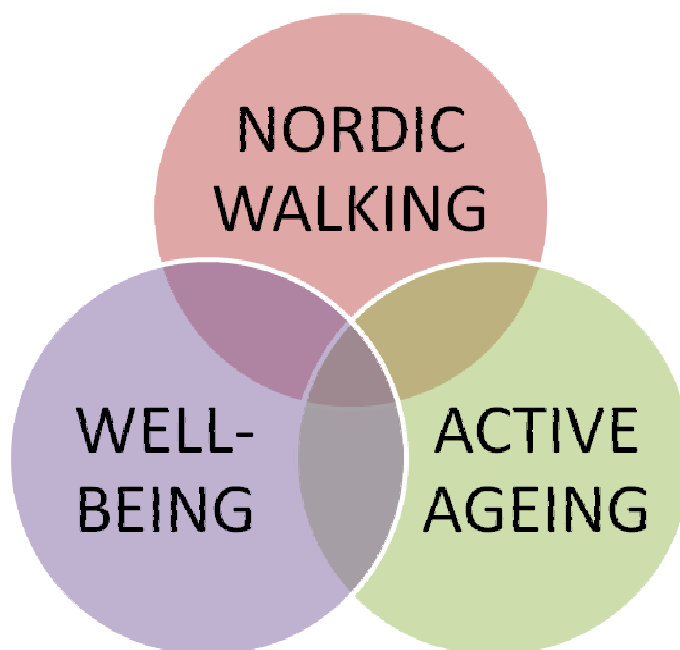


Fig. 3. The research focus

**Objective 1. Investigation of potential influences of regular participation in Nordic walking on mental well-being.**

As noted before, physical activity, even gentle walking, improves overall health and well-being (Siegel, Brackbill et al. 1995, McEachan, Sutton et al. 2010, Hilland, Ridgers et al. 2011, Litt, Iannotti et al. 2011). Nordic walking is promoted by many as an exercise which benefits participants' well-being and improves quality of life. There are a number of papers on Nordic walking and its beneficial effects on human body (Šokelienė, Česnaitienė 2011, Kocur, Deskur-Śmielecka et al. 2009, Antosiewicz 2010, Morgulec-Adamowicz, Marszałek et al. 2011). However, as noticed by Morgulec Adamowicz (2011) there is no scientific research on Nordic walking effects on well-being. Therefore, the key focus of the research, which will also fill the gap in knowledge, is to discover the potential influences of regular participation in Nordic walking on mental well-being.

**Objective 2. Identification of socio-ecological influences on regular participation in Nordic Walking.**

The socio-ecological perspective on physical activity suggests that individual, social, physical and policy environment factors impact the ability or likelihood of individual regular participation in walking activity. All levels of influences interact with each other and contribute to frequency of various kinds of walking behaviours. Those influences are also used to reduce physical barriers to walking, develop social support network and to achieve positive changes in walking behaviours as an ultimate goal. The premises of the socio-ecological perspective provide powerful theoretical background for the research study as they offer an insight into personal, social and environmental determinants that contribute to the increased participation in Nordic walking in the United Kingdom.

**Objective 3. Analysis of socio-demographic characteristics of Nordic Walkers in the North West England.**

England is a leader in participation of walking and number and length of walking paths (Shove, Pantzar 2005, Ramblers' Association 2010), which makes walking activity, such as

rambling, trekking, hiking the most popular forms of leisure time physical activity. As it was mentioned before, Nordic walking is a particular type of walking. Similar to ordinary walking it is easy and gentle, however gives better whole body workout than walking. This is the reason why it has become popular leisure time activity around the world. Nordic walking may be practiced at three levels of advancement health, fitness and sport, which depend on fitness levels of the participants. The Nordic walking sessions may be tailored to the stamina and age of the participants which makes it a chameleon like activity (Shove, Pantzar 2005). Nevertheless, most people treat it as a gentle outdoor leisure exercise, what implies that Nordic walking is perfect activity for older people who are not interested or not able to perform more strenuous physical activities. The research aims to investigate what socio-demographic group is attracted to Nordic Walking and participates in the activity regularly in the North West England.

#### **Objective 4. Exploring channels and ways Nordic Walking is promoted by organizations and Nordic walking leaders to general public.**

The main organization which supports Nordic walking worldwide from the 1990s is the International Nordic Walking Federation (INWA). In Great Britain Nordic Walking has been present for over a decade. The organization that promotes activity, trains and supports Nordic walking leaders is Nordic Walking UK. The organization holds information on Nordic walking leaders and groups around the country. However, the evidence from all over the world shows that it takes few years for Nordic walking to become popular and mainstream activity, if well promoted (Shove, Pantzar 2005) which may imply that Nordic walking is not effectively promoted in England. Shove (2005) claims that ineffective promotion is affected by weak collaboration between government, equipment producers, organizations and Nordic walking leaders. Therefore, the research will explore in what way Nordic walking is promoted by organizations to the general public in the North West England.

#### **Objective 5. Further promotion of Nordic walking activity among general public in United Kingdom.**

In England, walking, rambling and trekking have a long tradition and are well established in English culture. In comparison to these, Nordic walking is a relatively new leisure time activity and the general public is less familiar with it. Nonetheless, the popularity of Nordic walking has been growing steadily in the United Kingdom since it was introduced in 2001. On the other hand, Shove and Pantzar (2005) claim that in range of well established leisure time activities there is no place for Nordic walking in England. Therefore, the aim of the research is to explore further ways of promoting the idea of Nordic walking among wider populations which will lead to general national familiarisation with the activity.

Further evaluation of the research study will bring independent and original contribution to existing knowledge in the subjects of Nordic walking, mental well-being and the socio-ecological perspective. The independent contribution to knowledge and the ultimate aim of this study is to demonstrate potential influences of regular participation in Nordic walking on mental well-being. The original contribution is based on its socio-ecological approach. The research will be the first to investigate the socio-ecological influences on regular participation in the Nordic walking that may affect the growing popularity of Nordic walking in the North West England.

In order to meet the research aims and contribute to knowledge, the appropriate and efficient research methodology needs to be applied. Therefore, the research study is considered to be approached with use of quantitative and qualitative research methods. It is designed around collecting, analyzing and interpreting data from two primary sources – close-ended questionnaires and semi-structured interviews to answer research questions and produce valid and reliable conclusions. A questionnaire is a descriptive method of collecting data. It

establishes correlates between variables, discovers cause and effect relationship and allows for the comparison of results between samples. A questionnaire-based study can process large number of information relatively quick and inexpensively (McQueen, Knussen 1999). An interview is a technique used to collect qualitative data by asking respondents to describe their experiences, talk about their opinions on a particular subject. Interviews are known to be representative, reliable, comparable and valid (McQueen, Knussen 1999).

In this research, data are generated from a pilot study and a main study. A pilot close-ended questionnaire has been conducted from April 2012 and finishes in July 2012. The main close-ended questionnaire together with semi-structured interviews will be conducted from September 2012. The overall time for conducting the research fieldwork will be over 9 months.

### ***3.1 Pilot study***

The research pilot study is based on conducting pilot close-ended questionnaires on a group of Nordic walkers (15-20 people) from “Active Living” Wigan, who have intermediate skills and perform the activity weekly in Three Sisters Park in Ashton-in-Makerfield. The walkers were invited to take part in the pilot study. All participants were provided with an information sheet, attached to questionnaires, and the opportunity to discuss any queries with the researcher. The three questionnaires have been distributed over 12 weeks, from April 2012 to July 2012. In the initial questionnaire, conducted on 27<sup>th</sup> April, participants answered questions on socio-economic characteristics (age, gender, marital status, working status, health status), Nordic walking practice and type of other physical activities practiced in free time. The mid-time survey, conducted on 8<sup>th</sup> June, gathered information about perceived changes in mood, health and physical performance since started taking part in Nordic walking sessions. The final survey, to be conducted on 20<sup>th</sup> July, will gather information on socio-ecological factors such as weather, location, access and aesthetics of venue, family, friends and community support which may influence the regular participation in Nordic walking. All three close-ended surveys have included the Short Warwick-Edinburgh Mental Well-being Scale (SWEMWBS) questions to measure potential changes in participants’ mental well-being. SWEMWBS is used with permission from designers. In the surveys there is only one open-ended question of the birth date, which also verifies the participants’ age. During analysis on the pilot study, the date of birth will be also used to marry questionnaires to respondents’ and individual potential changes in their mental well-being. The analysis and interpretation of the pilot study is scheduled to be carried out from July 2012 till September 2012.

The aim of pilot questionnaire is to test suitability of the SWEMWBS for the study purposes as well as improve design, wording and calculate the size of final sample.

### ***3.2 Main study***

The main study close-ended questions will be based on the pilot questionnaires. Data collected using close-ended questionnaires will be conducted from September 2012 for over 12 weeks. The research participants will be chosen from Nordic walking groups with different levels of advancement, based in the North West of England. The researcher will join the Nordic walking sessions to describe the aim of the study and invite walkers to participate. All participants will be provided with an information sheet, attached to questionnaires, and the opportunity to discuss any queries with the researcher. Walkers who will agree to

participate will be given 3 questionnaires to complete after Nordic walking sessions every 4-6 weeks.

The initial questionnaire with close-ended questions will gather socio-demographic information on age, gender, marital status, working status, health status. The respondents will be also asked how they learnt about Nordic waling sessions, how long they walk and type of other physical activities they practice in free time. The mid-time survey will gather information about socio-ecological factors such as how weather, location, access and aesthetics of venue, family, friends and community support influence the regular participation in Nordic walking. The final survey will gather information on perceived changes in mood, health and physical performance since started taking part in Nordic walking sessions.

All three close-ended surveys will have the Short Warwick- Edinburgh Mental Well-being Scale (SWEMWBS) questions to measure potential changes in their mental well-being. In the surveys there is only one open-ended question of the birth date to verify participants' age. Date of birth will be also used to marry surveys to respondents' and individual potential changes in their mental well-being.

The main study will also employ individual semi- structured interviews with Nordic walking teachers and instructors. All interviewees will be provided with a copy of semi-structured questions and an information sheet, a few days before the interview date to be familiar with research purposes and questions. The interviews will be held in a setting and time convenient for participants. The interviews will be no longer than one hour and will be recorded. The semi-structured questions will explore beginnings and the processes of establishing regular group Nordic walking sessions in the region, statistical information on number of Nordic walkers, ways and means the activity is promoted to the general public and socio-ecological factors which may affect Nordic Walking popularity in the North West England. The aim of the interviews is to gather important information about history and growing popularity of Nordic walking in the North West England.

In undertaking the research study, there are a number of ethical considerations. The most important ones are voluntary participation, participations' consent and their anonymity. To ensure those requirements are fulfilled, the University Code of Practice on Ethical Standards for Research Involving Human Participants has been implemented. Both pilot and main studies are designed to inform all participants of the general aims of the research, voluntary participation and anonymity of all participants. Moreover, the researcher contact details are provided in case of request of withdrawal from the study or notifying the participants about the process of data collection and the results. In addition, all data are stored in a secure manner, according to the Data Protection Act 1998. In case of using Short Warwick-Edinburgh Mental Well-Being Scale (SWEMWBS) in the pilot questionnaire, the authorization has been sought and granted after filling the "Initial information sheet for users of WEMWBS". Having followed the University Code of Practice on Ethical Standards for Research Involving Human Participants, the fully designed pilot questionnaire with participation information sheet together with completed RE1 form was approved by the Centre Research Ethics Committee.

#### **4. Conclusion**

The concept of walking is associated with the physical, social and cultural environment we live in which influences our decision to walk. For the research study the socio-ecological approach is adopted, which suggests that individual, social and environmental influences contribute to walking behaviour and reduce physical barriers to walking, develop social

support network and to achieve positive changes in walking. The socio-ecological perspective as the theoretical framework for the research investigation provides insight into determinants contributing to regular participation in Nordic walking and explores potential changes in mental well-being of elderly people in the North West England. Following the research work plan thoroughly, together with choosing the appropriate research tools, this study will not only reach the research objectives, but it will also produce some new evidence on the potential influences of regular participation in Nordic walking on mental well-being.

## References

- AGRAWAL, A.W. and SCHIMEK, P., 2007. Extent and correlates of walking in the USA. *Transportation Research Part D: Transport and Environment*, 12(8), pp. 548-563.
- ALFONZO, M., 2005. To Walk or Not to Walk? The Hierarchy of Walking Needs. *Environment and Behavior*, 37(6), pp. 808-836.
- ANTOSIEWICZ, E., 2010. Subiektywna Ocena Treningu Nordic Walking Jako Elementu Kompleksowej Rehabilitacji. *Medycyna Sportowa*, 26(6), pp. 335-343.
- BALL, K., TIMPERIO, A., SALMON, J., GILES-CORTI, B., ROBERTS, R. and CRAWFORD, D., 2007. Personal, social and environmental determinants of educational inequalities in walking: a multilevel study. *Journal of epidemiology and community health*, 61(2), pp. 108-114
- BASSETT, D.R., PUCHER, J., BUEHLER, R., THOMPSON, D.L. and CROUTER, S.E., 2008. Walking, cycling, and obesity rates in Europe, North America, and Australia. *Journal of Physical Activity & Health*, 5(6), pp. 795-814.
- BIDDLE, S. and MUTRIE, N., 2008. *Psychology of physical activity : determinants, well-being and interventions*. 2nd ed. London: Routledge.
- BLACKLOCK, R.E., RHODES, R.E. and BROWN, S.G., 2007. Relationship Between Regular Walking, Physical Activity, and Health-Related Quality of Life. *Journal of Physical Activity & Health*, 4(2), pp. 138-152.
- CAPERCHIONE, C., MUMMERY, W.K. and DUNCAN, M., 2011. Investigating the relationship between leader behaviours and group cohesion within women's walking groups. *Journal of Science and Medicine in Sport*, 14(4), pp. 325-330.
- CERIN, E., LESLIE, E. and OWEN, N., 2009. Explaining socio-economic status differences in walking for transport: An ecological analysis of individual, social and environmental factors. *Social science & medicine*, 68(6), pp. 1013-1020.
- CERIN, E., LESLIE, E., SUGIYAMA, T. and OWEN, N., 2010. Perceived Barriers to Leisure-Time Physical Activity in Adults: An Ecological Perspective. *Journal of Physical Activity & Health*, 7(4), pp. 451-459.
- CHOI, B., PAK, A., CHOI, J. and CHOI, E., 2007. Daily step goal of 10,000 steps: A literature review. *Clinical and Investigative Medicine (Online)*, 30(3), pp. 146-151.
- DARKER, C.D., FRENCH, D.P., EVES, F.F. and SNIEHOTTA, F.F., 2010. An intervention to promote walking amongst the general population based on an 'extended' theory of planned behaviour: a waiting list randomised controlled trial. *Psychology & Health*, 25(1), pp. 71-88.
- DARKER, C., LARKIN, M. and FRENCH, D., 2007. An exploration of walking behaviour-An interpretative phenomenological approach. *Social science & medicine*, 65(10), pp. 2172-2183.



- DOWNER, D., 2006. Nordic Walking step by step. Nordic Walking Publications, pp. 1-22.
- EDENSOR, T., 2010. Walking in rhythms: place, regulation, style and the flow of experience. *Visual Studies*, 25(1), pp. 69-79.
- EDDY, J., DONAHUE, R., WEBSTER, R. and BJORNSTAD, E., 2002. Application of an ecological perspective in worksite health promotion: A review. *American Journal of Health Studies*, 17(4), pp. 197
- GAUVIN, LISE, WALL, A. E, QUINNEY, H. ARTHUR, 1994. *Toward active living: proceedings of the International Conference on Physical Activity, Fitness, and Health*. III edn. Leeds: Champaign, Human Kinetics.
- GILES-CORTI, B. and DONOVAN, R., 2002. The relative influence of individual, social and physical environment determinants of physical activity. *Social Science and Medicine*, 54(12), pp. 1793-1812
- GRANNER, M.L., SHARPE, P.A., HUTTO, B., WILCOX, S. and ADDY, C.L., 2007. Perceived Individual, Social, and Environmental Factors for Physical Activity and Walking. *Journal of Physical Activity & Health*, 4(3), pp. 278-293.
- GREEN, J., 2009. 'Walk this way': Public health and the social organization of walking. *Social Theory & Health*, 7(1), pp. 20-38.
- HAGEN, M., HENNIG, E.M. and STIELDORF, P., 2011. Lower and Upper Extremity Loading in Nordic Walking in Comparison with Walking and Running. *Journal of Applied Biomechanics*, 27(1), pp. 22-31.
- HILLAND, T.A., RIDGERS, N.D., STRATTON, G. and FAIRCLOUGH, S.J., 2011. Associations between selected demographic, biological, school environmental and physical education based correlates, and adolescent physical activity. *Pediatric Exercise Science*, 23(1), pp. 61-71.
- KAVANAGH, A.M. and BENTLEY, R., 2008. Walking: A Gender Issue? *Australian Journal of Social Issues*, 43(1), pp. 45-64.
- KOCUR, P., DESKUR-ŚMIELECKA, E., WILK, M. and DYLEWICZ, P., 2009. Effects of Nordic Walking training on exercise capacity and fitness in men participating in early, short-term inpatient cardiac rehabilitation after an acute coronary syndrome -- a controlled trial. *Clinical rehabilitation*, 23(11), pp. 995-1004.
- KING, A., STOKOLS, D., TALEN, E., BRASSINGTON, G.S. and KILLINGSWORTH, R., 2002. Theoretical approaches to the promotion of physical activity: Forging a transdisciplinary paradigm. *American Journal of Preventive Medicine*, 23(2), pp. 15-25
- KRIEGER, J., RABKIN, J., SHARIFY, D. and SONG, L., 2009. High point walking for health: Creating built and social environments that support walking in a public housing community. *American Journal of Public Health*, 99, pp. 593-599
- KRUGER, J., HAM, S.A., BERRIGAN, D. and BALLARD-BARBASH, R., 2008. Prevalence of transportation and leisure walking among U.S. adults. *Preventive medicine*, 47(3), pp. 329-334.
- LEE, C. and MOUDON, A.V., 2006. Correlates of Walking for Transportation or Recreation Purposes. *Journal of Physical Activity & Health*, 3, pp. 77-98.
- LITT, D.M., IANNOTTI, R.J. and WANG, J., 2011. Motivations for Adolescent Physical Activity. *Journal of Physical Activity & Health*, 8(2), pp. 220-226.
- MCEACHAN, R.R.C., SUTTON, S. and MYERS, L.B., 2010. Mediation of personality influences on physical activity within the theory of planned behaviour. *Journal of Health Psychology*, 15(8), pp. 1170-1180.

- MCGINN, A.P., EVENSON, K.R., HERRING, A.H. and HUSTON, S.L., 2007. The relationship between leisure, walking, and transportation activity with the natural environment. *Health & place*, 13(3), pp. 588-602.
- MCLEROY, K., BIBEAU, D., STECKLER, A. and GLANZ, K., 1988. An ecological perspective on health promotion programs. *Health education quarterly*, 15(4), pp. 351-377
- MCQUEEN, R. and KNUSSEN, C., 1999. *Research methods in psychology. A practical introduction*. 1 edn. Prentice Hall Europe.
- MEROM, D., PHONGSAVAN, P., CHEY, T. and BAUMAN, A., 2006. Long-term changes in leisure time walking, moderate and vigorous exercise : were they influenced by the national physical activity guidelines? *Journal of Science & Medicine in Sport*, 9(3), pp. 199-208.
- MORGAN, A.L., TOBAR, D.A. and SNYDER, L., 2010. Walking Toward a New Me: The Impact of Prescribed Walking 10,000 Steps/Day on Physical and Psychological Well-Being. *Journal of Physical Activity & Health*, 7(3), pp. 299-307.
- MORGULEC- ADAMOWICZ, N., MARSZAŁEK, J. and JAGUSTYN, P., 2011. NORDIC WALKING - A NEW FORM OF ADAPTED PHYSICAL ACTIVITY (A LITERATURE REVIEW). *Human Movement*, 12(2), pp. 124-132.
- MOUDON, A.V., LEE, C., CHEADLE, A., GARVIN, C., JOHNSON, D., SCHMID, T. and WEATHERS, R., 2007. Attributes of environments supporting walking. *American Journal of Health Promotion*, 21(5), pp. 448-459
- OLIVER, M.J., 1993. What's wonderful about walking? Inaugural Professorial Lecture, 9th February 1993
- PIECH, K., and RACZYNSKA, B., 2010. Nordic Walking- a versatile physical activity. *Polish Journal of Sport and Tourism*, 17, pp. 69-78.
- OWEN, N., HUMPEL, N., LESLIE, E., BAUMAN, A. and SALLIS, J., 2004. Understanding environmental influences on walking: Review and research agenda. *American Journal of Preventive Medicine*, 27(1), pp. 67-76
- RAMBLERS' ASSOCIATION, 2010. *Walking Facts and Figures 2: Participation in Walking*. Ramblers' Association.
- RHODES, R., COURNEYA, K., BLANCHARD, C. and PLOTNIKOFF, R., 2007. Prediction of leisure-time walking: an integration of social cognitive, perceived environmental, and personality factors. *International Journal of Behavioral Nutrition and Physical Activity*, 4, pp. 51.
- RUTT, C. and COLEMAN, K., 2005. The impact of the built environment on walking as a leisure-time activity along the U.S./ Mexico border. *Journal of Physical Activity & Health*, 2(3), pp. 257
- SAELENS, B.E. and HANDY, S.L., 2008. Built environment correlates of walking: a review. *Medicine and science in sports and exercise*, 40(7), pp. 550-566.
- SALLIS, J., OWEN, N. and FISHER, E., 2008. Ecological models of health behavior. In: K. GLANZ, B. RIMER and K. VISWANATH, eds, *Health behavior and health education: theory, research, and practice*. 4, illustrated edn. John Wiley & Sons, pp. 245-285
- SCOTT, E.J., EVES, F.F., FRENCH, D.P. and HOPPÉ, R., 2007. The theory of planned behaviour predicts self-reports of walking, but does not predict step count. *British Journal of Health Psychology*, 12(4), pp. 601-620.
- SHAY, E., SPOON, S. and KHATTAK, A., 2003. *Walkable environments and walking activity*. Final Report for Seed Grant submitted to the Southern Transportation Center; University of Tennessee. University of North Carolina at Chapel Hill

- SHOVE, E. and PANTZAR, M., 2005. Consumers, producers and practices: understanding the invention and reinvention of Nordic walking. *Journal of consumer culture*, 5(1), pp. 43-64.
- SIEGEL, P.Z., BRACKBILL, R.M. and HEATH, G.W., 1995. The epidemiology of walking for exercise: implications for promoting activity among sedentary groups. *American Journal of Public Health*, 85(5), pp. 706-710.
- ŠOKELIENĖ, V. and ČESNAITIENĖ, V.J., 2011. The Influence of Nordic Walking on Physical Fitness of Elderly People. (82), pp. 45-51.
- SPENCE, J. and LEE, R., 2003. Toward a comprehensive model of physical activity. *Psychology of Sport and Exercise*, 4(1), pp. 7-24
- STAHL, T., RUTTEN, A., NUTBEAM, D., BAUMAN, A., KANNAS, L., ABEL, T., LUSCHEN, G., RODRIQUEZ, D.J.A., VINCK, J. and VAN DER ZEE, J., 2001. The importance of the social environment for physically active lifestyle - results from an international study. *Social Science and Medicine*, 52(1), pp. 1-10
- STOKOLS, D., 1996. Translating social ecological theory into guidelines for community health promotion. *American Journal of Health Promotion*, 10(4), pp. 282-298.
- STOKOLS, D., 1992. Establishing and maintaining healthy environments: Toward a social ecology of health promotion. *American Psychologist*, 47(1), pp. 6-22
- TULLY, M.A., CUPPLES, M.E., CHAN, W.S., MCGLADE, K. and YOUNG, I.S., 2005. Brisk walking, fitness, and cardiovascular risk: a randomized controlled trial in primary care. *Preventive medicine*, 41(2), pp. 622-628.
- WEN, M., KANDULA, N. and LAUDERDALE, D., 2007. Walking for Transportation or Leisure: What Difference Does the Neighbourhood Make? *Journal of General Internal Medicine*, 22(12), pp. 1674-1680

# **Citizenship, migration and gender: Polish migrant women in the UK and Poland.**

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## **Abstract**

Accession 8 (A8) migration to the UK has been studied extensively over the last few years. In fact, migration from the new EU member states to the UK has been one of the most significant social phenomena of recent times. However, gender and gender roles, in particular in relation to A8 migration, remain an under-researched area. There is now much evidence to support the view that migrant women constitute a large proportion of international migrants. In fact, when considering migration within the European context, migrant women already outnumber their male counterparts.

Evidence suggests that characterising women as passive followers of migrant men is flawed. Drawing on an extensive review of secondary literature in relation to citizenship, gender and the new Accession 8 migration to the UK, in this paper it is argued that migrant women should be seen as active decision makers. The aim of this paper is to explore how migrant women utilise migratory spaces within the European Union (EU) to better their own and their families' wellbeing. In this paper migration is considered as a catalyst for change in traditional gender roles, and it is explored how Polish migrant women negotiate their gender roles in regard to work and welfare responsibilities when exercising their rights as EU citizens. It is concluded that gender roles are reconfigured through the migratory process. However, when taking women into account, migration may result in 'double caring responsibilities', as the literature suggests.

## **Keywords**

Gender, A8 migration, Polish women, UK, welfare.

### **1. Theories of Migration**

Classic theories of migration may have become redundant in light of contemporary international migratory movements (Morokvasic, 2004). It could be asserted that there is no single consistent theory of international migration but rather a group of theories developed independently from each other (Massey, *et al.*, 1993). The majority of classic migration theories recognise and focus on economic imperatives as the predominant reasons for migratory decisions. It could, however, be that in the 'age of migration' (Castles & Miller, 2003) people decide to migrate out of curiosity or simply because they can (Kindler *et al.*, 2010; Scullion & Pemberton, 2010).

Castles and Miller (2009) have identified a number of different approaches within the economic migration theory paradigm. *Neoclassical theory* is the dominant one and explains the movement of people from low to high income countries as affected by push (e.g. unemployment in the country of origin) and pull factors (e.g. better wages and employment conditions in the destination country). Another economic theory, *dual (or segmented) labour market theory*, considers that migration is caused by constant structural demand for both high and low-skilled workers. This theory is particularly useful in providing an explanation for migratory movements when international wage differentials decline. The *new economics of labour migration approach* is another economic theory and considers migration decisions as made not by individual social actors but whole families, or even local communities. It

stresses the fact that migration cannot be understood solely in economic terms and highlights family and other types of migration (Castles & Miller, 2009). The *historical-institutional approach* (or *historical-structural approach*) explains migration as a way of maximising capital by the rich who aim to accumulate greater wealth by the use of cheap international labour.<sup>1</sup>

When considering migration theories, it is important to distinguish economically motivated and forced migratory movements (ibid.). The former is the focus of this research project and refers to those who decide to migrate to improve their economic situation. Whereas economic migration relates to voluntary movements of people, forced migration refers to, among others, asylum seekers and refugees who migrate to escape existing conflicts, discrimination, persecution and/or environmental disasters in their country of origin (Castles, 2000). Whilst it is recognised that simplistic differences between forced and voluntary migration may not be able to account for current migration patterns, the ‘migration-asylum nexus’ provides a valid explanation (Castles & Van Hear, 2005). The ‘migration-asylum nexus’ highlights the current difficulties in separating forced and economic migration. It indicates similarities between the causes of both types of migration and argues that the boundaries between the two have become blurred.

It can be argued that in the last two decades, immigrant communities and as a result, the essence of diversity in Britain, has changed considerably (Vertovec, 2007). Since the 1990s, there has been a rise in net immigration recorded with a greater variety of countries of origin. As a consequence of this, there have been new immigration laws designed (e.g. the Asylum and Immigration Acts of 1993, 1996, 1999, Immigration, Asylum and Nationality Act 2006, the Borders, Citizenship and Immigration Act 2009). There was also a rapid increase of different immigration statuses and migration channels. What is more, various conflicts in different parts of the world resulted in an increase in the number of asylum seekers looking for refuge in the UK. Additionally, for labour migrants the UK remained an attractive destination for most of this time due to the low unemployment rate and labour shortages and generally high economic performance. On the other hand, there have been growing inequalities in the developing world. There has been increasing multilingualism, religious diversity and a vast variety of different categories of immigrants (i.e. migrant workers, international students, asylum seekers, etc.). It is noteworthy that “over the past thirty years, more females than males migrated to the UK” (Vertovec, 2007, p. 1040). This is particularly relevant to this research study and, perhaps more importantly, it confirms the ‘feminisation of migration’ (Castles & Miller, 2003).

## **2. Gendered Migration**

It has been widely accepted that migration is gendered (Caritas, 2011; Kofman, 2004; Pessar & Mahler, 2003). Although women play a crucial role in contemporary migrations, previously they have been “sociologically invisible, although numerically and socially present” (Morokvasic, 1983, p. 13) and the presence of women has been finally acknowledged when they entered waged labour market (ibid.). For many migrant women the change from unpaid work in the home to paid work in the labour market came about through migration (Phizacklea, 1983). Moreover, the assumptions of a male breadwinner family model and traditional gender roles have dominated classic migration theories (Ackers, 1998). Until the 1970s, most research and publications on international migration focused only on male migrants (Zlotnik, 2003). Female migrants began to appear in the literature from the mid 1970s, whereas previously they were portrayed as “followers, dependants, unproductive

persons, isolated, illiterate and ignorant” (Morokvasic, 1983, p. 16). Other studies consider them to be active decision makers (cf. Kindler, *et al.*, 2010). Morokvasic (1983) noted that paid work in the developed world offered to migrant women from developing countries is one way for them to escape the oppressive patriarchal traditions in their homeland. However, these studies fail to recognise whether the dominant economic model of migration – male breadwinning and profit-maximising - evident in academic literature, is founded on empirical evidence or is simply a convenient ideological construct. Hence, additional studies on migrant women and their strategies of negotiating gender roles in respect of paid employment and unpaid informal familial care work are needed. The importance of a study on migrant women and gender roles cannot be dismissed in times of ageing populations and declining birth and fertility rates (Erel, 2012). As women have become more active in the paid labour market, they are less likely to be able to undertake informal caring roles in the home (Daly & Rake, 2003). However, the use of migrant workers in the ‘transnational political economy of care’ enables the universal breadwinner model as both men and women are encouraged to seek paid employment and migrant labour enables them to secure it (Williams, 2010). It is therefore crucial to recognise that the role of women as workers and carers in contemporary society is undergoing a process of reconstruction.

It can be argued that migrant women who are EU nationals migrating between different EU countries are an “under-researched group in their own right” (Ackers, 1998, p. 1). “It is not the absence of women, however, but their invisibility in the research that is at issue here ...” (ibid., p. 139). Recent studies agree that whilst female migration was previously dictated by purely economic reasons; now however, women migrate out of curiosity and interest in other cultures and foreign languages, for instance (Kindler *et al.*, 2010). Furthermore, Anthias and Yuval-Davis (1992) argue that the existing literature considers migrant women to be incorporated in an ill-defined category of women, despite the fact that their migratory experiences are very much affected by their individual circumstances.

Moreover, as previously noted, Castles and Miller (2009) suggest that we can now observe a ‘feminisation of migration’. Nonetheless, the UN (UN-INSTRAW, 2007) rejects this view as misleading, as it suggests a sudden large overall increase in the number of female migrants whereas there have long been a significant proportion of women among migrants. Zlotnik (2003) however, notes the increase is nonetheless substantial: in the 1960s women constituted 47 per cent of all international migrants; by 1990 that number had increased to 48 per cent and in 2000 to almost 49 per cent. However, when taking Europe into account, in 1990 female migrants constituted almost 52 per cent of all migrants and by 2000 the figure had reached 52.4 per cent (ibid.).

Despite this, Yuval-Davis (1997) argues that women are still seen as the carriers of tradition rather than change. Engle (2004) indicates that the contrast between women’s migrations in the 19<sup>th</sup> and 21<sup>st</sup> centuries lies in the reasoning of their travels and the way it is recorded. She writes, “in fact, gender (i.e. perceived roles, responsibilities and obligations – or the lack thereof) may be the single most important factor influencing the decision to migrate” (ibid., p. 6) and that,

Women have always migrated; but, whereas in the past their movement was often more directly related to family reunification or depended on a male migrant, today they are moving as primary migrants in their own right (Engle, 2004, p. 17).

### 3. Gendered Citizenship

Citizenship is a gendered concept and arguably, women have been excluded from full citizenship “for much of history, ancient and modern” (Lister, forthcoming). A consideration of gender has often been absent in previous writing on citizenship and historically citizenship was viewed very much as the realm of men (Dwyer, 2010). Many feminists argue that the public – private dichotomy is the primary cause of women’s limited access to the full and equal citizenship status (Lister, 2003; Walby, 1994). Traditionally and stereotypically, women were assigned a place in the private sphere; therefore they were unable to be active in the public arena on an equal basis with men. Even today many social citizenship rights are dependent on women being in full-time employment, which is difficult to achieve if they have caring responsibilities in the home. The value assigned to women’s caring responsibilities makes them unable to exercise full social citizenship status.

According to some authors (Fraser, 2000), the traditional male breadwinner – female caregiver model has become obsolete as gender roles have undergone modification. There have been changes in partnering and we have been observing increasing employment rates for women (Dwyer, 2010). Relationships have become less stable with declining family size; there are fewer marriages and more divorces and cohabiting (Pascall, 1997). Therefore, a ‘universal breadwinner model’ may better reflect those changes. Here, women are treated as equal workers and their paid work is being recognised as equally valuable to that of men. However, informal familial care work is still routinely undertaken by women (Fraser, 2000). Arguably, the universal caregiver model is of most value to women as it asks men to change and “make[s] women’s current life-patterns the norm for everyone” (Fraser, 2000, p. 25).

Traditionally the UK was considered to be a strong male breadwinner state, thus the public–private divide is evident. The paid versus unpaid work and welfare division is gendered. Even though it is evident that more women participate in the paid labour market, unpaid work continues to be women’s burden (Lewis, 1992). Arguably, women are still seen as dependants of men (Kofman, 2004). In the past, gendered responsibilities and power relations in families left women in a disadvantaged position (Boyd & Grieco, 2003).

...wherever a woman comes from, wherever she migrates to, whether or not she works, is married or has children her primary role in life will be defined not as a waged worker, but as a mother and a domestic labourer (Phizacklea, 1983, p. 2).

In Central and Eastern Europe (CEE), the male breadwinner model was challenged in the communist era as women were officially equal with men (Pascall & Kwak, 2005). Rhetorically at least, the gender regimes in CEE countries seemed to achieve, to a certain extent, gender equality with women enjoying high levels of participation in the paid labour market and low gender pay gap. However, it can be argued that in Poland for instance, ‘retraditionalisation’ has taken place post 1989 with more women staying at home and men breadwinning (Pascall & Lewis, 2004). In Poland, there are high unemployment rates for women and mothers especially, even though many possess higher qualifications than their partners. Furthermore, in Poland, despite the fact that it is a secular country and there is no mention about Catholicism in the Polish Constitution (from 1997), the Roman Catholic Church plays a major role. In the aftermath of the Second World War, the Church and the communist party reinforced the role of the family. The Church, perhaps not surprisingly, favoured the traditional gendered division of labour within the family. Additionally the influence of the feminist movements that took place in the 1960s and 1970s in Western Europe was limited in Poland due to suppression from the Communist regime (Pascall & Kwak, 2005).

Williams, (2012) highlights the ‘silent crisis’ – the global crisis of care which devalues care despite the fact that it is essential to everyone’s life. Care is being turned into a commodity and service users into customers even though “the need for care is inevitable, given humans’ dependence in infancy and old age, and often in between” (Orloff, 2009, p. 334). The crisis of care is partly a result of ageing Western societies and the increasing need for paid carers in the formal labour market. As women are most likely to take on care work as paid employment, they are left with virtually no time for caring for their own families, or if they do not have one, starting a family of their own. Women who have families often turn to others (e.g. friends, relatives, paid carers or migrants) to do the caring work for them which results in a vicious circle when it comes to caregiving. Women are responsible for caregiving and specifically because of this they are in a disadvantaged position when it comes to full citizenship rights.

Furthermore, there is the phenomenon of global care chains which are linked to two processes – the increasing need for home-based care and domestic work and the fact that migrant women are often the ones to fulfil that need. Global care chains refer to the process where migrant women from the global South (or generally poorer regions) migrate to care for other people’s children (and other family members in need of care) in the global North (or wealthier regions) in order to be able to financially support their own children who are cared for by their relatives. Because of the care and domestic work being undertaken by migrant women the women from those households are able to engage in paid work too. This concept offers an explanation to intertwining of personal and global relationships and, perhaps more importantly, confirms the feminisation of migration and the ‘gendered nature of globalisation’ (Williams, 2010, p. 386).

#### **4. A8 Migration to the UK**

The term Accession 8 (A8) countries refers to the eight former Eastern Bloc states in Central and Eastern Europe that joined the European Union on the 1<sup>st</sup> May 2004<sup>ii</sup>. Accession 8 migration to the UK has been studied extensively, particularly since 2004 (Scullion & Pemberton, 2010; Grabowska-Lusińska & Okólski, 2008; Drinkwater, Eade & Garapich, 2006). In fact, migration from these new EU member states to the UK has been one of the most significant social phenomena of recent times (Pollard, Latorre & Srisikandarajah, 2008). That is not to say that Polish migration to the UK is a new phenomenon. There have been a number of studies dealing with migrant workers from the new A8 countries (Cook, Dwyer & Waite, 2012, 2011; Scullion & Morris, 2010a, 2010b). In recent years there has also been much press coverage on A8 immigration to the UK (Pidd, 2011; Harris, 2011; Quinn, 2011; Gentleman, 2011; Ramesh, 2010). It can be argued that the global economic crisis of 2008 has caused host populations to scapegoat recently arrived migrants for increasing competition for scarce resources within marginalised communities (Cook, Dwyer & Waite, 2012). Historically, migrants are the first to be blamed as they differ from the majority.

However, gender and gender roles, in particular in relation to A8 migration and CEE welfare states, remain an under-researched area (Pascall & Kwak, 2005, p. 12, 16, 31). Furthermore, there is now much evidence to support the view that migrant women constitute a large proportion of international migrants who have entered the UK. In fact, when considering migration within the European context, migrant women already outnumber their male counterparts (Zlotnik, 2003). In terms of A8 migrants, the Worker Registration Scheme (WRS) statistics show that the male – female ratio was 50:50 at the end of 2008 and beginning of 2009. Even though this highlights an even split, it is assumed that there is a proportion of women who did not register as they were stay-at-home mothers and wives/full-time homemakers (UKBA, 2008, 2009).



## 5. Rationale for the Study

Lipszyc (2004, p. 21) posed the question: “following traditional gender roles, when women break geographical ties, do they gain independence?” This research aims to shed some light on this particular issue. Previous research has noted that migration can have a positive effect on migrant women and their status (Castles & Miller, 2003). Through migration many women may become more autonomous and independent as they gain income and respect which positively affects their self-esteem. It can be argued that through migrating, women are constantly exposed to new social and cultural norms and different lifestyles which may affect their views on the values they were taught in their home country. All of this may have positive consequences when it comes to gender equality in their country of origin (Caritas, 2011). This may be the case, especially when the women in question decide to return to their home country and may bring back not only remittances but new ideas in respect of their life from now on.

The proposed thesis will explore the gendered roles of Polish migrant women and how these may have been affected by the migratory process. The researcher asks whether or not migration has emancipated women from their traditional gender roles and how, if at all, their gendered roles in respect of work (paid and unpaid) and welfare (formal and informal) have been altered as a result of their migratory movements between Poland and the UK. A key question for the study is therefore: “How is patriarchy altered or reconstituted after migration?” (Boyd & Grieco, 2003, p. 2). Patriarchy is understood here as the system in which men exercise control over women (O’Connor, 1996, p. 4).

## 6. Methodology

An abductive research strategy will be employed<sup>iii</sup>. The *idealist* ontology and the epistemology of *constructionism* will underpin this research project. According to the *idealist* ontology, the world consists of individuals’ interpretations, and “reality is what human beings make or construct” (Blaikie, 2007, p. 16). An epistemological position based on *constructionism* is particularly relevant as it considers knowledge to be the outcome of social actors trying to make sense of their encounters with other individuals and the outside world (ibid.). The epistemological framework of this research is based on the recognition that knowledge is situated and contextual (Yuval-Davis, 1997). From the researcher’s point of view it is also unavoidable that the research will be somewhat affected by the researcher’s own positioning<sup>iv</sup>. This qualitative study will be undertaken from a gendered perspective as it is suitable for exploring gender roles and migrant women. This approach is particularly relevant because migration has, for a long time, been androcentric, with women essentially being invisible (Morokvasic, 2004; Phizacklea, 1983; Oakley, 1981).<sup>v</sup>

### 6.1 Research design

In order to achieve the project aim and objectives, a thorough review of academic and policy literature will be conducted. Secondary data collection and analysis will also be undertaken. Prior to fieldwork, all relevant ethical issues will be addressed (see last section on ethical considerations). After ensuring these are sound, data collection will start by fieldwork

planning – designing the interview topic guide, conducting pilot interviews and making any necessary amendments. The next step will consist of conducting in-depth semi-structured interviews in the North West of England. This part of England has been chosen as the area with the second highest population density in England (ONS, 2011). What is more, this area has been chosen due to the established links with the migrant community. The researcher already has excellent links with Accession 8 migrants and organisations working with them in the area. Through her work at Europa<sup>vi</sup>, the researcher is very much up-to-date in respect to this community. This will be followed by a period of fieldwork in Poland.

The empirical research will focus on the migratory movements of women moving between Poland and the UK and the way in which these movements may shape their gender roles. Qualitative, in-depth and semi-structured interviews are the chosen research tools. It is anticipated that each interview will last approximately 60 minutes<sup>vii</sup>. During the interviews women will be encouraged to talk about their migration history and its impact on: work – paid and unpaid (public/private dichotomy); welfare – formal and informal; career and financial autonomy (i.e. work-life balance); and general quality of life (the UK welfare system). Additional field notes will be taken immediately after the interviews to record preliminary thoughts in regard to the respondents and any potential categories and/or themes for the data analysis. Thematic analysis of the data generated in the fieldwork will be conducted<sup>viii</sup>.

## ***6.2 Research questions***

The research aims to explore and unpack three main research questions<sup>ix</sup>:

1. How does gender impact on Polish migrant women's lives?
2. How, if at all, has migration impacted on Polish migrant women's roles as carers and workers?
3. How do Polish migrant women manage their roles over time and space?

## ***6.3 Sample***

Strategic purposive sampling will be adopted (Mason, 2002). The sample will consist of two groups.

**Group 1 – migrants:** 15 Polish migrant women who migrated to the UK post 2004 and continue to live in the UK.

**Group 2 – returnees:** 15 Polish women who migrated to the UK post 2004 but who have subsequently relocated back to Poland.

It is likely that a total of 30 participants will meet the purpose of the study. However, this will be decided during its course and will be determined by the point at which new data cease to emerge from the interviews<sup>x</sup>.

The UK based participants will be selected from users of agencies working in the North West of England (e.g. Europa, Open Culture Project, Rainbow Haven, Greater Manchester Pay and Employment Rights Advice Service, Migrants Supporting Migrants). The Poland based participants will be recruited through already established links in some of Poland's major cities. If necessary, snowball or chain sampling will also be employed (Ritchie, Lewis &

Elam, 2003, p. 94). It is anticipated that the sample will include individuals from different age ranges but of working age (i.e. between 18 and 65 years old); who are of different socio-economic characteristics; who have been living in the UK for different lengths of time (not less than 6 months); and who are of different relationship status (i.e. single/married/cohabiting, with/without children). Such a diverse sample should enable individuals of different demographic characteristics to have their say and as a result capture a wide variety of views and constitute a balanced sample.

#### **6.4 Ethical considerations<sup>xi</sup>**

The research will comply with the Social Policy Association Guidance on Research Ethics<sup>xii</sup> as these are of particular relevance to this project. The research and data collection process will be based on two principles: informed consent and confidentiality. The overall aim and objectives of the research will be explained to potential participants prior to the interview. Each participant will have the right and opportunity to ask questions and/or withdraw (without reason) at any stage of the research process. All participants will be asked to sign consent forms. All participants will be asked whether they give consent to being voice recorded<sup>xiii</sup>. If a participant does not give consent to being voice recorded, detailed field notes will be taken. All participants will be guaranteed anonymity and confidentiality, where possible, subject to the limits imposed by harm minimisation<sup>xiv</sup>. The research participants will be informed that the research findings will be published as a PhD thesis, in academic journals and presented at national and international conferences. The research outputs will be stored securely on the University F: Drive with restricted access to data (password protected) and removal of personal details. Paper-based data will be stored in locked filing cabinets at the researcher's University office. The researcher will also ensure her own safety by carrying a mobile phone when going to an interview location and informing at least one person of her whereabouts.

#### **References**

- Ackers, L. (1998). *Shifting Spaces. Women, citizenship and migration within the European Union*. Bristol: The Policy Press.
- Anderson, B. (2000). Selling the Self: Commodification, Migration and Domestic Work. In B. Anderson, *Doing the Dirty Work? The Global Politics of Domestic Labour* (pp. 108-125). London: Zed Books Ltd.
- Anthias, F. & Yuval-Davis, N. (1992). Connecting race and gender. In F. Anthias & N. Yuval-Davis, *Racialized boundaries. Race, nation, gender, colour and class and the anti-racist struggle* (pp. 96-131). London: Routledge.
- Babbie, E. (2004). *The Practice of Social Research*. USA: Wadsworth/Thomson Learning.
- Becker, S. & Bryman A. (2004). *Understanding Research for Social Policy and Practice*. Bristol: The Policy Press.
- Blaikie, N. (2007). *Approaches to Social Enquiry*. Cambridge: Polity Press.
- Blaikie, N. (1993). Research Strategies: Retroductive and Abductive Strategies. In N. Blaikie *Approaches to Social Enquiry* (pp. 162-197). Cambridge: Polity Press.
- Boyd, M. & Grieco, E. (2003). Women and Migration: Incorporating Gender into International Migration Theory, Migration Information Source, Retrieved 30 April, 2012, from: <http://www.migrationinformation.org/Feature/display.cfm?id=106>

- Braun, V. & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3, pp. 77-101. doi: 10.1191/1478088706qp063oa
- Caritas (2011). *The Female Face of Migration*, Retrieved from: <http://www.caritas.org/includes/pdf/backgroundmigration.pdf>
- Castles, S. (2000). International migration at the beginning of the twenty-first century: global trends and issues. UNESCO, USA: Blackwell Publishers. Retrieved from: [http://www.blackwellpublishing.com/content/bpl\\_images/journal\\_samples/issj0020-8701~52~165~258/258.pdf](http://www.blackwellpublishing.com/content/bpl_images/journal_samples/issj0020-8701~52~165~258/258.pdf)
- Castles, S. & Miller, M. (2009). Introduction. In S. Castles & M. Miller, *The Age of Migration. International Population Movements in the Modern World*, (4<sup>th</sup> ed.) (pp. 1-19). Basingstoke: Palgrave Macmillan.
- Castles, S. & Miller, M. (2009). Theories of Migration. In S. Castles & M. Miller, *The Age of Migration. International Population Movements in the Modern World*, (4<sup>th</sup> ed.) (pp. 20-48). Basingstoke: Palgrave Macmillan.
- Castles, S. & Miller, M. (2003). The Migratory Process and the Formation of Ethnic Minorities. In S. Castles & M. Miller, *The Age of Migration. International Population Movements in the Modern World*, (3<sup>rd</sup> ed.) (pp. 21-49). Basingstoke: Palgrave Macmillan.
- Castles, S. & Miller, M. (2003). Migrants and Minorities in the Labour Force. In S. Castles & M. Miller, *The Age of Migration. International Population Movements in the Modern World*, (3<sup>rd</sup> ed.) (pp. 178-197). Basingstoke: Palgrave Macmillan.
- Castles, S. & Van Hear N. (2005). Developing DfID's Policy Approach to Refugees and Internally Displaced Persons. Oxford: COMPAS. Retrieved from: <http://www.compas.ox.ac.uk/publications/reports-and-other-publications/dfid-approach-to-refugees/>
- CBOS (2006). Kobiety i mężczyźni o podziale obowiązków domowych. Komunikat z badań. Warszawa. Retrieved from: [http://www.bezuprzedzen.org/doc/kobiety\\_i\\_mezczyzni\\_o\\_podziale\\_obowiazkow\\_domowyc\\_h\\_2006\\_CBOS.pdf](http://www.bezuprzedzen.org/doc/kobiety_i_mezczyzni_o_podziale_obowiazkow_domowyc_h_2006_CBOS.pdf)
- Coats, D. (2008). *Migration Myths: Employment, Wages and Labour Market Performance*. London: The Work Foundation. Retrieved from: [http://www.theworkfoundation.com/assets/docs/publications/33\\_migration%20myths.pdf](http://www.theworkfoundation.com/assets/docs/publications/33_migration%20myths.pdf)
- Cook, J., Dwyer, P. & Waite, L. (2012). Accession 8 Migration and the Proactive and Defensive Engagement of Social Citizenship. *Journal of Social Policy*, 41(2), pp. 1-19. doi: 10.1017/S0047279411000766
- Cook, J., Dwyer, P. & Waite, L. (2011). The experiences of Accession 8 migrants in England: Motivations, work and agency. [Electronic version]. *International Migration*, 49(2), pp. 54-79.
- Cox, S. (2008). What if all the Poles went home? BBC News. Retrieved 7 May, 2012, from: <http://news.bbc.co.uk/1/hi/magazine/7316261.stm>
- Daly, M. & Rake, K. (2003). Gender and the Provision of Care. In M. Daly & K. Rake, *Gender and the Welfare State* (pp. 48-69). Cambridge: Polity Press.
- Davies, N. (1984). *God's Playground: A History of Poland*. Colombia: Colombia University Press.

Drinkwater, S. & Eade, J. & Garapich, M (2006). Poles Apart? EU Enlargement and the Labour Market Outcomes of Immigrants in the UK. IZA Discussion Paper No. 2410. Bonn: The Institute for the Study of Labor (IZA).

Dwyer, P. (2010). *Understanding Social Citizenship. Themes and perspectives for policy and practice*. Bristol: The Policy Press.

Economic and Social Data Service (2012). Ethnicity. Retrieved 13 May, 2012, from: [www.esds.ac.uk/government/dv/ethnicity/lfs/background.pdf](http://www.esds.ac.uk/government/dv/ethnicity/lfs/background.pdf)

Engle, L. B. (2004). *The World in Motion. Short Essays on Migration and Gender*. Switzerland: International Organisation for Migration (IOM).

Finch, J. (1991). Feminist research and social policy. In M. Maclean & D. Groves (Eds.), *Women's Issues in Social Policy* (pp. 194-204). London: Routledge.

Fraser, N. (2000). After the family wage: a postindustrial thought experiment. In B. Hobson (Ed.), *Gender and Citizenship in Transition* (pp. 1-32). Basingstoke: Macmillan.

Gentleman, A. (2011, 6 April). 'Going home: the Polish migrants who lost jobs and hope in UK', *The Guardian*, Retrieved from: <http://www.guardian.co.uk/world/2011/apr/06/uk-polish-migrants-lost-jobs-and-hope>

Glossop, C. & Shaheen, F. (2009). *Accession to Recession: A8 migration in Bristol & Hull*. London: Centre for Cities. Retrieved from: <http://www.centreforcities.org/assets/files/Accession%20to%20Recession%20.pdf>

Grabowska-Lusińska, I. & Okólski M. (2008). Migracja z Polski po 1 maja 2004 r.: jej intensywność i kierunki geograficzne oraz alokacja migrantów na rynkach pracy krajów Unii Europejskiej. Centre of Migration Research, CMR Working Paper No 33/9, Warsaw: Warsaw University.

Harris, J. (2011). 'For a generation of young Poles, travelling abroad is still often the only option', *The Guardian*, Retrieved from: <http://www.guardian.co.uk/world/2011/apr/08/polish-youth-unemployment>

Index Mundi (2012). Złoty to Pound Sterling Exchange rate. Retrieved 7 May, 2012, from: <http://www.indexmundi.com/xrates/graph.aspx?c1=PLN&c2=GBP&days=2826&lastday=20080929>

Kindler, M., Kordasiewicz, A., Napierała, J., Szulecka, M., Redondo Toronjo, D. & White, A. (2010). *Migracje kobiet: przypadek Polski*. Warszawa: Wydawnictwo Naukowe SCHOLAR.

Kofman, E. (2004). Gendered Global Migrations: Diversity and Stratification. *International Feminist Journal of Politics*, 6(4), pp. 643-665. doi: 10.1080/1461674042000283408

Lewis, J. (1992). Gender and the Development of Welfare Regimes. *Journal of European Social Policy* 2, pp. 159-173. doi: 10.1177/095892879200200301

Lipszyc, C. (2004). *Feminisation of Migration: Dreams and Realities of Migrant Women in four Latin American Countries*. Presentation at 'Reclaiming the Streets', Montevideo, 13, 14 and 15 April 2004.

Lister, R. (forthcoming). Citizenship and Gender. In K. Nash & A. Scott (eds.) *Blackwell Companion to Political Sociology*. Blackwell.

Lister, R. (2003). *Citizenship: Feminist Perspectives* (2<sup>nd</sup> ed.). New York: Palgrave Macmillan.

Lister, R., Williams, F., Anttonen, A., Bussemaker, J., Gerhard, U., Heinen, J., Johansson, S., Leira, A., Siim, B., Tobio, C. & Gavanas, A. (2007). *Gendering Citizenship in Western*

- Europe. New challenges for citizenship research in a cross-national context*. Bristol: The Policy Press.
- Mason, J. (2009). *Qualitative Researching*, London: SAGE Publications Ltd.
- Massey, D., Arango, J., Hugo, G., Kouaouci, A., Pellegrino, A. & Taylor, E. (1993). 'Theories of International Migration: A Review and Appraisal'. In R. Cohen (Ed.), *Theories of Migration* (pp. 181-216).
- Morokvasic, M. (2004). 'Settled in Mobility': Engendering Post-Wall Migration in Europe. [Electronic version]. *Feminist Review*, 77, pp. 7-25.
- Morokvasic, M. (1983). Women in Migration: Beyond the Reductionist Outlook. In A. Phizacklea (Ed.), *One Way Ticket: Migration and Female Labour* (pp.13-32). London: Routledge & Kegan Paul plc.
- Oakley, A. (1981). Interviewing women: a contradiction in terms. In H. Roberts (ed.), *Doing Feminist Research* (pp.30-62). London: Routledge & Kegan Paul Ltd.
- O'Connor, J. S. (1996). Understanding Women in Welfare States. [Electronic version]. *Current Sociology* 44(2), pp. 1-12.
- Olson, L. & Cloud, S. (2004). *A Question of Honor: The Kosciuszko Squadron: Forgotten Heroes of World War II*. New York: Vintage Books.
- ONS (2011). Regional Profiles – Population and Migration – North West – October 2011. Retrieved 25 June, 2012, from: <http://www.ons.gov.uk/ons/rel/regional-trends/region-and-country-profiles/population-and-migration/population-and-migration---north-west.html>
- Pascall, G. & Kwak, A. (2010). *Gender regimes in transition in Central and Eastern Europe*. Bristol: The Policy Press.
- Pascall, G. & Lewis, J. (2004). Emerging Gender Regimes and Policies for Gender Equality in a Wider Europe. *Journal of Social Policy*, 33(3), pp. 373-394. doi: 10.1017/S004727940400772Z.
- Pateman, C. (1989). Introduction. In C. Pateman, *The Disorder of Women* (pp. 1-16). Cambridge: Polity Press.
- Pessar, R. & Mahler, S.J. (2003). Transnational Migration: Bringing Gender in. [Electronic version]. *International Migration Review*, 37(3), pp. 812-846.
- Phizacklea, A. (1983). Introduction. In: A. Phizacklea (eds), *One Way Ticket. Migration and Female Labour* (pp. 1-13). London: Routledge & Kegan Paul plc.
- Pidd, H. (2011). Poland: Immigration to UK is back for good life despite economic crisis. *The Guardian*. Retrieved 2 June, 2011, from: <http://www.guardian.co.uk/world/2011/may/27/poland-immigration-uk-economic-crisis>
- Pollard, N. & Latorre, M. & Sriskandarajah, D. (2008). *Floodgates or turnstiles? Post-EU enlargement migration flows to (and from) the UK*. London: The Institute for Public Policy Research.
- Quinn, B. (2011, 9 April). 'Poles apart: stay in the UK or return home?' *The Guardian*, Retrieved from: <http://www.guardian.co.uk/money/2011/apr/09/poles-stay-uk-return-home>
- Ramesh, R. (2010, 12 August). 'Homeless Poles living on barbequed rats and alcoholic handwash', *The Guardian*, Retrieved from: <http://www.guardian.co.uk/uk/2010/aug/12/homeless-poles-rough-sleepers>
- Ritchie, J., Lewis, J. & Elam, G. (2003). Designing and Selecting Samples. In J. Ritchie & J. Lewis (eds.), *Qualitative Research Practice* (pp.77-137). London: SAGE Publications Ltd.



- Scullion, L. & Pemberton, S. (2010). *Exploring migrant workers motivations for migration and their perceived contributions to the UK: A case study of Liverpool*. Salford: The University of Salford.
- Scullion, L. & Morris, G. (2010). *Central and Eastern European migrants in Tameside*, Salford: The University of Salford.
- Scullion, L. & Morris, G. (2010). *Central and Eastern European migrant communities in Salford and Bury*. Salford: University of Salford.
- Scullion, L. & Morris, G. (2009). *Migrant workers in Liverpool: A study of A8 and A2 nationals*. Salford: The University of Salford.
- Scullion, L., Morris, G. & Steele, A. (2009). *A study of A8 and A2 migrants in Nottingham*. Salford: The University of Salford.
- Stanley, L. & Wise, S. (1990). Method, methodology and epistemology in feminist research process. In L. Stanley (Ed.), *Feminist Praxis* (pp. 20-60). London: Routledge.
- UKBA (2009). Accession Monitoring: Report May 2004 – March 2009. Retrieved from: [http://webarchive.nationalarchives.gov.uk/20100422120657/http://www.ukba.homeoffice.gov.uk/sitecontent/documents/aboutus/reports/accesion\\_monitoring\\_report/](http://webarchive.nationalarchives.gov.uk/20100422120657/http://www.ukba.homeoffice.gov.uk/sitecontent/documents/aboutus/reports/accesion_monitoring_report/)
- UKBA (2008). Accession Monitoring: Report May 2004 – September 2008. Retrieved from: [http://webarchive.nationalarchives.gov.uk/20100422120657/http://www.ukba.homeoffice.gov.uk/sitecontent/documents/aboutus/reports/accesion\\_monitoring\\_report/](http://webarchive.nationalarchives.gov.uk/20100422120657/http://www.ukba.homeoffice.gov.uk/sitecontent/documents/aboutus/reports/accesion_monitoring_report/)
- United Nations International Research and Training Institute for the Advancement of Women (UN-INSTRAW) (2007). *Feminisation of Migration*. Working Paper 1. Retrieved from: [http://www.renate-europe.net/downloads/Documents/Feminization\\_of\\_Migration-INSTRAW2007.pdf](http://www.renate-europe.net/downloads/Documents/Feminization_of_Migration-INSTRAW2007.pdf)
- Walby, S. (1994). Is citizenship gendered? [Electronic version]. *Sociology*, 28(2), pp. 379-395.
- Williams, F. (2010). Migration and Care: Themes, Concepts and Challenges. *Social Policy and Society*, 9(3), pp. 385-396. doi: 10.1017/S1474746410000102.
- Yuval-Davis, N. (1997). *Gender & Nation*. London: SAGE Publications Ltd.
- Zlotnik, H. (2003). The Global Dimensions of Female Migration, Migration Information Source. Retrieved 9 November, 2011, from: <http://www.migrationinformation.org/feature/display.cfm?ID=109>
- Zlotnik, H. (1995). The South-to-North Migration of Women. [Electronic version]. *International Migration Review*, 29(1), pp. 229-254.

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NOTES:

<sup>i</sup> *World systems theory* also emerged in the 1970s and 1980s and argued that the world could be divided into ‘peripheral’ and ‘core’ regions and migration is one way of exploiting the peripheries for the core regions’ benefit. In this way, the core capitalist nations control the world economy and maintain the poorer peripheries’ dependency on them (Castles & Miller, 2009). It is a relationship dependent on unequal resources distribution between the two regions. A more interdisciplinary approach is provided by *migration systems theory*. Here, migration is seen as a result of previously developed and maintained links between sending and receiving countries. This could be the result of past colonisation, political influence or pre-existing trade and/or cultural ties between nations. Advocates of this theory claim that the international movement of people can be explained by the interconnectedness of macro and microstructures (ibid.). That could be the connections between a

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nation-state and individual citizens, for example between Zimbabwean nationals and the UK, given the history and the fact that Zimbabwe is a former British colony. A more recent approach – the *theory of transnationalism and transnational communities*, argues that the rapid development of transport and communication technologies (e.g. the Internet, inexpensive air travel), enables migrants to maintain links between their home and host countries. In these circumstances, temporary and/or circular mobility becomes easy to pursue and may be very beneficial to migrants (Ryan, *et al.*, 2009).

<sup>ii</sup> They are: the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia.

<sup>iii</sup> This strategy has been chosen as the researcher is interested in social actors' meanings and interpretations of reality.

It is to the process of moving from lay descriptions of social life, to technical descriptions of that social life, that the notion of Abduction is applied (Blaikie, 1993, p. 177).

The abductive strategy allows movement from the social actors' interpretations (i.e. Polish migrant women's) to more scientific understandings of the social world (i.e. academic theorists). It has been chosen over the inductive and deductive strategies as it requires the researcher to step into the research participants' world and "discover their constructions of reality" (Blaikie, 2007, p. 10). This research strategy is particularly well suited to the chosen philosophical framework.

<sup>iv</sup> The researcher wishes to adopt the *insider's stance* (Blaikie, 2007). It requires the researcher to be thoroughly immersed in the participants' world and incorporate her own experiences. The researcher also wishes to take the role of *an expert* and make use of the existing knowledge on the subject. This kind of relationship is seen as particularly useful as the researcher is also a Polish migrant woman, which is an advantage here as she wishes to marry the two – the existing knowledge on the topic and her own experience and analyse these with data from the fieldwork. This will enable her to compare and contrast versatile data sources and achieve more accurate results than if she did not know much on the topic. Finally, when considering the relationship between the researcher and the research participants it is necessary to decide whether to do the research *on, for* or *with* people. In this project the researcher's aim is to be a '*reflective partner*', a '*conscientizer*', where the aim is to better the participants' situation in some way (Blaikie, 2007, p. 12). This will be achieved by giving them voice, thus, providing more balance to the existing literature on citizenship in relation to migrant women.

<sup>v</sup> Feminist researchers argue that their research has to be based on women's experiences and that "the cultural background of the researcher is part of the evidence" (Blaikie, 2007, p. 166). When adopting a feminist perspective, the researcher needs to recognise that women cannot be treated as research objects and that subjectivity is not necessarily unscientific or unwanted (Stanley & Wise, 1990). The project will be underpinned by the view that knowledge in social sciences has a male bias and balance is needed (Finch, 1991). A broad definition of feminism will be adopted: feminism is "a position with the political aim of challenging discrimination against women and/or promoting greater equality between the sexes" (Hoggart, 2012, p.136).

<sup>vi</sup> Europaia is a community organisation based in Manchester ; EUROPIA works with and for Central and Eastern European (CEE) migrants with the aim to help them integrate into wider society, see [www.europia.org.uk](http://www.europia.org.uk).

<sup>vii</sup> Qualitative semi-structured interviews have been chosen to give depth of information and to allow informal conversation and, when and where appropriate, new questions to be formulated as a result of the interviewee's responses. This method may be particularly beneficial in terms of more sensitive themes as the researcher may tailor her questions accordingly to the situation and the person she is interviewing. Interviews are favoured over structured questionnaires as the latter only give a limited chance of explaining social phenomena due to their more rigid structure. They were also favoured over the use of focus groups as some topics may be too sensitive to be explored in a group setting. Moreover, the depth of understanding and flexibility which can be achieved through in-depth interviewing make it appropriate for this qualitative research project (Babbie, 2004).

<sup>viii</sup> This type of analysis is particularly well suited as it is an interpretive process which can, but does not need to, produce a theory. Thematic analysis entails searching for noticeable, recurrent themes in the interview transcripts, coding and analysing them. Arguably, it is the most attainable type of



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analysis, therefore especially useful for early career researchers (Braun & Clarke, 2006). Data collection and data analysis will be conducted simultaneously enabling recognition of the data saturation point. An N-Vivo software package will be used to aid data management.

<sup>ix</sup> Relevant sub-questions include for example:

- a. To what extent are Polish migrant women's lives gendered?
- b. How, if at all, do gender roles differ between the UK and Poland?
- c. How do Polish migrant women understand gender roles in relation to work and welfare?
- d. How do Polish migrant women experience and negotiate their gender roles in respect of work and welfare?
- e. Has the migratory process affected Polish migrant women's gender roles, and if so, in which ways?
- f. Has migrating changed women's gender roles?
- g. Has migrating made them redefine their gender roles?
- h. Has migrating made them feel more independent?

<sup>x</sup> Sampling until reaching data saturation point (Ritchie, Lewis & Elam, 2003, p. 80).

<sup>xi</sup> Issues of rigour. The following strategies will be adopted to ensure the study findings are credible and accurately reflect respondents' accounts:

- 1) An on-going engagement with other academics (i.e. at conferences and other events, through publications, etc.) will ensure sound research design and data collection process;
- 2) An on-going engagement with different grass roots agencies working with Polish migrants (i.e. formal/informal meetings and other community events, etc.) will ensure an insider's perspective and sound research in the field;
- 3) Providing respondents with extracts from their interviews will ensure their accounts and research findings are transparent;
- 4) An on-going critical reflexivity by the researcher with research supervisors will ensure sound themes generation and data analysis.

<sup>xii</sup> The Social Policy Association Guidance on Research Ethics can be found here: [http://www.social-policy.org.uk/downloads/SPA\\_code\\_ethics\\_jan09.pdf](http://www.social-policy.org.uk/downloads/SPA_code_ethics_jan09.pdf)

<sup>xiii</sup> It will be explained that the researcher wishes to maintain eye contact and ensure that no information is lost in the process of transcription hence the use of the digital voice recorder. It will also be noted that the researcher will be the only person listening to the recordings.

<sup>xiv</sup> To maximise anonymity, all participants will be asked to choose an alternative name for themselves.

# **Preliminary observations of the effects of social group housing on the behaviour of captive cheetahs (*Acinonyx jubatus*)**

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## **Abstract**

Ex-situ efforts to support in-situ cheetah conservation are currently hampered by poor breeding success among the captive population. This might indicate underlying welfare concerns. One important aspect of captive cheetah management is social group housing. Housing animals in appropriate social groups provides them the context in which to express wild-counterpart behaviour. This is an effective way of improving welfare and can also directly affect reproductive success. Thus, knowledge of captive cheetah social interaction is crucial if zoos are to provide optimal conditions for welfare and breeding. Field observations have revealed a complex and unusual social system in wild cheetahs which has implications for expressed behaviour; however, knowledge of captive cheetah social behaviour is currently lacking. This paper presents the preliminary findings of the effects of social group housing on the behaviour of captive cheetahs. Behavioural observations were carried out on 26 cheetahs housed at ten UK zoos between May 2011 and February 2012. Among group housed individuals, affiliative behaviours were more frequent than aggressive behaviours. Related males (natural grouping type) groomed each other more and were less aggressive than unrelated males (unnatural grouping type). No difference was observed in the rate of aggressive interactions between related and unrelated females (both unnatural grouping types). The implications of these findings are discussed in relation to cheetah management and breeding.

## **Keywords**

Animal behaviour, animal welfare, cheetah, social behaviour, zoo

## **1. Introduction**

Cheetahs (*Acinonyx jubatus*) are best known for their speed and are widely considered to be the fastest land mammals over short distances (Caro, 1994). Classified as Vulnerable on the IUCN (International Union for Conservation of Nature and Natural Resources) Red List (Durant *et al.*, 2008), it is estimated that cheetahs have disappeared from up to 76% of their historic range in Africa, where they remain widely dispersed, occurring at low densities (Caro, 1994; Durant *et al.*, 2008). Habitat destruction, declining prey numbers, intra-guild competition and direct persecution are major threats faced by the remaining cheetah population (Caro, 1993; Marker-Kraus and Kraus, 1997; Gros, 2002; Durant *et al.*, 2008), which is thought to number less than 10,000 individuals (Durant *et al.*, 2008).

The rapid decline in the wild cheetah population has led to the development of co-ordinated captive breeding programmes in zoos and breeding facilities in order to boost cheetah numbers (Caro, 1993; Marker-Kraus and Kraus, 1997; Bauman *et al.*, 2010). Unfortunately, many zoos have encountered problems in breeding the species and, whilst cheetahs in the wild show no evidence of reproductive problems (Laurenson *et al.*, 1992; Lindburg *et al.*, 1993; Wielebnowski *et al.*, 2002), the captive population is not self-sustaining (Wildt *et al.*,

1993; Wielebnowski *et al.*, 2002; Crosier *et al.*, 2007; Bauman *et al.*, 2010). At the end of 2010 the captive population numbered 1578 individuals, of which 1323 had never bred (Marker, 2012). During the same year only 93 animals (42 males and 51 females), representing 5.9% of the captive cheetah population, successfully bred and of 240 facilities that maintained cheetahs, just 27 reported breeding success (Marker, 2012). Together with previous research confirming that there are no differences in the reproductive physiology of wild and captive cheetahs (Wildt *et al.*, 1993; Wielebnowski and Brown, 1998), Wielebnowski and Brown (1998) found no differences in the physiology of breeders and non-breeders within the captive population. It is therefore likely that the reasons for the cheetah's poor reproductive performance in captivity are related to the behaviour and captive management of the species (Wielebnowski *et al.*, 2002; Crosier *et al.*, 2007). Some authors have suggested that social group housing may be important in determining reproductive success in captive cheetahs (Caro and Collins, 1986; Caro, 1993; Wielebnowski *et al.*, 2002). The cheetah's social organisation is unique among mammals, and its complexity has been revealed by extensive field studies (Eaton, 1970; Caro and Collins, 1986; Caro, 1994; Marker *et al.*, 2003; Durant *et al.*, 2004; Gottelli *et al.*, 2007). Wild adult females are solitary unless accompanied by cubs (Caro, 1994; Wielebnowski *et al.*, 2002; Terio *et al.*, 2003). Caro (1994) reported that cubs separated from their mothers at approximately 18 months of age, remaining in sibling groups for an average of 6.7 months with females separating from their littermates between the ages of 23 and 27 months. Females do not hold territories, but range over large areas of around 800 km<sup>2</sup> (Gottelli *et al.*, 2007).

Male cheetahs can be solitary, but up to 60% of wild males remain in stable groups, or coalitions, throughout their lifetime (Caro and Collins, 1986; Caro, 1993 and 1994; Ruiz-Miranda *et al.*, 1998; Durant *et al.*, 2004). Coalition members maintain close proximity to one another and intra-coalition interactions are mostly affiliative, with little overt aggression and frequent displays of allogrooming (Caro, 1993 and 1994). Coalitions are able to occupy territories, of around 40 km<sup>2</sup>, for longer than single males (Caro and Collins, 1986; Durant *et al.*, 2004) and more females are observed in territories held by coalitions (Caro, 1994; Durant *et al.*, 2004; Gottelli *et al.*, 2007). Thus, it seems that the formation and maintenance of coalitions is important for improving the survival and reproductive success of wild male cheetahs (Ruiz-Miranda *et al.*, 1998; Durant *et al.*, 2004; Gottelli *et al.*, 2007).

The success of captive breeding programmes is influenced by the well-being of individuals (Carlstead and Shepherdson, 1994; Ruiz-Miranda *et al.*, 1998) and incorporating individual differences into management programmes can lead to welfare improvements (Tetley and O'Hara, 2012). Appropriate social housing is an effective way of improving animal welfare by providing animals the context in which to express wild-counterpart behaviour (De Rouck *et al.*, 2005; Price and Stoinski, 2007). Knowledge of captive cheetah social interaction is therefore crucial if zoos are to provide optimal conditions for welfare and breeding (Caro, 1993; Ruiz-Miranda *et al.*, 1998), yet little effort has so far been made to systematically document the behaviour of cheetahs housed in different social groups. This paper presents the preliminary findings of behavioural observations carried out at ten UK zoos, and highlights patterns of behaviour in captive cheetahs housed in different social groups. In particular, it focuses on social group housing arrangements that do or do not approximate to wild cheetah social organisation. The implications of these findings are discussed in relation to captive cheetah management and breeding.

## 2. Methods

### 2.1 Subjects and housing

Table 1. Study subjects and social groupings at ten UK zoos visited for behavioural observations

Name	Enclosure observation hours	Age (years)	Sex	Relationship	Notes
<b>Africa Alive</b>					
Etna	15	9	F	NR	Etna housed with her four cubs, separately from Joshi. Either Etna and cubs or Joshi given access to on-show enclosure on alternate days.
Joshi	10.3	13	M	NR	
<b>Banham Zoo</b>					
Adjovi	11.98	8	F	-	Unrelated male, Quartz, housed off-show.
<b>Chester Zoo</b>					
Burba	71.5	4	M	FS	Burba and Singa together since birth; Matrah introduced in 2008.
Singa	71.5	4	M	FS	
Matrah	71.5	4	M	NR	
<b>Exmoor Zoo</b>					
Dave	41.3	8	M	FS	Together since birth. Transferred to Exmoor in 2005.
Neena	41.3	8	F	FS	
<b>Marwell Wildlife – Enclosure 1</b>					
Suki	21	6	F	FS	Together since birth.
Juba	21	6	F	FS	
Relationship: FS = full sibling; NR = not related					
Table 1 cont.					
Name	Enclosure observation hours	Age (years)	Sex	Relationship	Notes
<b>Marwell Wildlife – Enclosure 2</b>					
Turkus	21	6	M	-	Housed with Suki and Juba since 2007. Housed alone since August 2011.
<b>Paignton Zoo</b>					
Tosca	42	6	F	-	Unrelated male, Kasai, housed off show.
<b>Paradise Wildlife Park</b>					
Murphy	40.8	3	M	NR	Mia and Xana together since Mia's arrival in 2010. Murphy arrived 1 week before observations began in May 2011.
Mia	40.8	2	F	NR	
Xana	40.8	14	F	NR	

### Port Lympne

Nescio	41.6	11	M	-	Housed alone at Port Lympne since 2008.
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### West Midland Safari Park – Enclosure 1

Kiwara	29	4	F	NR	Together in mixed group since 2008. All-female group since 2010. Kiwara and Duma are full siblings. Zuri and Cheetor are full siblings.
Zuri	29	4	F	NR	
Epesi	29	4	F	FS	
Azizi	29	4	F	FS	

### West Midland Safari Park – Enclosure 2

Munya	27.5	6	M	FS	Munya and Belika together since birth, transferred to WMSP in 2006. Cheetor and Duma arrived in 2008. Together in mixed group from 2008, all-male group since 2010.
Belika	27.5	6	M	FS	
Cheetor	27.5	4	M	NR	
Duma	27.5	4	M	NR	

### Whipsnade Zoo

Maktoum	42	5	M	NR	Together in mixed group in 2008, pair-housed since 2009.
Al Safa	42	5	M	NR	

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Relationship: FS = full sibling; NR = not related

Between May 2011 and February 2012, 414.98 hours of behavioural observations were carried out on 14 male and 12 female cheetahs at ten zoos (Table 1). None of the three all-male groups consisted of related individuals only. However, since the formation of wild coalitions containing an unrelated individual is thought to occur before three years of age (Caro, 1993) and the individuals in all three groups had been introduced to one another before three years of age, all three groups were considered to resemble wild coalitions. The remaining groups consisted of related and unrelated females, mixed sex adults and one female with cubs. Twenty-one dyads were represented in the sample and five dyads were full siblings (Table 1).

## 2.2 Behavioural Observations

A published ethogram was amended to document the behaviour of the animals (Table 2, Caro, 1994; Wielebnowski, 1999; Skibieli *et al.*, 2007). Data were collected continuously from the public viewing areas during zoo opening hours. All animals in an enclosure were observed throughout the day and behaviour was recorded once per minute onto check sheets. The number of visitors present in the public viewing areas was counted once per minute, after the behaviour of the animals had been recorded. All occurrences of scent marking and grooming were recorded, as well as social behaviours (aggression, allogrooming and social play, Table 2) among group-housed cheetahs. At zoos with more than one cheetah enclosure, observation time was split equally between the enclosures, where possible. Feeding times, temperature and weather conditions were also recorded.

Table 2. Cheetah behaviour ethogram. Adapted from Caro (1994), Wielebnowski (1999) and Skibieli *et al.* (2007).

<b>Behaviour</b>	<b>Definition</b>
<b><i>Active</i></b>	
Aggression	Growling, hissing, slapping or biting directed at another.
Feeding	Eating, drinking, chewing edible substances.
Locomotion	Walking, running.
Pacing	Repetitive locomotion along a definite path (e.g. along the fence of the exhibit).
Playing alone	Engaging in seemingly meaningless, but non-aggressive behaviour alone.
Scent marking	Animal releases spray from posterior toward an object.
Social play	Engaging in seemingly meaningless, but non-aggressive behaviour with another.
Standing	Flank and hindquarters off the ground, forelegs and back legs supporting the body.
Standing alert	Flank and hindquarters off the ground, forelegs and back legs supporting the body. Vigilant: head raised, eyes open and looking around.
Urinating/defecating	Any projection of bodily fluids (except scent-marking). Includes vomiting.
Vocalization	Auditory sound emitted by the mouth.
<b><i>Inactive</i></b>	
Allogrooming	Animal licking the fur of another.
Grooming	Animal licking or scratching itself.
Lying flat out	Lying prone with head on the ground.
Lying out	Lying prone with head raised.
Lying alert	Lying with flank and hindquarters on the ground and forelegs tucked under the body. Vigilant: head raised, eyes open and looking around.
Sitting	Sitting on back legs with forelegs vertically supporting the body.
Sitting alert	Sitting on back legs with forelegs vertically supporting the body. Vigilant: head raised, eyes open and looking around.
<b><i>Not visible</i></b>	
Out of sight	Animal is in enclosure but its behaviour is not observable.
In house	Animal is in indoor quarters and its behaviour is not observable.

### 2.3 Data Analysis

To control for the variable amount of time individuals were observed, data were summarised as the percentage of visible scans on which each animal performed each defined behaviour (Stoinski *et al.*, 2004). Percentage of visible scans was calculated by dividing the total number of scans an animal was observed performing each behaviour by the number of scans the animal was visible. Rates of social interactions within dyads (aggression and allogrooming, Table 2) were calculated by dividing the number of occurrences of each interaction by the number of hours both members of the dyad were visible.

Individuals were grouped according to their housing condition into one of the following categories: social situations that occur in the wild (two or more adult males, singly housed adult females, females with cubs; N=12), social situations that occasionally occur in the wild (singly housed adult males, N=3) and social situations that do not occur in the wild (two or more adult females, mixed-sex adults; N=11). The data were not normally distributed, so Kruskal-Wallis one-way analysis of variance was used to examine differences in activity and pacing behaviour based on social group type. Differences in the rates of allogrooming and aggression within dyads based on relatedness were analysed using Mann-Whitney U tests.

### 3. Results

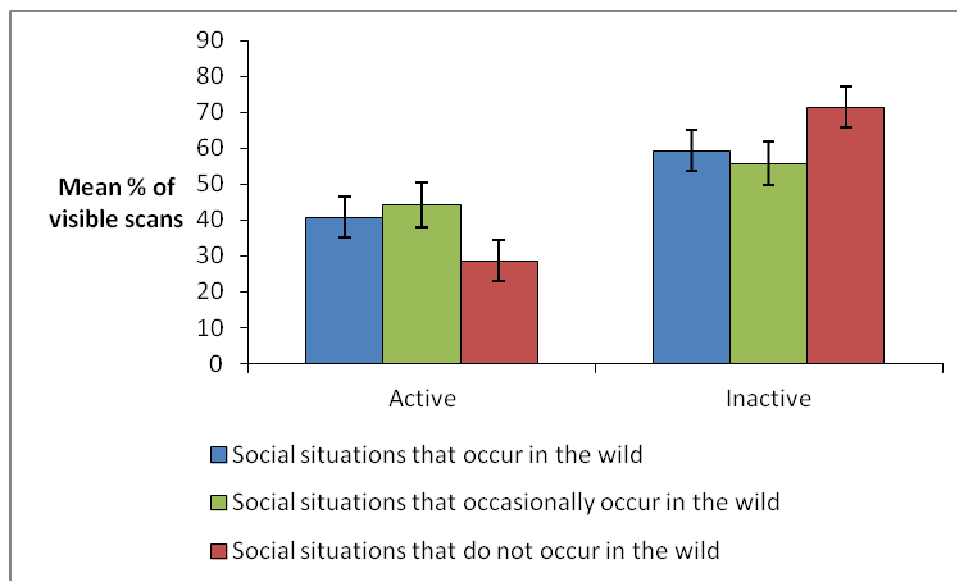


Fig. 1. Mean percentage of visible scans on which active and inactive behaviours were observed for individuals in the three housing categories.

The cheetahs showed more inactive behaviours than active behaviours (inactive:  $\bar{x}$  = 69.3% visible scans; active:  $\bar{x}$  = 30.7% visible scans, Figure 1). Individuals housed in groups that occur in the wild showed more active behaviours (Fig. 1), however there were no significant differences in activity between the three group types (Kruskal-Wallis,  $H(2)=3.04$ ,  $P>0.05$ ). Pacing behaviour, defined as repeatedly walking the same path, was included in the active category of behaviours (Table 2). Individuals housed in groups expected in the wild showed less pacing behaviour than those in the other two group categories (Fig. 2).

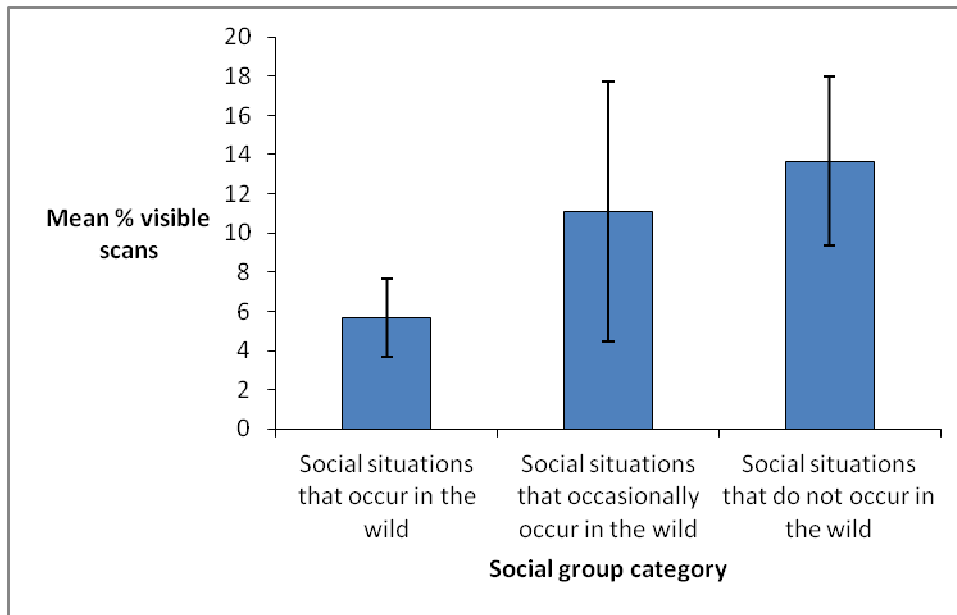


Fig. 2. Mean percentage of visible scans on which pacing behaviour was observed for individuals in the three housing categories.

Among group housed individuals, the mean rate of allogrooming was higher than the mean rate of aggression (allogrooming:  $\bar{x} = 0.32 \pm 0.07$  occurrences/hr, range 0 to 0.87 occurrences/hr; aggression  $\bar{x} = 0.25 \pm 0.06$ , occurrences/hr, range 0 to 0.88 occurrences/hr). Allogrooming was more frequent within related dyads than unrelated dyads. This difference approached significance at the 5% level (Mann-Whitney,  $U=18.5$ ,  $P=0.072$ ). There was a general trend for related dyads to engage in fewer aggressive interactions than unrelated dyads, however this difference was not found to be significant ( $U=25.5$ ,  $P>0.05$ ). The same trends were apparent when interactions between male dyads and female dyads were analysed separately (Fig. 3); female dyads engaged in fewer aggressive interactions than males and allogrooming between females was also observed.



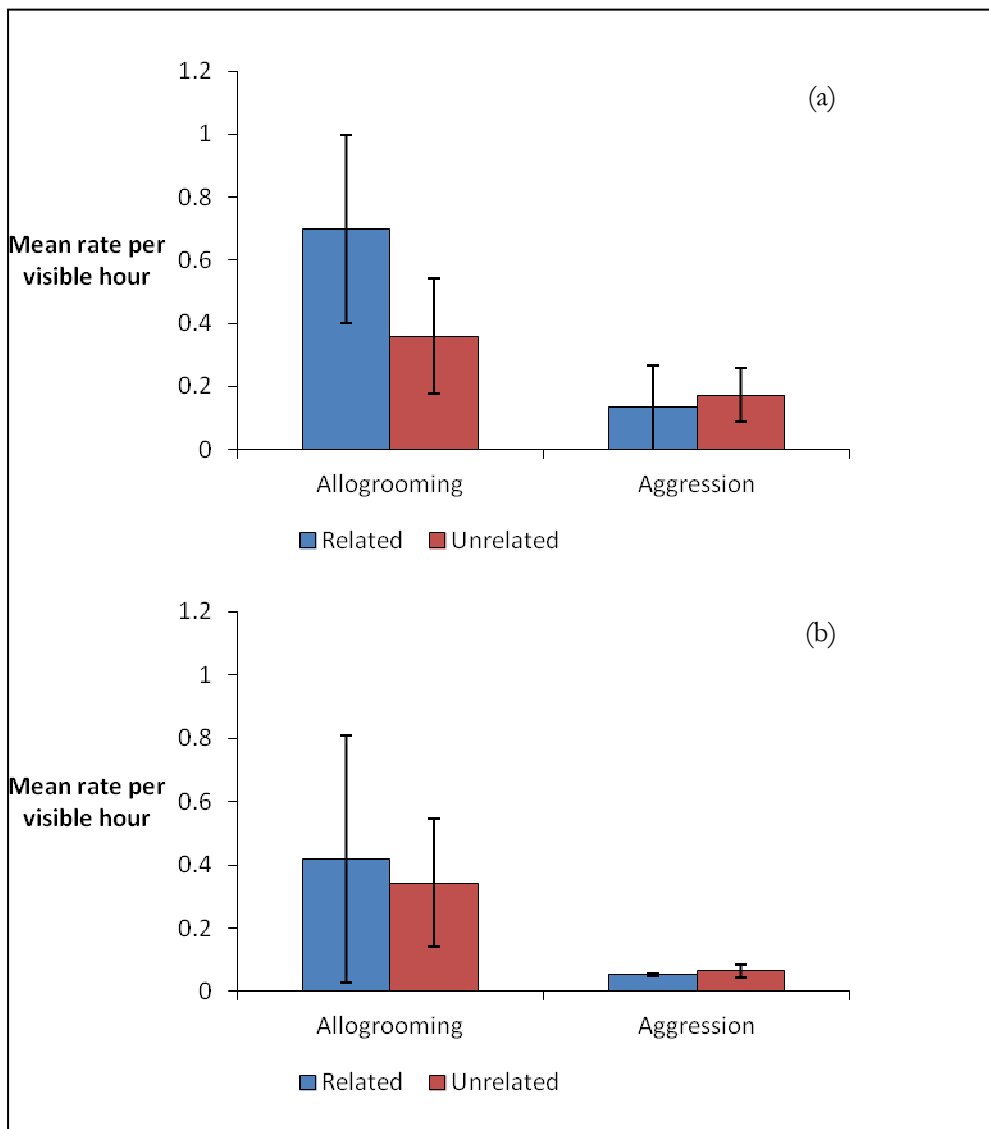


Fig. 3. Rates of allogrooming between (a) related and unrelated males and (b) related and unrelated females.

#### 4. Discussion

The data presented here show that there are few barriers to replicating natural cheetah social groups in captivity. Group housed males had the opportunity to display the social behaviours observed in wild males, and aggressive encounters were rare. The data also highlight the potential behavioural consequences of housing cheetahs in unnatural-type groups, including increased pacing and inactivity, which might indicate underlying welfare concerns.

Pacing behaviour was observed less frequently among individuals housed in natural group types than those housed in groups that have not been observed in wild studies. Pacing behaviour was included in the active category of behaviours, and is of concern because it can indicate welfare problems (Lyons *et al.*, 1997; Mason and Latham, 2004; Clubb and Mason, 2007). However, individuals housed in social groups that would be expected in the wild were

more active than those in the other two categories. Thus, even though these individuals were more active, they were engaged in active behaviours other than pacing. Further investigation is required into other factors that might influence pacing, for example the presence of keepers, or the presence of other cheetahs in neighbouring enclosures.

The natural social groupings of male cheetahs can be replicated in captivity. Group-housed males frequently groomed each other and shared enclosures successfully, with low rates of aggressive interactions. Given the importance of sociality in the wild, this ability to house male cheetahs in coalitions in captivity may have positive implications for welfare and reproductive success. Ruiz-Miranda *et al.* (1998) suggested a degree of psychological attachment between coalition members and used allogrooming behaviour as a measure of evidence of this attachment. We found that the rate of allogrooming between sibling males was higher than between non-sibling males, which might be indicative of emotional connectedness between siblings. This result echoes the findings of Ruiz-Miranda *et al.* (1998), who studied the behaviour of two coalitions of captive male cheetahs during separation and reunion trials. They observed increases in vocalisation and pacing when coalition members were separated from one another and increased affiliative behaviours when they were reunited, and the intensity of these behaviours was more pronounced in siblings than non-siblings. These interactions are reminiscent of the intense greeting behaviours observed in fission-fusion species, when sub-groups or individuals reunite following regular—and even brief—periods of separations (e.g. Guinea baboons (*Papio papio*): Whitham and Maestripieri, 2003; African elephants (*Loxodonta africana*): Leighty *et al.*, 2008; spotted hyenas (*Crocuta crocuta*): Smith *et al.*, 2011). The reunion-specific behaviours are thought to reaffirm bondedness (or emotional connectedness) between coalition or group members. Whilst cheetahs in the wild do not regularly separate in this way, the Ruiz-Miranda *et al.* (1998) result highlights that the social element between cheetah coalition partners might be more important than previously assumed and should be considered when it is necessary to temporarily isolate captive individuals for management purposes.

Crucially for captive breeding programmes, housing male cheetahs in coalitions has potential implications for reproductive success as female reproductive activity may be stimulated in the presence of a group of males (Brown *et al.*, 1996; Wielebnowski and Brown, 1998). Most matings observed in the wild have occurred between females and coalition members (Caro, 1993) and ovulation in female cheetahs is often induced (Wildt *et al.*, 1993; Wielebnowski *et al.*, 2002). Wielebnowski and Brown (1998) found increased oestradiol concentrations in faecal samples of females collected during introductions to males, indicating that oestrus was detected when males were present. Additionally, Ziegler-Meeks (2009) suggested that coalitions of males are better able to investigate a female's enclosure for signs of oestrus, and they appear more “behaviourally confident” than single males (Ziegler-Meeks 2009, p.26). Thus, the presence of coalitions in captivity may be an important management tool for encouraging natural courtship behaviour in both males and females (Brown *et al.*, 1996).

The most striking findings from these preliminary data relate to the behaviour of group-housed females. Despite their solitary nature in the wild, very low rates of aggression were observed within female dyads, even less so than within male dyads. Allogrooming between females was also observed, with little difference in the rate of allogrooming within related and unrelated female dyads. This surprising result suggests that it is safe for zoos to house groups of females together, which may be necessary where space is limited. However, we temper this recommendation, pointing out that this is an unnatural social group type for this species; and, given that the data also suggest that individuals housed in unnatural groups are likely to show more pacing behaviour, housing females in groups should be avoided. Furthermore, there is evidence in the literature that housing female cheetahs in pairs or

groups can cause reproductive suppression (Brown *et al.*, 1996; Wielebnowski *et al.*, 2002), which is detrimental to the success of captive breeding programmes. The pair-housed females in a study carried out by Wielebnowski *et al.* (2002) exhibited reduced ovarian activity and increased pacing behaviour. Reproductive cycling resumed almost immediately after the females were separated, further emphasising the importance of housing animals in social groups which reflect the groupings of their wild counterparts.

Further observations and analyses to be carried out on these data will focus on association patterns between group housed cheetahs. Spatial analyses are underway to investigate whether group housed cheetahs spend time in proximity to one another, if they move around the enclosure together, and if relatedness is a factor in association patterns.

Appropriate social groupings are important for captive animal welfare, as they provide animals the opportunity to engage in species-specific behaviour (Carlstead and Shepherdson, 1994; Ruiz-Miranda *et al.*, 1998; De Rouck *et al.*, 2005; Price and Stoinski, 2007). Housing animals in groups that would be expected to occur in wild populations can also improve the success of captive breeding programmes (Carlstead and Shepherdson, 1994) and educate zoo visitors about the behaviour of wild animals (Caro, 1993). It is hoped that further work will enable recommendations to be made for the most appropriate methods of housing cheetahs in captivity to promote welfare and, potentially, breeding success.

## References

- Bauman, K., Blumer, E., Crosier, A., Fallon, J., Geise, G., Grisham, J., Ivy, J., Long, S., Rogers, A., Schwartz, K., Snodgrass K. and Spevak, E. (2010). Global cheetah *ex situ* planning: Linking Managed Populations Working Group. *Conservation Breeding Specialist Group News*, 21 (1) pp. 1-4.
- Brown, J., Wildt, D., Wielebnowski, N., Goodrowe, K., Graham, L., Wells, S. and Howard, J. (1996). Reproductive activity in captive female cheetahs (*Acinonyx jubatus*) Assessed by faecal steroids. *Journal of Reproduction and Fertility*, 106 (2) pp. 337-346.
- Carlstead, K. and Shepherdson, D. (1994). Effects of environmental enrichment on reproduction. *Zoo Biology*, 13 (5) pp. 447-458.
- Caro, T.M. (1993). Behavioural solutions to breeding cheetahs in captivity: Insights from the wild. *Zoo Biology*, 12 (1) pp. 19-30.
- Caro, T.M. (1994). *Cheetahs of the Serengeti Plains: Group Living in an Asocial Species*. Chicago: University of Chicago Press.
- Caro, T.M. and Collins, D.A. (1986). Male cheetahs of the Serengeti. *National Geographic Research*, 2 (1) pp. 75-86.
- Clubb, R. and Mason, G.J. (2007). Natural behavioural biology as a risk factor in carnivore welfare: How analysing species differences could help zoos improve enclosures. *Applied Animal Behaviour Science*, 102 (3-4) pp. 303-328.
- Crosier, A.E., Marker, L., Howard, J., Pukazhenti, B.S., Henghali, J.N. and Wildt, D.E. (2007). Ejaculate traits in the Namibian cheetah (*Acinonyx jubatus*): Influence of age, season and captivity. *Reproduction, Fertility and Development*, 19 (2) pp. 370-382.
- De Rouck, M., Kitchener, A.C., Law, G. and Nelissen, M. (2005). A comparative study of the influence of social housing conditions on the behaviour of captive tigers (*Panthera tigris*). *Animal Welfare*, 14 (3) pp. 229-238.
- Durant, S.M., Kelly, M. and Caro, T. (2004). Factors affecting life and death in Serengeti cheetahs: Environment, age and sociality. *Behavioural Ecology*, 15 (1) pp. 11-22.
- Durant, S., Marker, L., Purchase, N., Belbachir, F., Hunter, L., Packer, C., Breitenmoser-Wursten, C., Sogbohossou, E. and Bauer, H. (2008). *Acinonyx jubatus*. In: IUCN 2012. *IUCN Red List of Threatened Species*. Version 2012.1. URL

- <<http://www.iucnredlist.org/details/219/0>>. Page last accessed 7<sup>th</sup> September 2012.
- Gottelli, D., Wang, J., Bashir, S. and Durant, S.M. (2007). Genetic analysis reveals promiscuity among female cheetahs. *Proceedings of the Royal Society B: Biological Sciences*, 274 (1621) pp. 1993-2001.
- Gros, P.M. (2002). The status and conservation of the cheetah *Acinonyx jubatus* in Tanzania. *Biological Conservation*, 106 (2) pp. 177-185.
- Laurenson, M.K., Caro, T. and Borner, M. (1992). Patterns of female reproduction in wild cheetahs: implications for conservation. *National Geographic Research and Exploration*, 8 (1) pp. 64-75.
- Leighty, K.A., Soltis, J., Wesolek, C.M. and Savage, A. (2008). Rumble vocalizations mediate interpartner distance in African elephants, *Loxodonta africana*. *Animal Behaviour*, 76 (5) pp. 1601-1608.
- Lindburg, D.G., Durrant, B.S., Millard, S.E. and Oosterhuis, J.E. (1993). Fertility assessment of cheetah males with poor quality semen. *Zoo Biology*, 12 (1) pp. 97-103.
- Lyons, J., Young, R.J. and Deag, J.M. (1997). The effects of physical characteristics of the environment and feeding regime on the behaviour of captive felids. *Zoo Biology*, 16 (1) pp. 71-83.
- Marker, L. (2012). *2010 International Cheetah (Acinonyx jubatus) Studbook*. Otjiwarongo, Namibia: Cheetah Conservation Fund.
- Marker, L.L., Dickman, A.J., Jeo, R.M., Mills, M.G.L. and Macdonald, D.W. (2003). Demography of the Namibian cheetah, *Acinonyx jubatus jubatus*. *Biological Conservation*, 114 (3) pp. 413-425.
- Marker-Kraus, L. and Kraus, D. (1997). Conservation strategies for the long-term survival of the Cheetah *Acinonyx jubatus* by the Cheetah Conservation Fund, Windhoek. *International Zoo Yearbook*, 35 (1) pp. 59-66.
- Mason, G.J. and Latham, N.R. (2004). Can't stop, won't stop: Is stereotypy a reliable animal welfare indicator? In: Kirkwood, J.K., Roberts, E.A. and Vickery, S. (Eds.), Proceedings of the UFAW International Symposium: Science in the Service of Animal Welfare, Edinburgh 2003. *Animal Welfare*, 13, pp. S57-S69.
- Price, E.E. and Stoinski, T.S. (2007). Group size: Determinants in the wild and implications for the captive housing of wild mammals in zoos. *Applied Animal Behaviour Science*, 103 (3-4) pp. 255-264.
- Ruiz-Miranda, C.R., Wells, S.A., Golden, R. and Seidensticker, J. (1998). Vocalizations and other behavioural responses of male cheetahs (*Acinonyx jubatus*) during experimental separation and reunion trials. *Zoo Biology*, 17 (1) pp. 1-16.
- Skibieli, A.L., Trevino, H.S. and Naugher, K. (2007). Comparison of several types of enrichment for captive felids. *Zoo Biology*, 26 (5) pp. 371-381.
- Smith, J.E., Powning, K.S., Dawes, S.E., Estrada, J.R., Hopper, A.L., Piotrowski, S.L. and Holekamp, K.E. (2011). Greetings promote cooperation and reinforce social bonds among spotted hyenas. *Animal Behaviour*, 81 (2) pp. 401-415.
- Stoinski, T.S., Kuhar, C.W., Lukas, K.E. and Maple, T.L. (2004). Social dynamics of captive western lowland gorillas living in all-male groups. *Behaviour*, 141 (2) pp. 169-195.
- Terio, K.A., Marker, L., Overstrom, E.W. and Brown, J.L. (2003). Analysis of ovarian and adrenal activity in Namibian cheetahs. *South African Journal of Wildlife Research*, 33 (2) pp. 71-78.
- Tetley, C.L. and O'Hara, S.J. (2012). Ratings of animal personality as a tool for improving the breeding, management and welfare of zoo mammals. *Animal Welfare*, 21 (4) pp. 463-476.
- Whitham, J.C. and Maestripieri, D. (2003). Primate rituals: The function of greetings between male Guinea baboons. *Ethology*, 109 (10) pp. 847-859.
- Wielebnowski, N.C. (1999). Behavioural differences as predictors of breeding status in

- captive cheetahs. *Zoo Biology*, 18 (4) pp. 335-349.
- Wielebnowski, N.C. and Brown, J.L. (1998). Behavioural correlates of physiological oestrus in cheetahs. *Zoo Biology*, 17 (3) pp. 193-209.
- Wielebnowski, N.C., Ziegler, K., Wildt, D.E., Lukas, J. and Brown, J.L. (2002). Impact of social management on reproductive, adrenal and behavioural activity in the cheetah (*Acinonyx jubatus*). *Animal Conservation*, 5 (4) pp. 291-301.
- Wildt, D.E., Brown, J.L., Bush, M., Barone, M.A., Cooper, K.A., Grisham, J. and Howard, J.G. (1993). Reproductive status of cheetahs (*Acinonyx jubatus*) in North American Zoos: The benefits of physiological surveys for strategic planning. *Zoo Biology*, 12 (1) pp. 45-80.
- Ziegler-Meeks, K. (2009). *Husbandry Manual for the Cheetah*. Silver Spring, Maryland: Association of Zoos and Aquariums.

# Assessing the impact of physico-chemical parameters on contaminant treatment in integrated constructed wetlands

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## Abstract

Sediment accumulation is an important characteristic in the ageing process of integrated constructed wetlands (ICW). Retained contaminants in saturated sediments have the potential to be remobilized and released to the overlying water when environmental conditions change. In this study, mesocosms filled with sediments and planted with *Phragmites australis* and *Agrostis stolonifera* were set up to assess the impacts of physico-chemical parameters on ICW treatment performance by applying multiple regression analysis (MRA), principal component analysis (PCA), redundancy analysis (RDA), and the self-organizing map (SOM). The analysis results showed that dissolved oxygen concentration and electrical conductivity value were correlated with treatment efficiencies of ammonia-nitrogen (NH<sub>4</sub>-N) and molybdate reactive phosphorus (MRP), and redox potential and electrical conductivity values were related to chemical oxygen demand (COD) removal. Although no reduction in the overall performance has been observed for full-scale ICWs, this laboratory-scale study provides valuable warning signs regarding the decline in contaminant removal effectiveness for systems that are in operation for a relatively long time.

## Keywords

Mathematical models; Neural networks; Nutrient; Sediment; Wastewater management.

## 1. Introduction

Constructed wetland (CW) systems have been widely applied for treating many types of wastewater all over the world (Vymazal, 2009). However, the long-term effectiveness of CWs to retain and/or remove contaminants such as nitrogen and phosphorus is not certain. Wetland aging and sediment accumulation could be risks which may impact on ICW treatment efficiency over time (Scholz et al., 2007). In addition, the application of statistical models for CW performance assessment is relatively new, and its development lags behind that of standard wastewater treatment processes such as activated sludge technology. The aim of this paper is hence to assess the existence of obvious relationships between physico-chemical parameters and contaminant removal efficiency by using four complementary statistical models.

### 1.1 Site Description

The case study covers two ICW systems currently in operation which are located in Dunhill (County Waterford, southeast Ireland). ICW site 7 has a total area of 0.3 ha and was

constructed to treat local sewage and to improve water quality of the Annetstown stream. ICW site 11 has a total area of 0.76 ha and was used to treat farmyard and roof runoff. Both sites have four unlined cells in a row, and the corresponding subsoil has been reworked and used as a natural liner. The primary vegetation types planted were emergent species (helophytes).

### ***1.2 Experimental Set-up***

Five mesocosms were set up to simulate contaminant retention and/or release processes by mature sediments and soils from full-scale surface flow ICW systems. Details of mesocosm design are illustrated in Fig. 1. The laboratory room temperature was maintained at 15 °C. Artificial light was provided by programmable controlled UV lights to simulate sunshine. Of the five mesocosms, mesocosms 1 and 2 were fed with farmyard runoff, which was collected from an outdoor farmyard runoff drain at the Gorgie City Farm; and mesocosms 3, 4 and 5 were fed with pre-treated domestic wastewater taken from the Seafield Wastewater Treatment Plant.

Mesocosms 2, 3 and 4 were packed with four successive layers of aggregates (from bottom to top): 5 cm of small gravel (1.2-5.0 mm), 5 cm of sand (0.6-1.2 mm), 25 cm of sodium bentonite clay (permeability of  $10^{-9} \text{ m s}^{-1}$ ) and 35 cm of core sediment (incorporating plants if applicable). Core sediment samples were taken directly from surface of the first cell in ICW site 7 (mesocosm 3 and 4) and site 11 (mesocosm 2). Mesocosms 1 and 5 were set up as benchmarks to ensure the same inflow conditions and saturation ratios. The soils and aggregates (from bottom to top) contained 5 cm of small gravel, 5 cm of sand, and 60 cm of sodium bentonite clay. The mesocosms were flooded with inflow water (farmyard runoff or domestic wastewater) up to the top once every three days.

Mesocosms 2 and 3 were planted with *Phragmites australis* (Cav) Trin. ex Steud; whereas mesocosm 4 was planted with *Agrostis stolonifera* L. rhizomes. The control mesocosms (1 and 5) were left unplanted.

### ***1.3 Description of Experimental Data***

Experimental data were collected by monitoring the influent and effluent (taps I to III) water quality variables for approximately 1.5 years (February 19, 2009 to October 21, 2010 for mesocosms 1 and 2; May 14, 2009 to October 21, 2010 for mesocosms 3, 4 and 5). Collected samples were analyzed for variables including temperature (°C), pH, conductivity ( $\mu\text{S cm}^{-1}$ ), total dissolved solids (ppm), redox potential (mV), dissolved oxygen ( $\text{mg l}^{-1}$ ), and chemical oxygen demand (COD,  $\text{mg l}^{-1}$ ) at The University of Edinburgh. Frozen samples were shipped by overnight courier on dry ice to the Waterford County Council water laboratory where ammonia-nitrogen ( $\text{NH}_4\text{-N}$ ,  $\text{mg l}^{-1}$ ), nitrate-nitrogen ( $\text{NO}_3\text{-N}$ ,  $\text{mg l}^{-1}$ ), nitrite-nitrogen ( $\text{NO}_2\text{-N}$ ,  $\text{mg l}^{-1}$ ), total oxidized nitrogen (TON,  $\text{mg l}^{-1}$ ), chloride ( $\text{mg l}^{-1}$ ) and molybdate reactive phosphorus (MRP,  $\text{mg l}^{-1}$ ) were analyzed. Standard methods according to APHA (2005) were followed, unless mentioned otherwise.

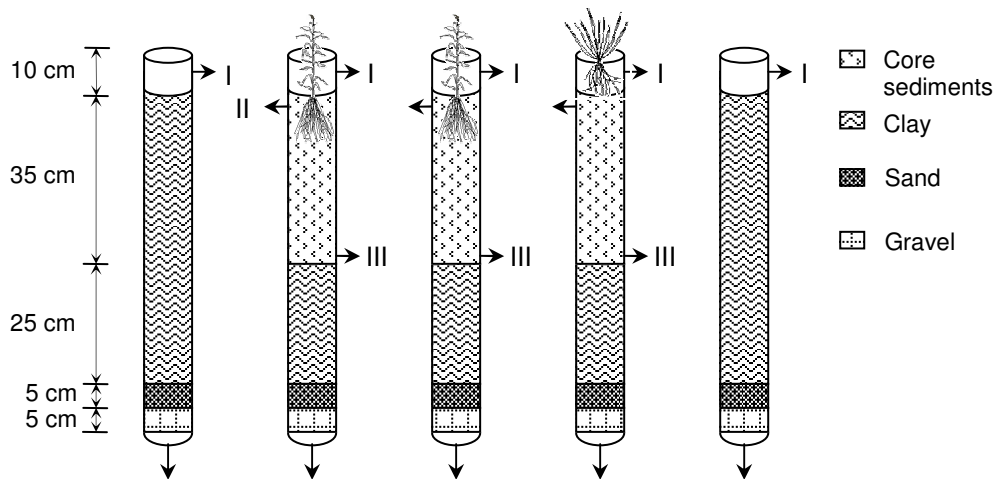


Fig. 1. Schematic diagram of integrated constructed wetland (ICW) mesocosms

The experimental database contained 71 entries for mesocosm 2, and 65 entries for mesocosms 3 and 4. For every entry, physico-chemical parameters (T, pH, CON, TDS, DO, RP, and Cl) were recorded at sampling points I, II and III; treatment efficiencies (%) of COD,  $\text{NH}_4\text{-N}$ ,  $(\text{NO}_3+\text{NO}_2)\text{-N}$ , and MRP at corresponding sampling points were also included.

#### 1.4 Statistics

Forward stepwise regression analysis was carried out with Origin 8.0. Principal component analysis was conducted by Matlab 9.0. Redundancy analyses were employed by the programme Canoco for Windows 4.5, and the corresponding graphics were created with CanoDraw for Windows 4.1. SOM modeling was performed using the SOM toolbox (version 2) for Matlab 9.0 developed by the Laboratory of Information and Computer Science at the Helsinki University of Technology.

## 2. Results and Discussion

### 2.1 Multiple Regression Analysis

Multiple regression is the instrument used to develop an optimal equation for predicting the value of a dependent variable from several independent variables (Keppel and Zedeck, 1989). In this study, the forward stepwise regression method was performed to develop the linear regression model and to find out relationships between independent variables (T, pH, CON, TDS, RED, DO, and Cl), influent contaminant concentrations, and treatment efficiencies ( $\text{NH}_4\text{-N}$ ,  $(\text{NO}_3+\text{NO}_2)\text{-N}$ , MRP and COD). The instructions of the program were set up at  $p = 0.05$ ,  $F = 1$ , maximum steps = 100, sweep delta =  $10^{-7}$ , and inverse delta =  $10^{-12}$ .

Table 1 shows the relationship equations and their respective regression coefficient ( $R^2$ ) values at individual sampling points. Only *R-square* values above 0.50 indicate acceptable linear relations (Hijosa-Valsero et al., 2011). However, this does not necessarily specify that the treatment efficiency of unlisted contaminants is not correlated to physico-chemical parameters. It only demonstrates that the relationship between them is not linear. As to confirm this statement, other statistical tests must be performed to explore the subtle existing



relationships. The signs (plus or minus) in Table 1 show the particular relationship (positive or negative) of this parameter with the contaminant removal efficiency.

Table 1: Multiple regression equation models and regression coefficient (R-square) values for the treatment efficiency of contaminants in mesocosms 2, 3 and 4.

		y (TE, %)	Equation	R- square
M 2	Tap I	MRP	$y = 312.803 \times C_{\text{MRP},\text{in}} - 392.685 \times \text{pH} + 1919.736$	0.5714
	Tap II	COD	$y = 0.8998 \times C_{\text{COD},\text{in}} + 7.9990 \times C_{\text{NO},\text{in}} - 39.5221 \times C_{\text{MRP},\text{in}} - 104.076$	0.5870
		MRP	$y = 415.228 \times C_{\text{MRP},\text{in}} - 820.456$	0.5304
	Tap III	COD	$y = 51.594 \times \text{pH} + 1.002 \times C_{\text{COD},\text{in}} + 16.137 \times \text{DO} + 0.046 \times \text{CON} - 663.516$	0.7765
		MRP	$y = 1485.05 \times C_{\text{MRP},\text{in}} - 2876.24$	0.6319
	M 3	Tap I	NH <sub>4</sub> -N	$y = -1.109 \times C_{\text{COD},\text{in}} + 7.022 \times C_{\text{NH},\text{in}} + 0.444 \times \text{Cl} - 66.487$
Tap II		COD	$y = 1.311 \times C_{\text{COD},\text{in}} + 0.555 \times \text{Cl} - 0.118 \times \text{CON} - 143.496$	0.5654
		NH <sub>4</sub> -N	$y = 54.475 \times C_{\text{NH},\text{in}} - 3.779 \times C_{\text{COD},\text{in}} + 134.113 \times \text{DO} - 964.625$	0.6690
		MRP	$y = 1.449 \times \text{Cl} + 112.512 \times C_{\text{MRP},\text{in}} - 104.076 \times C_{\text{NO},\text{in}} - 679.270$	0.5141
Tap III		NH <sub>4</sub> -N	$y = 185.560 \times \text{pH} + 55.390 \times C_{\text{NH},\text{in}} - 4.840 \times C_{\text{COD},\text{in}} - 1943.90$	0.7378
M 4		Tap I	NH <sub>4</sub> -N	$y = -1.459 \times C_{\text{COD},\text{in}} + 14.999 \times C_{\text{NH},\text{in}} + 55.239 \times \text{pH} + 33.034 \times \text{DO} - 481.227$
	Tap II	NH <sub>4</sub> -N	$y = 49.727 \times C_{\text{NH},\text{in}} - 4.151 \times C_{\text{COD},\text{in}} - 437.564$	0.6787
	Tap III	NH <sub>4</sub> -N	$y = 51.525 \times C_{\text{NH},\text{in}} - 1.962 \times C_{\text{COD},\text{in}} - 0.576 \times \text{RED} - 865.972$	0.6760

Note: TE, treatment efficiency (%); T, temperature (°C); CON: conductivity ( $\mu\text{S cm}^{-1}$ ); DO: dissolved oxygen ( $\text{mg l}^{-1}$ ); RED: redox potential (mV); Cl: chloride ( $\text{mg l}^{-1}$ ); COD: chemical oxygen demand; NH<sub>4</sub>-N: ammonia-nitrogen; MRP: molybdate reactive phosphorus; C<sub>COD,in</sub>: influent chemical oxygen demand concentration ( $\text{mg l}^{-1}$ ); C<sub>NH,in</sub>: influent ammonia-nitrogen concentration ( $\text{mg l}^{-1}$ ); C<sub>NO,in</sub>: influent nitrate-nitrogen and nitrite-nitrogen concentration ( $\text{mg l}^{-1}$ ); C<sub>MRP,in</sub>: influent molybdate reactive phosphorus concentration ( $\text{mg l}^{-1}$ ).

In the case of mesocosms 3 and 4, the inflow concentrations of COD showed negative impacts on NH<sub>4</sub>-N treatment efficiencies. In fact, the nitrifying bacteria are environmentally sensitive organisms. It follows that the elevated levels of organic carbon in influent were likely to stifle ammonia oxidation since fast-growing heterotrophic microorganisms can outcompete slow-growing ammonia-oxidizing bacteria for oxygen (Kadlec and Knight, 1996; Palmer et al., 2009). In addition, considering the different relationship equations obtained for corresponding sampling points in mesocosms 3 and 4, it is worth mentioning that the plants

might also have played an important role in  $\text{NH}_4\text{-N}$  removal. In general, it is likely that the pH value as well as the DO and Cl concentrations affected ICW treatment efficiencies.

## 2.2 Principal Component Analysis

Principal component analysis (PCA) is a mathematical dimension-reduction procedure that can be used to reduce a large set of variables to a small set which still contains most of the essential information of the large set. A detailed description of the principal component analysis can be found in Davis (1986).

In this particular study, 42 out of 71 data entries for mesocosm 2, and 41 out of 65 data entries for mesocosms 3 and 4 were used to identify relationships among contaminant treatment efficiencies with measured water quality variables and to visualize these on the graphical output. The data entries were selected due to the absence of missing values.

Fig. 2 shows the PCA ordination of mesocosm 2. Three distinct groupings (highlighted by circles) indicating strong mathematical relationships can be observed on both the left and right hand sides in Fig. 2. The results showed that conductivity, total dissolved solids and chloride concentration are likely to have influence on treatment processes involving  $\text{NH}_4\text{-N}$ ,  $(\text{NO}_3+\text{NO}_2)\text{-N}$  and MRP removal. This finding was in agreement with previous research: Wu et al. (2008) found that the nitrogen removal performance of constructed mangrove wetlands was reduced by high salinity. The reduction of  $\text{NH}_4\text{-N}$  and inorganic N dropped from 98% to 83% and from 78% to 56%, respectively, with salinity increasing from 0 to 60  $\text{mS cm}^{-1}$ . Chapanova et al. (2007) also reported that degradation of  $\text{NH}_4\text{-N}$  was dramatically reduced after adding salinity to wastewater influent. Similarly, Rejmánková and Sirová (2007) demonstrated that the activities of phosphatase (an extracellular enzyme) exhibited a significant response to salinity. The phosphorus removal rates of ICW systems decreased with increasing salt concentration, which was probably because the phosphate-accumulating microorganism cells had reached a certain threshold and subsequently resulted in reduced phosphate accumulation capabilities (Scholz, 2006; Zhang et al., 2008). However, Klomjek and Nitisoravnt (2002) investigated eight salt-tolerant wetland plants and indicated that the variety of saline concentrations had no significant effect on nutrients ( $\text{NH}_4\text{-N}$  and total P) treatment performance.

The PCA ordination of mesocosm 3 showed that the treatment efficiency of COD was related to conductivity, TDS and DO. This trend is to be expected owing to the association of organics with the solids (Reddy et al., 2001). In addition, the reduction of organic matter in constructed wetlands can be the result of aerobic heterotrophic bacteria (Vymazal, 2007) and a considerable amount of oxygen would be required to decompose the organic contaminants. However, due to relatively high concentrations of ammonia in the inflow wastewater, more than 90% of the above-ground plants died back after operation of approximately three months. This change considerably affected the oxygen transfer capacity to the deeper sediment layers and the aerobic decomposition processes were thus reduced.

As for mesocosm 4, a slightly different relationship was obtained with regard to treatment efficiency of  $(\text{NO}_3+\text{NO}_2)\text{-N}$ . The result indicated that temperature can also have an impact on  $(\text{NO}_3+\text{NO}_2)\text{-N}$  elimination. This statistical finding is supported by the research showing that the  $(\text{NO}_3+\text{NO}_2)\text{-N}$  removal performance for a pilot-scale constructed wetland system was highest during the late spring and summer (ranging between 60% and 100%) and lowest during the winter (ranging between 5% and 60%) (Chavan et al., 2008). Corresponding to the findings from mesocosms 2, conductivity, total dissolved solids, and dissolved oxygen concentration are considered to play key roles in the treatment of  $\text{NH}_4\text{-N}$  and COD. This result is also in agreement with Palmer et al. (2009), who found that oxygen enhancement of

experimental surface flow wetland mesocosms produced extremely high ammonia reduction (95-96% concentration removal) in a relatively short hydraulic retention time (5 days).

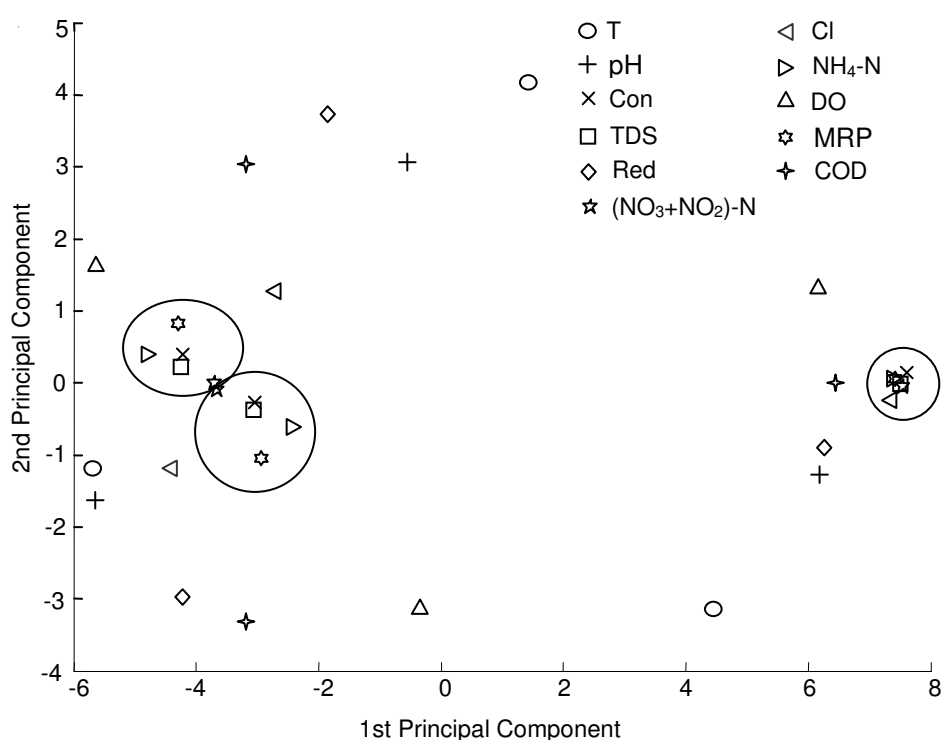


Fig. 2. PCA ordinations for mesocosm 2.

T, temperature ( $^{\circ}\text{C}$ ); Con, electrical conductivity ( $\mu\text{S cm}^{-1}$ ); TDS, total dissolved solids (ppm); DO, dissolved oxygen ( $\text{mg l}^{-1}$ ); Red, redox potential (mV); Cl, chloride ( $\text{mg l}^{-1}$ );  $\text{NH}_4\text{-N}$ , ammonia-nitrogen treatment efficiency (%);  $(\text{NO}_3+\text{NO}_2)\text{-N}$ , nitrate-nitrogen and nitrite-nitrogen treatment efficiency (%); MRP, molybdate reactive phosphorus treatment efficiency (%); COD, chemical oxygen demand ( $\text{mg l}^{-1}$ ).

### 2.3 Redundancy Analysis

The redundancy index, which was introduced by Stewart and Love (1968), measures the proportion of total variance of the variables in one set accounted for by regression on those of the other. Based upon the index, redundancy analysis (RDA) was developed by van den Wollenberg (1977) as an extension of multiple linear regression and principal component analysis to include external explanatory variables. RDA is a straightforward analysis tool and provides a low dimensional representation of the relationships between dependent and independent variables.

The same data set as used for PCA was employed for the analysis. In this study, RDA with the option of 'centre and standardized by species' was applied. The Monte Carlo permutation test was subsequently performed to overcome problems with distributional characteristics and assess the significance of the first axis. The tests were based on 499 random permutations.

Fig. 3 shows the RDA ordination diagram created using the data from mesocosm 2. The statistical analysis indicated that 45.6% of the total variation of treatment efficiency data (dependent variables) can be explained by the chosen independent environmental variables. The values of conductivity and total dissolved solids from sampling point I were omitted after the forward selection process because they were not able to increase the amount of explained variability.

In Fig. 3, the treatment efficiency of  $\text{NH}_4\text{-N}$  was positively related to the dissolved oxygen concentration and negatively correlated with the values of pH, conductivity, total dissolved solids, and chloride concentration. A negative correlation also existed between MRP treatment efficiency and temperature, as well as redox potential value. In addition, temperature, pH value and chloride concentration were correlated with COD and  $(\text{NO}_3+\text{NO}_2)\text{-N}$  elimination.

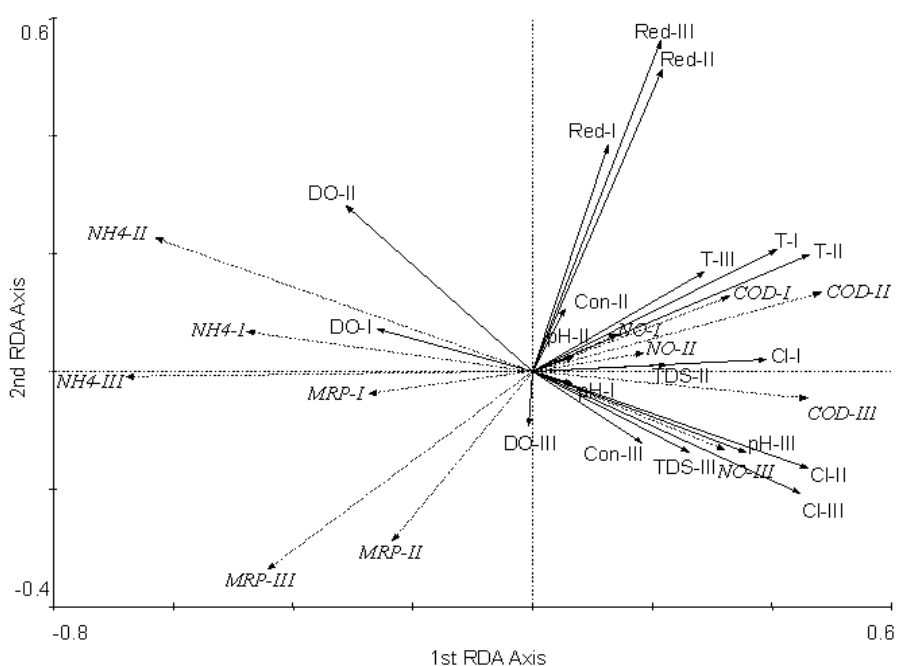


Fig. 3. Ordination diagram for the redundancy analysis (RDA) of mesocosm 2.

The horizontal and vertical axes are the first and second RDA axes respectively. Physico-chemical variables (dotted lines): T, temperature ( $^{\circ}\text{C}$ ); Con, electrical conductivity ( $\mu\text{S cm}^{-1}$ ); TDS, total dissolved solids (ppm); DO, dissolved oxygen ( $\text{mg l}^{-1}$ ); Red, redox potential (mV); Cl, chloride concentration ( $\text{mg l}^{-1}$ );  $\text{NH}_4$ , ammonia-nitrogen treatment efficiency (%); NO, nitrate-nitrogen and nitrite-nitrogen treatment efficiency (%); MRP, molybdate reactive phosphorus treatment efficiency (%); COD, chemical oxygen demand treatment efficiency (%).

The RDA ordination diagrams for mesocosm 3 indicated that 32.7% of the total variation of the treatment efficiency data can be interpreted by the chosen independent environmental variables. The pH values from sampling point I, conductivity from sampling point II, and chloride concentration from sampling point III were omitted after the forward selection procedure. The treatment efficiencies of  $\text{NH}_4\text{-N}$  and MRP were positively correlated with temperature and the dissolved oxygen concentration. However, no distinct relationship could be found between COD and  $(\text{NO}_3+\text{NO}_2)\text{-N}$  reduction with the explanatory variables.

The RDA ordination diagram for mesocosm 4 revealed that 37.5% of the variation in contaminant treatment efficiencies can be explained by predictor (environmental) variables,

and all environmental variables were included to plot the diagram. Outstanding positive relationships can be observed between the treatment efficiency of  $\text{NH}_4\text{-N}$  and dissolved oxygen concentration, as well as between COD reduction and temperature, pH and redox potential values. Due to the exactly opposite arrow directions of  $\text{NH}_4\text{-N}$  and COD treatment efficiency, those explanatory variables, which were positively correlated to  $\text{NH}_4\text{-N}$  removal, were negatively related to COD removal, and vice versa. MRP treatment efficiency was positively correlated to dissolved oxygen concentration and negatively related to redox potential value. Although distinct relationships can be identified at individual sampling points, no general relationship can be found for the reduction of  $(\text{NO}_3+\text{NO}_2)\text{-N}$  with environmental variables.

The correlations between physico-chemical variables and contaminant reduction achieved by the RDA model were generally coincident with the respective PCA model. However, pH values were found to be correlated with contaminant treatment efficiency. The effluent pH values from sampling points (from top to bottom) in three ICW mesocosms were in the range of 5.85 to 6.64, 5.65 to 6.55, and 6.26 to 7.99, respectively. These differences were attributed to the decomposition of build-up organic matter in sediments, which caused greater quantities of organic acid in the oxidized sediment layer and subsequently reduced the pH values (Mitch and Gosselink, 2000). Optimal values for nitrification in constructed wetlands are found at near-neutral pH values (Truu et al., 2009). It was also reported that the nitrification rates swiftly decline when the pH value drops to below 7 (Ahn, 2006). As particularly low pH values have been found in mesocosms, nitrification efficiency might be adversely affected. On the other hand, redox potential values have been negatively related to MRP treatment. Experimental data showed that the redox potential values from all sampling points were negative. Since the sorption behavior of phosphorus is redox-sensitive, accumulated phosphorus might be released significantly from sediments under low RP conditions (Braskerud et al., 2005).

#### ***2.4 Self-organizing Map Model***

Self-organizing maps (SOM) were developed by Kohonen in the early 1980s. SOM, which feature in clustering high dimensional data and arranging clusters on a grid, have become one of the most widely used artificial neural network (ANN) models (Kohonen et al., 1996). The SOM can be visualized with the help of the U-matrix and the component planes. The U-matrix visualizes distances between neighbouring map units, and thus shows the cluster structure of the map. High values of the U-matrix point towards a cluster border. A uniform area of low values indicates a cluster. Each component plane indicates the values of one variable in each map unit (Vesanto et al., 1999).

In general, SOM application to constructed wetlands study is rare and is normally related to assessing the water quality of ICW system effluent and identifying the corresponding correlations and similarities between variables (Scholz et al., 2007). On the other hand, the SOM model has been successfully used as an effective prediction tool for constructed wetlands monitoring and management. Lee and Scholz (2006) employed SOM to elucidate heavy metal removal mechanisms and to predict effluent heavy metal concentrations for experimental constructed wetlands treating urban runoff. SOM was also applied to predict the nitrogen and phosphorus removal efficiencies within ICW systems by using water quality variables which can be measured time-efficiently and cost-effectively (Zhang et al., 2008).

The relationships between contaminant removal efficiencies and environmental parameters for mesocosm 2 can be visualized from component planes. As illustrated in Fig. 4, high COD reductions ( $> -70.2\%$ ) are linked to high redox potential values ( $> -157\text{mV}$ ). This information is consistent with the results obtained by RDA. In contrast, the physico-chemical parameters

are not significantly correlated to  $\text{NH}_4\text{-N}$ ,  $(\text{NO}_3+\text{NO}_2)\text{-N}$  and MRP removal. In the case of mesocosms 3 and 4, low COD reduction (mesocosm 3:  $< -111\%$ ; mesocosm 4:  $< -83.1\%$ ) is linked to low RP values (mesocosm 3:  $< -226\text{mV}$ , mesocosm 4:  $< -274\text{mV}$ ). Šíma et al. (2009) reported that the redox properties of planted wetland beds play the most important role in the degradation of organic compounds. Similarly, no strong correlation has been identified between particular environmental parameters and the removal of  $\text{NH}_4\text{-N}$ ,  $(\text{NO}_3+\text{NO}_2)\text{-N}$ , and MRP based on the component planes for mesocosms 3 and 4.

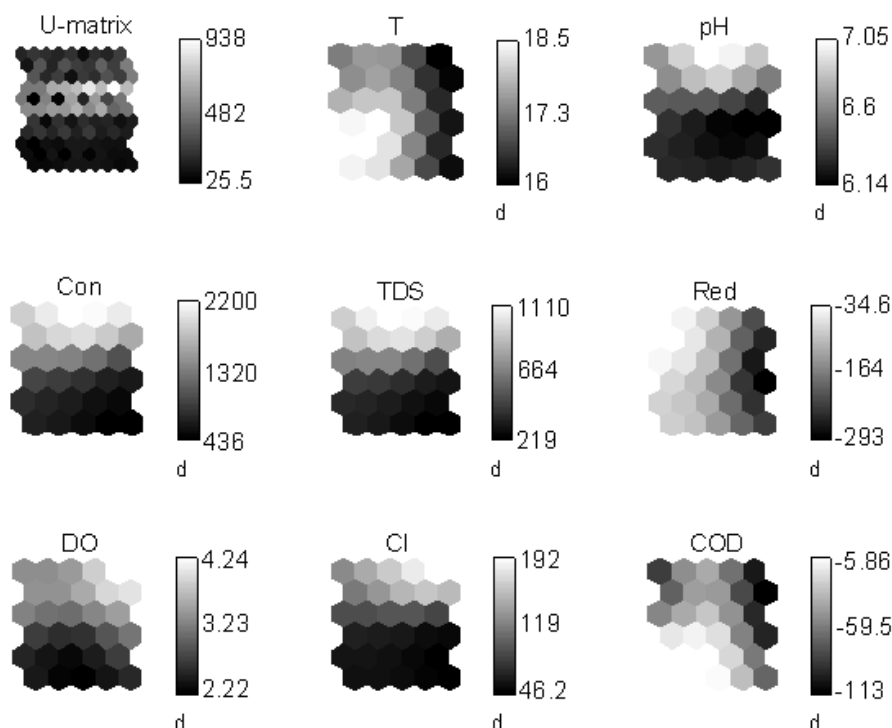


Figure 4 Component planes of the SOM for mesocosm 2 – visualization of the relationship between water quality parameters and chemical oxygen demand treatment efficiency. T, temperature ( $^{\circ}\text{C}$ ); Con, electrical conductivity ( $\mu\text{S cm}^{-1}$ ); TDS, total dissolved solids (ppm); Red, redox potential (mV); DO, dissolved oxygen ( $\text{mg l}^{-1}$ ); Cl, chloride concentration ( $\text{mg l}^{-1}$ ); COD, chemical oxygen demand treatment efficiency (%).

## 2.5 Influence of Parameters on the Treatment Efficiency and Wetland Management

The multiple regression models showed that there were significant linear relationships between pH, dissolved oxygen and chloride concentrations with contaminant treatment efficiencies within tested ICW mesocosms. Three advanced statistical tools (PCA, RDA, and SOM) were subsequently employed to carry out further investigations of subtle relationships. Findings showed that dissolved oxygen concentration and conductivity can be linked to treatment efficiencies of  $\text{NH}_4\text{-N}$ , MRP, and COD. Furthermore, redox potential values related to MRP and COD removal. Temperature and pH values contributed to the treatment of  $\text{NH}_4\text{-N}$  and  $(\text{NO}_3+\text{NO}_2)\text{-N}$ . The key results associated with all four techniques were similar. However, this is likely to be a coincidence related to this particular case study.

Although no reduction of the overall performance has been found in the multi-cellular ICW sites 7 and 11 over an operational period of 15 years, the long-term performance of individual

cells and the cascading transfer of intercepted contaminants is less known. Wetland aging, which might cause the loss of contaminant removal, is seen as a perceived challenge for their management. Scholz et al. (2007) calculated theoretical desludging frequencies between 9 and 46 years (mean of 23 years) for six ICW systems located in Ireland. However, based on this laboratory research study, a much higher desludging frequency of about 5 to 10 years for the first wetland cell might be more appropriate. Alternatively, other management strategies including a change in vegetation and water depth as well as dewatering or allowing the first wetland cell to dry out in summer could also be tested.

### 3. Conclusions

(1) Findings suggest that the treatment performance of mature wetland were relatively poor and the mesocosms acted rather as contaminant sources than sinks. Due to long-term operation and high nutrient loads entering the full-scale ICW systems, contaminants accumulated within the sediment layer at the base of the first wetland cell. However, contaminants may remobilize when environmental and chemical conditions change. As to maintain the effectiveness of ICW systems, sustainable sediment management such as entire sediment removal from the first wetland cell is recommended if a saturation point (i.e. wetland becomes a source for contaminants) has been reached.

(2) The relationships between physico-chemical parameters and contaminant treatment efficiency were sequentially investigated using four statistical tools (multiple regression, PCA, RDA, and SOM). The obtained results provided complementary information for the retention and/or release processes inside ICW systems.

(3) No reduction in treatment performance has been found in the multi-cellular ICW sites 7 and 11 according to monitoring results. In addition, the operational conditions are well controlled for laboratory-scale ICW systems. Therefore, the application of these findings to the management of the long-term operating ICW system is limited. The full-scale ICW dataset should be further analyzed to improve the tested techniques and models. However, the results still provide valuable warning hints regarding decreasing treatment efficiency in long-term operating ICW systems.

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### References

- Ahn, Y.H. (2006). Sustainable nitrogen elimination biotechnologies: a review. *Process Biochemistry* 41 (8), pp. 1709–21
- APHA (2005). *Standard methods for the examination of water and wastewater, 21st edition*. Washington DC: American Public Health Association (APHA), American Water Works Association, and Water and Environment Federation
- Braskerud, B.C., Hartnik, T. and Løvstad, Ø. (2005). The effect of the redox-potential on the retention of phosphorus in a small constructed wetland. *Water Science & Technology* 51 (3–4), pp. 127–34
- Chapanova, G., Jank, M., Schlegel, S. and Koeser, H. (2007). Effect of temperature and

- salinity on the wastewater treatment performance of aerobic submerged fixed bed biofilm reactors. *Water Science & Technology* 55 (8–9), pp. 159–64
- Chavan, P.V., Dennett, K.E., Marchand, E.A. and Spurkland, L.E. (2008). Potential of constructed wetland in reducing total nitrogen loading into the Truckee River. *Wetlands Ecology & Management* 16 (3), pp. 189–97
- Davis, J.C. (1986). *Statistics and Data Analysis in Geology*. New York: John Wiley & Sons, Inc.
- Hijosa-Valsero, M., Sidrach-Cardon, R., Martín-Villacorta, J., Cruz Valsero-Blanco, M., Bayona, J.M. and Becares, E. (2011). Statistical modelling of organic matter and emerging pollutants removal in constructed wetlands. *Bioresource Technology* 102 (8), pp. 4981–88
- Kadlec, R.H. & Knight, R. L. (1996). *Treatment Wetlands*. Florida: CRC Press
- Keppel, G. & Zedeck, S. (1989). *Data Analysis for Research Designs – Analysis of Variance and Multiple Regression/Correlation Approaches*. New York: W.H. Freeman and Company
- Klomjek, P. and Nitisravnt, S. (2002). Effect of salt concentrations on treatment performance of constructed wetland. *Proceeding of the Regional Symposium on Environment and Natural Resources* Vol. 1, pp. 766–76
- Kohonen, T., Simula, O. and Visa, A. (1996). Engineering applications of the self-organizing map. *Proceedings of IEEE*, 84 (10), pp. 1358–84
- Lee, B. and Scholz, M. (2006). Application of the self-organizing map (SOM) to assess the heavy metal removal performance in experimental constructed wetlands. *Water Research* 40 (18), pp. 3367–74
- Mitsch, W. J., and Gosselink, J. G. (2000). *Wetlands*. New York: Wiley
- Palmer, H., Beutel, M. and Gebremariam, S. (2009). High rates of ammonia removal in experimental oxygen-activated nitrification wetland mesocosms. *Journal of Environmental Engineering* 135 (10), pp. 972–79
- Reddy, G.B., Hunt, P.G., Phillips, R., Stone, K. and Grubbs, A. (2001). Treatment of swine wastewater in marsh-pond-marsh constructed wetlands. *Water Science & Technology* 144 (11–12), pp. 545–50
- Rejmánková, E. and Sirová, D. (2007). Wetland macrophyte decomposition under different nutrient conditions: Relationships between decomposition rate, enzyme activities and microbial biomass. *Soil Biology & Biochemistry* 39 (2), pp. 526–38
- Scholz, M. (2006). *Wetland Systems to Control Urban Runoff*. Amsterdam: Elsevier
- Scholz, M., Harrington, R., Carroll, P. and Mustafa, A. (2007). The integrated constructed wetlands (ICW) concept. *Wetlands* 27 (2), pp. 337–54
- Šíma, J., Diáková, K., Pavelcová, L. and Havelka, M. (2009). Redox properties of a constructed wetland: theoretical and practical aspects. *Chemistry & Biodiversity* 6 (3), pp. 341–55
- Steward, D. and Love, W. A. (1968). A general canonical correlation index. *Psychological Bulletin* 70 (3), pp. 160–63
- Tomenko, V., Ahmed, S. and Popov, V. (2007). Modelling constructed wetland treatment system performance. *Ecological Modelling* 205 (3–4), pp. 355–64
- Truu, M., Juhanson, J. and Truu, J. (2009). Microbial biomass, activity and community composition in constructed wetlands. *Science of the Total Environment* 407 (13), pp. 3958–71
- van den Wollenberg, A.L. (1977). Redundancy analysis: an alternative for canonical correlation analysis. *Psychometrika* 42 (2), pp. 207–19
- Vesanto, J., Himberg, J., Alhoniemi, E. and Parhakangas, J. (1999). Self-organizing map in Matlab: the SOM Toolbox. *Proceeding of the Matlab DSP Conference*, pp. 35–40
- Vymazal, J. (2007). Removal of nutrients in various types of constructed wetlands. *Science of*



*the Total Environment* 380 (1–3), pp. 48–65

Vymazal, J. (2009). Review: the use constructed wetlands with horizontal subsurface flow for various types of wastewater. *Ecological Engineering* 35 (1), pp. 1–17

Wu, Y., Tam, N.F.Y. and Wong, M.H. (2008). Effects of salinity on treatment of municipal wastewater by constructed mangrove wetland microcosms. *Marine Pollution Bulletin* 57 (6–12), pp. 727–34

Zhang, L., Scholz, M., Mustafa, A. and Harrington, R. (2008). Assessment of the nutrient removal performance in integrated constructed wetlands with the self-organizing map. *Water Research* 42 (13), pp. 3519–27

# The influence of clogging on effluent water quality and performance of vertical-flow constructed wetland treating domestic wastewater

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## Abstract

In this study, the impact of clogging on the outflow water quality of vertical flow constructed wetlands treating urban waste water was investigated, as a function of different design (aggregate size) and operational (contact time, empty time and chemical oxygen demand (COD) loading) variables. Different vertical-flow constructed wetlands were constructed and operated from June 2011 until June 2012. Data from June 2011 (setting-up period) were not used. The result shows that filter with the highest COD loading performed the worst in terms of outflow COD concentration (120 mg/l) but best in terms of COD load reduction (61%). The wetland with the largest aggregate size had the lowest mean nitrate-nitrogen outflow concentration of 1.2 mg/l. The results were similar regardless of aggregate size (10 versus 20 mm) and resting time (24 versus 48 h). However, different COD inflow concentrations (COD of 146 mg/l versus COD of 312 mg/l) had a significant ( $p < 0.05$ ) impact on the treatment performance for COD, ammonia-nitrogen, ortho-phosphate phosphorus and suspended solids (SS). Serious clogging phenomena impacting negatively on the treatment performance were not observed for any columns.

*Keywords:* Aggregate size, Chemical oxygen demand, Contact time, Phosphorus, Suspended solids

## 1 Introduction

### 1.1 Background

Constructed wetlands are engineered systems used worldwide as an alternative means of water pollution control to treat variety of waste waters including agricultural and urban runoff, industrial effluents, animal waste waters, sludge and mine drainage (Scholz and Lee, 2005), and recently applied successfully to treat domestic waste water (Dong et al., 2011; Scholz, 2010). These systems are based on natural ecosystems and the treatment process involves complex interactions between vegetation, soils, and other microbial organisms to aid in the treatment of the waste water (Scholz, Wetland systems to control urban runoff, 2006).

Vertical-flow constructed wetlands are widely regarded as the state of the art in wetland technology worldwide (Scholz, 2010; Tsihrintzis et al., 2007). However, an inevitable drawback limiting the competitiveness and efficiency of vertical-flow systems is clogging. Generally, the process design of vertical-flow constructed wetlands has involved a casual and empirical approach to mitigating clogging by selection or recommendation of values for many parameters whose relationship to substrate clogging are assumed or poorly understood.

The resultant lack of understanding hinders the ability of operator to maintain good hydraulic and treatment performances.

### ***1.2 Treatment Performance Efficiency***

Dong et al (2011) assessed the impact of design and operational parameters on the treatment performance and clogging processes of industrial-scale wetland systems treating domestic wastewater near Monaghan, Ireland. All wetland cells had a natural liner (compacted soil). The treatment performance was high for most water quality variables; 98% for the biochemical oxygen demand (BOD), 94% for suspended solids (SS) 92% for chemical oxygen demand (COD), 90% for nitrate-nitrogen, 96% for total nitrogen, 97% for ammonia-nitrogen and 96% for ortho-phosphate-phosphorus. The large footprint of the system resulted in a high hydraulic retention time of approximately 92 days. The groundwater was not contaminated, possibly due to natural clogging processes and biomass development. Tanner et al. (1995) indicated that the pollutant removal efficiency of constructed wetlands is linked to the hydraulic loading rate and hydraulic retention time.

Stefanakis and Tsihrintzis (2012) pointed out that water quality outflow parameters such as chemical oxygen demand (COD) is relatively unstable during experimental setting-up phase, when the wetland matures. Furthermore, a long contact time results in higher removal efficiencies for ammonia-nitrogen, regardless of plant maturity. Nitrification and biodegradation in general can be promoted by relatively long resting times.

### ***1.3. Processes of Clogging within Constructed Wetlands***

Clogging is a complex process and the mechanisms of clogging are not completely clear. Deposition of organic and inorganic solids at the wetland surface leads to a clogging mat (outer blockage) and deposition of solids within pores results in substrate clogging (inner blockage). Clogging may be due to the accumulation of solids and/or microbial activity. The process of clogging consists of the puncture phase for the pollutants, the formation phase of the deposition blanket-like layer, and the formation and compaction phase of the clogging layer (Scholz, 2006, 2010). Hua et al. (2010) showed that the clogging layer caused by suspended solids within vertical sub-surface-flow wetlands develops gradually from the upper substrate layer downwards. Clogging results in low hydraulic conductivity but it also functions as an excellent biological filter, which enhances the treatment efficiency of the system.

Multiple layers of gravel are organized in a way that the sizes of the gravel increase from the top to the bottom layer of the sub-surface flow constructed wetlands. However, many studies reported that the occurrence of clogging relates to this conventional arrangement of aggregates (Langergraber et al., 2002). Therefore, Sun et al. (2007) proposed an anti-sized reed bed system, which was more effective than a conventional mono-sized reed bed with regard to the removal of several major pollutants from a high strength pigery wastewater.

The below section briefly outlined the potential problems and causes associated with clogging. In summary, the key problems are as follows:

- The accumulation of solids within the media matrix favours the formation of short-circuiting and, consequently, the decrease of the hydraulic conductivity and effective volume.
- Clogging promotes the presence of water over the matrix by occlusion of interstitial spaces.
- The reduced oxygen content in the wetland due to clogging may lead to a reduction of the pollutant removal efficiency, which results in a negative impact such as eutrophication on the receiving watercourses.

Key causes for clogging:

- Organic solids deposit on the constructed wetland surface blocking pores.
- Accumulation of SS inside the voids of the filter media.
- The initial mean void diameter is too small.
- Matrix with heterogeneous gravel (different diameters).
- Anomalies in the distribution and/or water collection systems.
- The rapid growth of micro-organisms.
- Chemical precipitation and deposition within the pores.
- Obstruction of the pores caused by the growth of rhizomes and roots.

#### ***1.4. Numerical Modelling of Wetland Processes***

Numerical modelling of constructed wetlands gained popularity over the past decade. Wetlands are complex systems in which varied physical, chemical and biological processes take place (Rousseau et al., 2004). These processes are active in parallel and mutually influence each other (Langergraber et al., 2009). Realistic descriptive models can produce reliable predictions of the performance of constructed treatment wetlands (Langergraber, 2007).

Looking back to the history of numerical wetland modelling, as review by Rousseau et al. (2004), the primitive first-order models by Kadlec and Knight (1996), which simply regarded wetlands as a 'black box', used a first-order rate constant to evaluate the effects of autochthonous production, sedimentation, temperature and retention time (Shepherd et al., 2001) on the variation of the concentrations of the contaminants in treated water. Due to the oversimplification by using the first-order, rate assumption, further efforts using a variable order, known as Monod-type of models, have been made to evaluate the contaminant removal rate (Kemp and George, 1997; Mitchell and McNevin, 2001).

Multi-component reactive transport models were proposed to model both the transport and reactions of the main constituents of municipal wastewater in the subsurface flow processes through wetlands (Langergraber et al., 2009). The reactive transport model highlighted the essential requirement for the description of the clogging process, which significantly influences the hydraulic conductivity of porous substrate beds and, consequently, the long-term behaviour of wetlands. Demaret et al. (2009) proposed a simple biological clogging model, which takes account of the effect of biomass growth on hydraulic conductivity (eq. 1).

$$K = \begin{cases} K_0 \frac{\left(1 - \frac{M}{M_{clog}}\right)^b + a}{1 + a} & M < M_{clog} \\ K_0 \frac{a}{1 + a} & M > M_{clog} \end{cases} \quad (1)$$

Where K is the hydraulic conductivity, M is biomass density, a and b are two empirical parameters, and  $M_{clog}$  is the biomass density beyond which no further reduction of hydraulic conductivity is observed.

### ***1.5 Justification, Aim and Objectives***

In this study, a comprehensive and multi-disciplinary approach was used to understand and differentiate the mechanisms and causative factors of clogging in vertical-flow constructed wetlands. The depicted clogging mechanisms arising from differentiation of causative factors and the engineering significance of the results will be presented and analyzed in terms of operational and design considerations.

The aim was to assess the impact of clogging on the outflow water quality of vertical-flow constructed wetlands treating domestic wastewater and surface runoff. The key objectives were to evaluate:

- the current literature on clogging relevant to vertical-flow wetlands;
- the performances of different wetland filters in treating domestic wastewater mixed with surface runoff;
- the influence of design parameters such as aggregate size on clogging;
- the influence of operational parameters such as contact time, empty time and loading on clogging;
- a simulation model assessing the impact of sedimentation of SS on the clogging processes of experimental wetland filter.

## **2 Materials and Methods**

### ***2.1 Experimental System Design and Operation***

Eight laboratory-scale vertical-flow constructed wetlands constructed from Pyrex tubes with an inner diameter of 19.5 cm and a height of 120 cm are located within a green house on top of the roof of the Newton building of the University of Salford, Greater Manchester, UK. Note that the two filters in the middle are not in operation (Fig.1). The filters were filled with pea gravel up to a depth of 60 cm and planted with common reeds *Phragmites australis*(cav.) Trin.ex Steud.(Common Reed)



Figure1: Laboratory set-up of the vertical-flow constructed wetland system located within a greenhouse on top of the roof of Newton Building of University of Salford, UK

The main outlet valve is located at the bottom of each constructed wetland system. Eight further valves (used to test for clogging) are located on the sidewall of each wetland column.

Wetland columns received 6.5 l of inflow water during the feeding mode, which was different between several filters (Table 1) and was obtained from the Davyhulme waste water treatment plant operated by the water company United Utilities in Greater Manchester. Fresh wastewater was collecting approximately once per week, stored and aerated by standard aquarium air pumps in a cold room before use.

**Table 1: Comparison of statistical experimental set-up**

Design and operational variables	Unit	Filters				
		1 and 2	3 and 4	5 and 6	7	8
Aggregate diameter	mm	20	10	10	10	10
Contact time	h	72	72	72	36	36
Resting time	h	48	48	48	48	24
Chemical oxygen demand	mg/l	154.6	154.6	309.1	154.6	154.6

Note: Annually treated volumes of wastewater: Filters 1 to 6, 475 l/a; Filter 7, 680 l/a Filter 8, 949 l/a.

## 2.2 Water Quality Analysis

Water quality sampling were carried out according to APHA (2005; unless stated otherwise). The spectrophotometer DR 2800 Hach Lange ([www.hachlange.com](http://www.hachlange.com)) was used for analysis of water quality variables including COD, ammonia-nitrogen, nitrite-nitrogen, nitrate-nitrogen, total phosphorus, ortho-phosphate phosphorus and SS. turbidity was measured with a Turbichack Turbidity meter (Lovibond Water Testing Tintometer Group, [www.lovibond.com](http://www.lovibond.com)). All temperature data were recorded in the shade at an official weather station in Woodford located South-east of Salford. The raw data were supplied by the UK MetOffice ([www.metoffice.gov.uk](http://www.metoffice.gov.uk)).

## 2.3 Statistical Analysis

Microsoft Excel ([www.microsoft.com](http://www.microsoft.com)) was used for the general data analysis. The non-parametric Mann-Whitney U-test was computed using Matlab ([www.mathworks.co.uk](http://www.mathworks.co.uk)) to compare the medians of two (unmatched) samples.

## 2.4 Measurement of Clogging and Modelling

Clogging was measured directly by regularly filling the columns with waste water to the top of the debris and subsequently emptied after resting time of two hours to allow for air bubbles to escape the media. The time taken to drain and the volume of water collected were recorded for each column

The average hydraulic conductivity can be calculated using Darcy's Law as shown in eq. 2

$$K = \frac{Q \times L}{A_w \times (h_1 - h_2)} \quad (2)$$

Where K (m/d) is the saturated hydraulic conductivity of the media;  $A_w$  ( $m^2$ ) is the wetted cross-sectional area of the reactor in the axial flow direction; Q ( $m^3/d$ ) is the flow rate; L (m) is the distance between an upstream and a downstream point in the axial flow direction; and  $h_1$  (m) is the water depth at the upstream point;  $h_2$  (m) is the water depth at the downstream point.

As an indirect measure of clogging, SS samples were taken from the inflow wastewaters, the layer of debris on top of each filter, the eight sampling ports of each column (see section I.1) and the outflows. The results were used as input data for the mathematical model, which was developed to analyze the major influences and sub-mechanisms involved in the clogging processes using the following equation;

$$\frac{\partial \phi}{\partial t} = D \frac{\partial^2 \phi}{\partial z^2} - (u - v) \frac{\partial \phi}{\partial z} + \dot{R} \quad (3)$$

Where  $\phi$  is the concentration of SS particles of all sizes within the treated wastewater, t is time, D is the dispersion coefficient, z is the vertical elevation position, u is the vertically flowing water velocity (positive upward), v is the settling velocity of the SS, and  $\dot{R}$  is the source term of suspended solids particles.

### 3.0 Results and Discussion

#### 3.1 Comparison of Outflow Water Qualities for Nutrients

Tables 2, shows comparisons of seasonal outflow water quality. Table 3 summarises an assessment of the statistically significant differences between outflow water quality variables of different filters using the non-parametric Mann-Whitney U-test. Nitrogen removal within constructed wetlands is mainly by microbial nitrification and denitrification. In the nitrification process, ammonia is oxidized largely to nitrate which is reduced to gaseous nitrogen by the denitrification process. Nitrogen removal in many constructed wetland systems without adequate active or passive aeration is insufficient, mainly because of the lack of available oxygen used for aerobic biological degradation (Scholz, 2010).

**Table 2 Comparison of outflow water quality and air temperature (01/07/11 to 30/06/12)**

Parameter	Unit	Number	Mean	Removal (%)	Minimum	Maximum
Filters 1 and 2 combined						
Chemical oxygen demand	mg/l	89	75.7	75.7	5.0	135.0
Ammonia-nitrogen	mg/l	64	10.4	65.7	0.8	25.3
Nitrite-nitrogen	mg/l	40	0.27	87.8	0.00	2.43
Nitrate-nitrogen	mg/l	58	1.2	22.1	0.0	7.8
Total phosphorus	mg/l	43	3.8	46.8	0.7	8.1
Ortho-phosphate-phosphorus	mg/l	81	2.8	49.2	0.0	6.0
Suspended solids	mg/l	91	17.1	75.1	0.2	85
Filters 3 and 4 combined						
Chemical oxygen demand	mg/l	87	74.3	76.2	6.0	165.0
Ammonia-nitrogen	mg/l	64	8.5	72.0	1.2	31.2
Nitrite-nitrogen	mg/l	41	0.08	96.4	0.00	0.69

Table 2 (Cont.)

Nitrate-nitrogen	mg/l	60	1.8	-14.1	0.0	11.9
Total phosphorus	mg/l	43	3.3	54.5	0.9	7.1
Ortho-phosphate-phosphorus	mg/l	79	2.6	77.0	0.0	6.5



Suspended solids	mg/l	89	16.4	84.6	0.0	120.0
Filters 5 and 6 combined						
Chemical oxygen demand	mg/l	86	120.1	61.5	30.9	240.0
Ammonia-nitrogen	mg/l	65	18.0	40.7	0.9	39.9
Nitrite-nitrogen	mg/l	39	0.29	86.9	0.00	3.50
Nitrate-nitrogen	mg/l	60	2.9	-89.9	0.1	21.2
Total phosphorus	mg/l	38	5.7	20.6	1.8	10.2
Ortho-phosphate-phosphorus	mg/l	79	4.8	57.2	0.0	8.2
Suspended solids	mg/l	84	24.9	76.5	1.4	90.0
Filter 7						
Chemical oxygen demand	mg/l	64	72.4	76.8	15.7	158.0
Ammonia-nitrogen	mg/l	48	7.3	76.1	0.0	35.8
Nitrite-nitrogen	mg/l	25	0.13	94.3	0.00	1.61
Nitrate-nitrogen	mg/l	47	4.0	-156.2	0.0	14.6
Total phosphorus	mg/l	24	7.0	3.5	1.4	80.9
Ortho-phosphate-phosphorus	mg/l	53	2.5	77.5	0.0	4.9
Suspended solids	mg/l	61	15.1	85.7	0.5	85.0
Filter 8						
Chemical oxygen demand	mg/l	70	67.6	78.3	14.5	158.0
Ammonia-nitrogen	mg/l	49	6.8	77.8	0.2	16.8
Nitrite-nitrogen	mg/l	25	0.09	95.9	0.00	0.78

Table 2 (Cont.)

Nitrate-nitrogen	mg/l	52	3.2	-107.7	0.1	12.7
Total phosphorus	mg/l	27	3.6	49.5	0.5	6.7

Ortho-phosphate-phosphorus	mg/l	56	2.4	78.5	0.0	7.07
Suspended solids	mg/l	68	11.8	88.9	0.3	60.0

The overall reduction rates of ammonia-nitrogen were relatively high, partially due to temperatures usually above 15°C during the warm seasons (Tsihrintzis et al., 2007). The removal efficiencies regarding both concentrations and loads were low if undiluted wastewater was used. Table 3 indicates that inflow water high in COD results in a statistically significant ( $P < 0.05$ ) difference between the mean daily values of Filters 5 and 6 in comparison to the mean daily values of Filters 3 and 4. However, aggregate size, resting time and contact time were not important for ammonia-nitrogen removal.

Phosphorus is one of the most difficult pollutants to be removed by constructed wetlands (Pant et al., 2001). The ortho-phosphate-phosphorus removal efficiencies (based on concentrations) ranged between 75 and 78% for filters operated at a low inflow COD load. The removal rate was about 57% for the high rate filter (Table 2). However, this difference was statistically significant (Table 3). Aggregate size, contact time and resting time were not crucial parameters in terms of ortho-phosphate-phosphorus removal. Filters with a high loading rate were associated with relatively high removal load. This reads apparent contradiction but has been reported in many studies in practice (Scholz, 2006, 2010).

**Table 3 – Assessment of the statistically significant differences between outflow water quality variables of different filters using the non-parametric Mann-Whitney U-test**

Parameter	Unit	Statistics	Aggregate diameter <sup>a</sup>	Contact time <sup>b</sup>	Resting time <sup>c</sup>	Chemical oxygen demand <sup>d</sup>
Chemical oxygen demand	mg/l	<i>P-value</i>	0.726	0.650	0.424	<0.000
		h	0	0	0	1
Ammonia-nitrogen	mg/l	<i>P-value</i>	0.057	0.124	0.863	<0.000
		h	0	0	0	1
Nitrite-nitrogen	mg/l	<i>P-value</i>	0.648	0.641	0.932	0.618
		h	0	0	0	0
Nitrate-nitrogen	mg/l	<i>P-value</i>	0.834	0.014	0.416	0.074
		h	0	1	0	0
Total phosphorus	mg/l	<i>P-value</i>	0.332	0.0278	0.445	0.163
		h	0	0	0	0
Ortho-phosphate-phosphorus	mg/l	<i>P-value</i>	0.432	0.710	0.341	<0.000
		h	0	0	0	1
Suspended solids	mg/l	<i>P-value</i>	0.238	0.512	0.678	0.008

<sup>a</sup>Comparison between the mean daily values of Filters 1 and 2, and Filters 3 and 4;

<sup>b</sup>Comparison between the mean daily values of Filters 3 and 4, and Filter 7; <sup>c</sup>Comparison

between Filters 7 and 9; <sup>d</sup>Comparison between Filters 3 and 4, and Filters 5 and 6. Note: *P*-

*value*, probability of obtaining a test statistic at least as extreme as the one that was actually observed, assuming that the null hypothesis is true; *h*, response indicator; if *h*=1, filters are statistically significantly different (*P-value* < 0.05) for the corresponding water quality parameter; if *h*=0, the difference is not significant.

### 3.2 Comparison of Outflow Water Qualities for other Parameter

The mean COD removal efficiencies for Filters 5 and 6 were higher than those for Filters 3 and 4. This difference was statistically significant (Table 3). The opposite is the case for the equivalent COD loads. A comparison between the Filters 3 and 4 with Filter 7 gives insight into effect of contact time on the treatment performance. The removal efficiencies were rather similar. The COD removal efficiencies for Filters 1 to 4 were also similar, indicating that aggregate size may not matter. A higher loading rate had a significant (*p*<0.05) negative impact on the treatment performance (Table 3). Suspended solids accumulated in the top part of the filters confirming findings by Hua et al. (2010) and Scholz (2010).

### 3.3 Assessment of Filter Clogging Based on Water Quality Variables

For water quality variables with high overall mean inflow concentrations, Table 3 indicates that only an elevated COD inflow load makes a significant difference in terms of COD and SS outflow concentrations. The development of a litter zone on top of each filter was observed partly due to both the high strength and SS load of the wastewater. However, concerning filter bed clogging evolution measured in terms of SS accumulation (Table 4), none of the systems have shown any signs of serious within-bed clogging, yet.

**Table 4 – Mean suspended solids accumulation and turbidity profile within the wetland filters (01/07/11 to 30/06/12)**

Sampling location	Filters 1 and 2	Filters 3 and 4	Filters 5 and 6	Filter 7	Filter 8
SS for summer 2011 (21/06/11 to 22/09/11 (data collection started on 01/07/11))					
Litter layer of filter	-	-	-	-	-
60 cm above outlet	-	-	-	-	-
55 cm above outlet	14.0	7.0	15.0	-	-
50 cm above outlet	14.8	10.0	25.5	7.0	15.0
45 cm above outlet	11.0	15.6	23.9	27.0	17.3
40 cm above outlet	8.6	13.3	19.9	12.0	17.3
30 cm above outlet	14.2	14.3	22.4	15.5	16.5
20 cm above outlet	11.7	15.2	24.0	15.5	27.8
10 cm above outlet	11.8	15.0	22.1	16.5	35.3
Outflow water	22.6	20.9	40.7	32.8	19.5
Turbidity for summer 2012 (20/06/12 to 21/09/12 (data collection stopped on 30/06/12)): Data points are shown in fig. 2					
Litter layer of filter	76.2	69.3	84.4	-	-
60 cm above outlet	28.3	17.0	19.2	13.9	-

55 cm above outlet	34.2	14.8	6.0	15.9	-
50 cm above outlet	13.6	16.5	10.4	7.8	-
45 cm above outlet	12.9	8.8	7.1	4.8	-
40 cm above outlet	7.9	7.8	7.5	11.6	-
30 cm above outlet	6.0	6.9	5.7	10.0	-
20 cm above outlet	5.3	3.6	5.8	3.7	-
10 cm above outlet	4.0	3.7	5.7	4.0	-
Outflow water	4.4	3.8	-	6.3	-

### 3.4 Assessment of Filter Clogging using the Simulation Model

Table 4 and Fig. 2 show the mean seasonal SS accumulation profile within the wetland filters. The turbidity profile is also shown in Table 4. No clogging was apparent in summer 2011. The litter layer was absent. In comparison, a litter layer associated with elevated SS values formed a year later. A clear SS and turbidity profile that decreases from the top to the bottom of all filters was evident. The profile can be explained by the maturation of the filter biomass retaining SS and not by a gradual increase in clogging of filter pores

Figure 2 shows a comparison of the measured and modeled distribution of SS within the wetland filters about one year after the start of the experiment (i.e. mean data for summer 2012). The model performed well with respect to the prediction of SS within the filter. However, the model runs consistently under-predicted the SS concentrations within the litter zones. This can be explained by the fact that the model does not account for biological growth and decay of plant matter. Degrading leaves and stems contribute to SS accumulation on top of the filter.

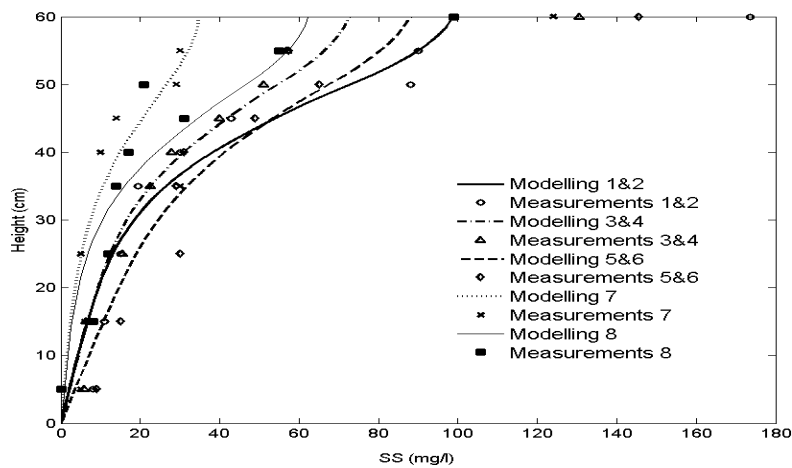


Figure 2: Comparison of the measured and modeled distribution of SS within the wetland filters.

A comparison between the mean daily values of Filters 1 and 2, and the mean daily values of Filters 3 and 4 indicates that a larger aggregate diameter leads to more SS entering the top 30 cm of the filters. A shorter contact time is better to avoid clogging due to SS accumulation. This observation can be explained by the fact that a longer contact time results in a greater breakdown of large particles into smaller ones. A comparison between Filters 7 and 8 indicates that a longer resting time leads to less SS because they will be relatively quickly

broken down by aerobic biodegradation. A lower COD inflow concentration leads to a reduced accumulation of SS within the filter (Fig. 2).

#### 4 Conclusions

All constructed wetland systems have shown high removal efficiencies for the key water quality parameters COD, ammonia-nitrogen, ortho-phosphate-phosphorus and SS; the removal efficiencies exceeded 61, 40, 57 and 76%, respectively, in all filters. Overall, good removal was achieved for a smaller aggregate size (except for nitrate-nitrogen), a longer contact time (except for nitrate-nitrogen), a longer resting time and a reduced loading rate. Different chemical oxygen demand inflow concentrations had a significant ( $P < 0.05$ ) impact on the treatment performance for variables COD, ammonia-nitrogen, ortho-phosphate-phosphorus and suspended solids SS. The simulation model confirms the observation based on the water quality analysis of all filters that considerable filter clogging restricting the operation has not occurred after about one year of operation. However, the SS profile confirms the accumulation of particles at the top of the filter. However, SS accumulation within the litter zone could have only been predicted by the model if it would have taken account of plant decay. A small aggregate diameter, a short contact time, a long resting time and a low COD inflow concentration were most beneficial in reducing SS accumulation within the filters.

#### References

- American Public Health Association. (2005). *Standard Methods for the examination of water and waste water*. Washington
- Carman, P. C. (1956). *Flow of Gases through porous media*. Butterworths.
- Damaret, L., Ebel, H., Efendiev, M., & Maloszewski, P. (2009). A simple bioclogging model that account for spatial spreading of bacteria. *Electr.J.Different Eq.conf.* , 17, 51-69.
- Dong, Y., Wilinski, P., Dizakpasu, M., & Scholz, M. (2011). Impact of hydraulic loading rate on water contaminant reductions within integrated constructed wetlands. *Wetlands* , 31, 499-509.
- Hua, G., Zhu, W., Zhao, L., & Huang, J. (2010). Clogging pattern in vertical-flow constructed wetlands: Insight from a laboratory study. *J. Hazard. Mat.* , 180, 668-674.
- Kadlec, R., & Knight, R. (1996). *Treatment Wetlands*. Chemical Rubber Company Press, Boca Raton, Florida, USA. Boca Raton, Florida: Lewis .
- Kayranli, B., Scholz, M., Mustafa, A., Hofman, O., & Harrington, R. (2010). Performance Evaluation of Integrated Constructed Wetlands Treating Domestic Wastewater. *Water Air Soil Pollut.* , 2010 (1-4), 435-451.
- Kemp, M., & George, D. (1997). Subsurface flow constructed wetlands treating municipal wastewater for nitrogen transformation and removal. . *Wat. Environ Res.* 69, 1254–1262 , 69, 1254-1262.
- Langergraber, G. (2007). Simulation of the treatment performance of outdoor subsurface flow constructed wetlands in temperate climates. *Sci. Tot. Environm* , 380, 210-219.

- Langergraber, G., Giraldi, D., Mena, J., Mena, D., Pena, M., Toscano, A., et al. (2009). Recent developments in numerical modelling of subsurface flow constructed wetlands. *Sci. Tot. Environm* , 407, 3931–3943.
- Langergraber, G., Haberl, R., Laber, J., & Pressl, A. (2003). Evaluation of substrate clogging processes in vertical flow constructed wetlands. *Wat. Sci. Technol* , 48, 25–34.
- Mitchell, C., & McNevin, D. (2001). Alternative analysis of BOD removal in subsurface flow constructed wetlands employing Monod kinetics. *Wat. Res* , 35 (5), 1295–1303.
- Nivala, J., & Rousseau, D. (2009). Reversing clogging in subsurface-flow constructed wetlands by hydrogen peroxide treatment: two case studies. I. *Water Sci. Techno* , 59 (10), 2037–2046.
- Pant, H., Reddy, K., & Lemon, E. (2001). Phosphorus retention capacity of root bed media of sub-surface flow constructed wetlands. *Ecol. Eng.* , 17 (4), 345-355..
- Richardson, J., & Zaki, W. (1954). The sedimentation of a suspension of uniform spheres under conditions of viscous flow. *Chem. Eng. Sc* , 3, 65-73.
- Rousseau, D., Vanrolleghem, P., & De Pauw, N. (2004). Model-based design of horizontal subsurface flow constructed treatment wetlands: a review. *Wat. Res* , 38, 1484–1493.
- Rowe, R., & Babcock, D. (2007). Modelling the clogging of coarse gravel and tire shred in column tests 44, 1273–1285. *Can. Geotech. J.* , 44 (11), 1273-1285.
- Royal Commission on Sewage Disposal. (1915). *Final Report of the Commissioners Appointed to Inquire and Report What Methods of Treating and Disposing on Sewage May Properly Adopted*. London: His Majesty's Stationary Office.
- Scholz, M. (2010). *Wetland Systems – Storm Water Management Control*. Berlin: Springer, Verlag.
- Scholz, M. (2006). *Wetland systems to control urban runoff*. Amsterdam: Elsevier.
- Scholz, M., & Lee, B.-H. (2005). Constructed wetlands: a review. *Int. J. Environ. Stud.* , 62 (4), 421–447..
- Shepherd, H., Tchobanoglous, G., & Tchobanoglous, M. (2001). Time-dependent retardation model for chemical oxygen demand removal in a subsurface wetland for winery wastewater treatment. *Wat. Environ. Res.* , 73 (5), 597-606.
- Smith, E., Gordon, R., Madani, A., & Stratton, G. (2006). Year-round treatment of dairy wastewater by constructed wetlands in Atlantic Canada. *Wetlands* , 26 (2), 349-357.
- Soares, M., Braester, C., Belkin, S., & Abeliovich, A. (1991). Denitrification in laboratory sand columns: Carbon regime, gas accumulation and hydraulic properties. *Wat. Res.* , 25 (3), 325-332..
- Stefanakis, A., & Tsihrintzis, V. (2012). Effects of loading, resting period, temperature porous media, vegetation and aeration on performance of pilot-scale vertical flow constructed wetlands I. *Chem. Eng. J.* , 181-182 (15), 416-430.

Sun, G., Zhao, Y., & Allen, S. (2007). An alternative arrangement of gravel media in tidal flow reed beds treating pig farm wastewater. *Wat. Air Soil Poll* , 182 (1-4), 13–19.

Tanner, C., Clayton, J., & Upsdell, M. (1995). Effect of loading rate and planting on treatment of dairy farm wastewaters in constructed wetlands – II. Removal of nitrogen and phosphorus. *Wat. Res.* , 29, 27-34..

Tsihrintzis, V., Akaratos, C., Gikas, G., Karamouzis, D., & Angelakis, A. (2007). Performance and cost comparison of a FWS and a VSF constructed wetland system. *Environm. Technol* , 28 (6), 621-628.

# The monitoring network architecture in the neighbourhood area of the smart grid

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## Abstract

The Smart Grid has three main characteristics, which are to some degree antagonistic. These characteristics are: provision of good power quality, energy cost reduction and improvement in the reliability of the grid. The need to ensure that they can be accomplished together demands a much richer ICT monitoring and control network than the current system, which is centrally controlled. In this paper we discuss our design choices for building a communication network alongside the power network. We examine the existing communication technologies and justify our choice for selecting one of these technologies as the most appropriate method of communication in our proposed architecture. We focus particularly on the neighbourhood area sub-grid. Since visualisation tools for monitoring the neighbourhood area of the power grid are currently lacking, we present a visualisation tool we have developed for this system.

## Keywords

Smart Grid, Neighbourhood Area Network, Monitoring, Wireless Technology, Visualisation Tool.

## 1. Introduction

The Smart Grid utilises diverse technologies such as power system automation, control, and communication to enable, real-time interoperability between electricity consumers and providers. This system intends to improve efficiency in decision-making systems which rely on resource availability and economics (Reed et al., 2010).

According to the U.S Department Of Energy (DOE) (Miller et al., 2008) desirable characteristics of the Smart Grid have been identified as: self healing, consumer friendly, reliable with good power quality, and resistant to cyber attack. In addition, it should be able to accommodate all storing and generation options, and enable new services and markets. To achieve these features we face challenges at each different layer of the system. One of the vital challenges is a lack of predictive real-time system controls, which is the focus of our research. Based on successful applications in the water distribution network (Khan *et al.*, 2010) we provide an architecture for integrating sensing, computation, and decision making to monitor and predict the future state of the power grid in real-time.

In a traditional electricity grid, there was only a power distribution network and the whole system lacked monitoring of the state of the grid, except at a centralised level. As shown in Figure 1, Smart Grid is considered to be an integration of a power network and a communication network. The power network, responsible for transmitting electricity from generation points to the clients consists of three sectors: generation, transmission, and distribution. Our current proposal for such a communication network, responsible for providing communication between different sectors in a power network, has three tiers. These are known as: (1) wide area network (distribution), (2) neighbourhood area network (metering), and (3) home area network (consumers). Until now most work has focused mainly on wide area and home area communication networks (1 and 3). By contrast we have



particularly investigated the monitoring of the neighbourhood area network (also called local area network (LAN)) in the distribution network of the power grid. The communication network at this level of the Grid is very underdeveloped, and it suffers from a lack of monitoring and predictive real-time system control. Thus, providing such communication architecture at the neighbourhood area of the sub grid will be an important contribution to the overall ICT architecture of the Smart Grid.

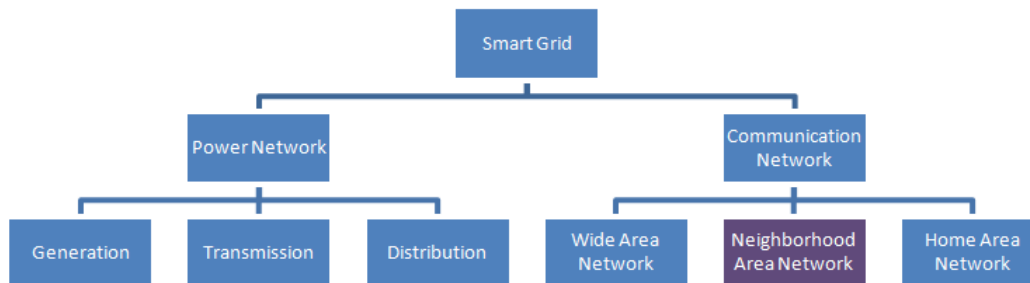


Fig.1. Smart Grid Overview

## 2. Communications in the Power Grid

Some of the motivations behind having a communication network alongside a power grid are to give customers control over the price of their energy usage, which will lead to better management of demand. Also to reduce the personnel required to operate the Grid, and to integrate new Distributed Generation (DG) sources of energy that emit less CO<sub>2</sub> (Carbon Dioxide). In addition, since the electrical networks are one hundred and fifty years old, they face frequent disruptions (Farhangi, 2009). Smart Grid proposes to accomplish the above-mentioned goals by incorporating control technology in communication network. It is believed (Ericsson, 2010) that communication systems will be a critical tool for the operation and administrative purposes of the future power grid.

Our motivation for this research is also based on our understanding from other networked systems such as water distribution grids (Stoianov et al., 2007, Machell et al., 2010). Based on these studies, we believe that integration of computation and communication network could help power engineers to perform better control over the grid. Moreover, according to recent studies (Yang et al., 2011, Chuang and Mcgranaghan, 2008), it is believed that the controls that are being applied centrally could be done better by distributed control. Thus we have to design a system where some controls could be done locally in homes or at street level, while others could be done at higher levels. Furthermore, by reviewing the literature (Abbasi and Younis, 2007, Raghunathan et al., 2004, Youssef et al., 2003), we design an architecture to provide a better information flow in the grid, compared with the previously proposed systems.

From the literature mentioned above, and also from a wider literature review phase, we have identified that there is less research on street level communications, called a Local Area Network in this research, and most of the research considers the whole Distributed Generation (DG) network as well as the local area. Considering the case where all information is collected at a DG level database, where controls are applied, we encounter the problem of information flooding. Moreover, by conducting a survey of available communication technology (Parikh et al., 2010, Nordell, 2008), we identified that it is not feasible to use one single technology for the whole grid but that heterogeneous communication technologies should be provided. Observing that one of these technologies

should be wireless, and since wireless sensor networks are energy constrained we believe the communication network in the Smart Grid should use energy efficiently in order to prevent poor communications.

### **3. Related Work**

Recently several attempts have been made to upgrade the existing grid to the “smarter” grid, such as GridStat (Bakken et al. 2002), GridWise (Cherian & Ambrosio, 2004), and numerous others. However, this research mainly focuses on the Wide Area Network or Home Area Network and there is less research on Local Area Networks (LAN). Therefore, in this paper, we concentrate on this level.

Currently the available intelligent monitoring system in place for the sub-Grid is SCADA (Supervisory Control and Data Acquisition) (Daneels and Salter, 1999). It is used for collecting data from the grid. One of the limitations of this system is that it fails to monitor the whole sub-Grid, and only monitors the critical areas of the network. Thus, our architecture should go beyond that and monitor the entire network. It has also been observed that SCADA has slow data update rate (Qiu et al., 2011), and lacks the ability to control the distribution network in real-time (Kayastha et al., 2012). These issues make SCADA inappropriate for the Smart Grid applications.

There has also been use of sensor data to monitor water networks, for example the Neptune project.<sup>3</sup> Building on this, it is possible to create dynamic visualization interfaces for monitoring and controlling the system (Haines et al. 2009). Our work extends this latter approach to the electrical Grid where the monitoring systems take account of much more rapid changes in the state of the network (seconds rather than hours).

### **4. Existing communication Systems**

In order to transmit data in the communication network of the Smart Grid there exist several options such as using power line communication, fibre optic, radio wave and so on. Initially, Power Line Communication (PLC) seemed to be the best option, since the cables are already there and there will be no deployment cost. Also the energy constraint problem of a Wireless Sensor Network, WSN, could be prevented. However, due to two fundamental shortcomings, PLC was rejected. Firstly, advanced noise filtering and error correction mechanism is required in PLC (Galli et al., 2010). Noise filtering is a big problem, particularly when we want to collect fine-grained information at quite a high rate. Secondly, if we rely on the power line for communication, we cannot monitor the areas with cable breakage or some other faults in the field. On top of these, there exist other difficulties such as lack of standardization between different vendors. Moreover disturbances in the distribution line and switching off the distribution line will lead to changes in communication routing (Nordell, 2008).

Another option is a satellite system, but due to cost and signal delay it is not the best available option. Fibre optics offer high bandwidth, large communication distance and they are expected to be cost efficient in the long run, but due to the high cost of installing them in key areas of the electrical network, we consider they are not the best available option (Nordell, 2008). Our investigation for this project shows that what drives the cost up is the

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<sup>3</sup> <http://www.shef.ac.uk/neptune/projectdetails>

cost of actual installation. Radio systems use cheap components and they are easy to install, and they provide communication to any geographical area with poor access, thus they seem to be the best candidate.

It is considered (Nordell, 2008) that wireless can be used either for communications in the substation, or over longer paths such as between substations or between enterprises and the substation. Since the wireless communication is at a sufficiently high frequency as to be resistant to electromagnetic interference from the electrical and magnetic fields in each substation, this system is one of the best options for the communication system. Among various wireless communication technologies, each individual technology seems to be suitable for different applications in the Smart Grid. As an example, ZigBee (IEEE 802.15.4) operating on various unlicensed frequency bands with 20-250 Kbps data rate, covering 10-100m, is suitable for home area networks (Parikh et al., 2010). In addition, infrared transmissions are only suitable for home and indoor applications due to the drawback that can easily get absorbed by rain and dust, and they have a short coverage in distance (Tan et al., 2011).

Alternatively, Wireless LAN (IEEE 802.11a,b,g,n,i), WiMAX (802.16), cellular technology, and Mobile Broadband Wireless Access (IEEE 802.20) are appropriate for wide area network applications and in our proposed architecture they are suitable for providing the communication between the Wireless Sensor Network (WSN) and the local computation unit. Finally, Bluetooth (802.15.1) with its low power, short range coverage between 1 to 100m with extended antenna, and 721Kbps data rate, seems to be a good candidate for monitoring applications in home and neighbourhood area network. However, Bluetooth is less secure compared to other standards, and interferes with IEEE 802.11 (Parikh et al., 2010). Despite these drawbacks of Bluetooth its low power requirements fit the need for communication between street level sensors. Additionally, since Bluetooth is able to integrate well with mobile phones used by engineers in the field, this system is one of the best options, from current communication technologies, to meet our system requirements.

## **5. Research Methodology**

In this project we apply principles of WSNs to the electrical network where monitoring and controlling is required. We test these principles in an actual NAN environment, where monitoring has not previously been deployed. Since there is no previous monitoring at this level we do not have previous experimental data to compare our results with. Thus, we use a combination of simulations and real experiments to evaluate our architectural proposals and communication technologies. The current monitoring and controlling system in place is a centralized system, which is no longer adequate for a new intelligent electrical grid. In this project we are migrating from centralized monitoring to distributed local monitoring. Since this new local monitoring is not a well-understood problem, first we have to design and build such a system to allow experiments. Observing that the information has to be sufficiently up-to date to permit effective control of the system, we are working to develop an ICT system that can meet their requirements in the most energy efficient manner (Pourmirza and Brooke, 2012a).

Our proposed architecture (Pourmirza and Brooke, 2012a) uses a sensor network communicating via radio technology to monitor the whole system. This architecture is a combination of peer-to-peer and hierarchical architectures, utilizing various communication technologies for transmitting data. It represents the integration of sensor networks and distributed computation. An advantage of the proposed architecture is that it will prevent a single point of failure. It is a modular architecture for controlling a particular local area in the

sub-Grid. In previous work, we provided evidence that the proposed architecture will bring energy efficiency to the communication network (Pourmirza and Brooke, 2012b). Moreover, we demonstrated the optimal topology of the WSN in our test bed (Pourmirza and Brooke, 2013). Given that the energy for data transmission is higher than energy for data computation (Heinzelman et al., 2000), by reducing the transmission range and adding more computational units for local control, we could achieve an even more energy efficient architecture. Finally this architecture can avoid a bottleneck caused by huge amounts of information travelling in the system, by adding a number of local computational units and by sending a lesser but sufficient amount of data to enable higher level control.

## **6. A Monitoring Network for a Neighbourhood Area**

As discussed earlier, we consider the implementation of a monitoring network over the power network in the neighbourhood area of the Smart Grid. A list of applications for such a monitoring system, has been identified through our research and that of other researchers (Veleva and Davcev, 2012). The list is as follows:

- Real-time data collecting applications,
- Home Area Network (HAN) applications,
- Substation monitoring applications,
- Energy management applications,
- Power quality analysis,
- Equipment monitoring,
- Equipment theft prevention,
- Traffic monitoring applications,
- Weather (temperature and humidity) monitoring applications,
- Outage warning,
- Fast fault identification and rectification,
- Planned outage scheduling,
- System maintenance scheduling,
- GIS applications,
- Motion applications,

Finally, monitoring at this level can also be used for car park monitoring in order to predict the future load from electrical vehicle charging.

## **7. Visualisation Tool for Neighbourhood Area Monitoring**

Visualisation tools are employed in many engineering fields, such as water distribution grids, to display and manage large volume of data. However, there is far less research on this topic in the power network. In order to make the real data and network topology of the power grid comprehensible by network operators and engineers in the field, a software system representing a visualisation tool has been developed. It overlays information about the condition of the electrical network onto GIS systems, in our case Google maps. We use it to visualise real data extracted from a University Campus NAN test bed. We also overlay visualisations of the sensor data in the form of charts and graphs, and give users the option to choose specific data from a desired time interval, and finally to send active and passive alerts in case of emergency. Figure 2 below illustrates our visualisation tool and demonstrates how data relating to the sensors is overlaid on the Google Maps GIS background.

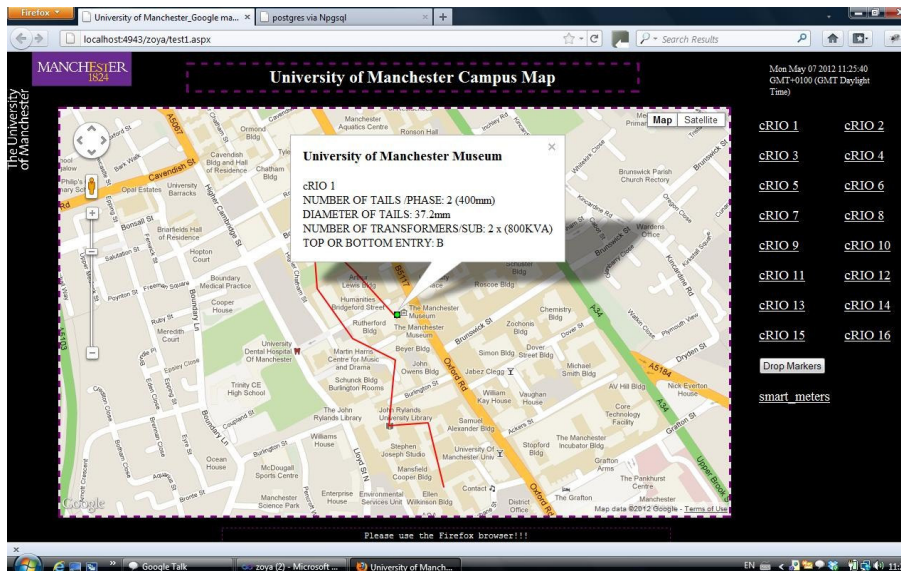


Fig. 2. Visualisation tool

The first step in designing a new software system is to identify its requirements. In software engineering, functional requirements are defined as the concrete functionalities of a software system. Most of the functional requirements are used to provide the use cases. However, non-functional requirements are described as the qualitative characteristics of a system. We now outline the functional and non-functional requirements of our visualisation system and present a use case diagram of our visualisation tool.

One of the most important functionalities in our systems is to display the flow of data via tables and graphs. In addition, it is vital to demonstrate the position of each metering devices on the map since their data may vary according to their locations. Security requirements dictate that users need to be authorised to gain the required read permission of the database to access the data. Finally, monitoring needs to be combined with the ability to alert users about unusual events or conditions and also their locations in the sub-Grid.

The aforementioned functional requirements allow us to identify some use cases for the proposed tool. The title of each use case is selected as an action-verb, which refers to the primary goal of each functional requirement. The internal-actors of this system can be divided into two categories: unauthorised and authorised user. The system starts with the first use case, called 'Show Map'. This use case is based on the Google Map API and locates all the metering devices on the map. 'Select Device' is identified as a second use case. This case can be called by both authorised and unauthorised users, and it is employed to present the information regarding a specific metering device on the map as well as showing its position according to its longitude and latitude, and displaying its data. However, the data demonstration functionality requires two prerequisite use cases, including 'Login' which changes the status of the user from unauthorised to authorised user and 'Request for Data' which has some sub-functional requirements such as filtering the data according to the date and drawing an appropriate chart. The last use case describes how the system informs its users of data that exceeds a threshold. This action can be an active procedure that sends data over a threshold to both authorised and unauthorised users. It can also be a passive procedure that highlights these values in a table to be viewed by an operator. Figure 3 below illustrates the use case diagram for the proposed visualisation tool.

Furthermore, some non-functional requirements have been considered in the design of the proposed system such as:

- Accessibility: this system can be accessed via different devices such as PCs and portable devices such as PDAs and Mobile devices.
- Backup: the tool will save a mean value of data in another table, in order to have a backup system when required.
- Open Source: the system is under the GNU LGPL 2.1 license.

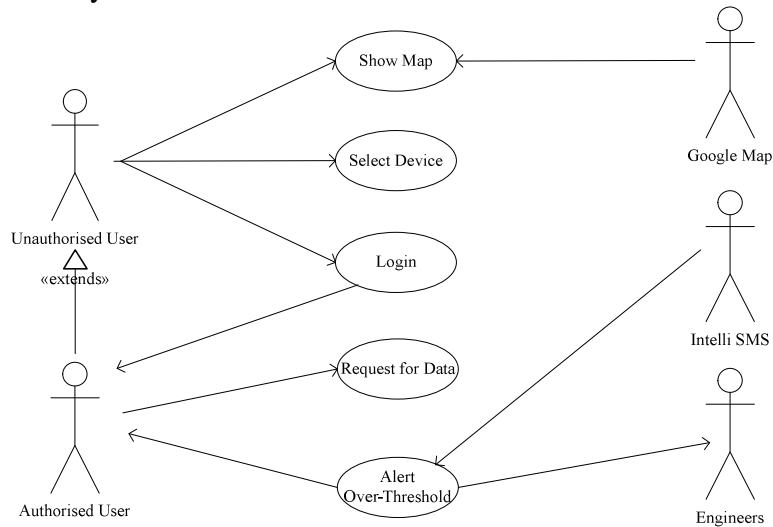


Fig. 3. System Use Case Diagram

## 8. Conclusion and future research

In this paper we have focused on the communication system in the neighbourhood area network of the Smart Grid and we justify the need for having such a system alongside the current power grid. Bluetooth is selected as an appropriate communication technology due to its low power requirements and ability to integrate well with the mobile devices. Also the applications of the monitoring network in the neighbourhood is identified and discussed. Moreover, we have developed a visualisation tool for monitoring the neighbourhood area in the power grid. Finally, the functional and non-functional requirements of this system are discussed. Currently the visualization tool is receiving real data from smart meters on the University Campus. These are already connected by wired connections. We are simulating sensor data from a TinyOS sensor simulator to represent the real data that will come when the sensor network is installed.

In future work we will add more functionality to the visualisation tool, according to the needs of the electrical engineers. Also it is intended to implement a control algorithm via the visualisation tool for controlling the sub-grid. Thus this tool will not be only used to monitor and display the information of the grid, but also it can be used to actively control the grid locally and examine the what if scenarios. Additionally we will investigate data reduction algorithms to provide efficient flow of the information between the sensing field and the visualisation tool, which is located at the control unit.

## References

- Abbasi, A. A. & Younis, M. 2007. A survey on clustering algorithms for wireless sensor networks. *Computer Communication*, 30, 2826-2841.
- Cherian, S. & Ambrosio, R. 2004. Towards realizing the GridWise™ vision: integrating the operations and behavior of dispersed energy devices, consumers, and markets. *In: Power Systems Conference and Exposition, 2004. IEEE PES, 10-13 Oct. 2004.*
- Chuang, A. & Mcgranaghan, M. 20-24 July 2008. Functions of a Local Controller to Coordinate Distributed Resources in a Smart Grid. *Power and Energy Society General Meeting - Conversion and Delivery of Electrical Energy in the 21st Century, 2008 IEEE, 2008.*
- Daneels, A. & Salter, W. WHAT IS SCADA? *Accelerator and Large Experimental Physics Control Systems 1999 Trieste, Italy.* 339-343.
- David Bakken, Anjan Bose, Carl Hauser, Ioanna Dionysiou, Harald Gjermundrød, Lin Xu & Bhowmik, S. 2002. Towards More Extensible and Resilient Real-Time Information Dissemination for the Electric Power Grid. *In: Power Systems and Communications Infrastructures for the Future, International Institute for Critical Infrastructures, 2002 Beijing, September.*
- Ericsson, G. N. 2010. Cyber Security and Power System Communication-Essential Parts of a Smart Grid Infrastructure. *Power Delivery, IEEE Transactions on, 25, 1501.*
- Farhangi, H. Roadmap for Smart Grid in Iran. *In: 24th International Power System Conference, 2009, 2009 Tehran, Iran.*
- Galli, S., Scaglione, A. & Wang, Z. 4-6 Oct. 2010. Power Line Communications and the Smart Grid. *First IEEE International Conference on Smart Grid Communications (SmartGridComm), 2010.* 303-308.
- Haines, R., Khan K., Brooke J.M., Bringing simulation to engineers in the field: a Web 2.0 approach *Philosophical Transactions of the Royal Society, 367:1898 2635-2644, 2009*
- Heinzelman, W. R., Chandrakasan, A. & Balakrishnan, H. Energy-Efficient Communication Protocol for Wireless Microsensor Networks. *Proceedings of the 33rd Hawaii International Conference on System Sciences-Volume 8, 2000.* 820485: IEEE Computer Society, 1-10.
- Kashif Khan, Robert Haines & Brooke, J. M. A Distributed Computing Architecture to Support Field Engineering in Networked Systems. *International Conference on Complex, Intelligent and Software Intensive Systems, 2010, 54-61.*
- Kayastha, N., Niyato, D., Hossain, E. & Han, Z. 2012. Smart grid sensor data collection, communication, and networking: a tutorial. *Wireless Communications and Mobile Computing.*
- Machell, J., Mounce, S. R. & Boxall, J. B. 2010. Online modelling of water distribution systems:a UK case study. *Drinking Water Engineering and Science, 279-294.*
- Miller, J., Pullins, S. & Bossart, S. 2008. " The Modern grid " *U.S. Department of Energy, Office of Electricity Delivery and Energy Reliability.* U.S. Department of Energy, Office of Electricity Delivery and Energy Reliability.
- Nordell, D. E. 21-24 April Communication systems for Distribution Automation. *Transmission and Distribution Conference and Exposition, 2008. IEEE/PES, 2008.* 1-14.
- Parikh, P. P., Kanabar, M. G. & Sidhu, T. S. 25-29 July 2010. Opportunities and challenges of wireless communication technologies for smart grid applications. *Power and Energy Society General Meeting, 2010 IEEE, 2010.* 1.
- Pourmirza, Z. & Brooke, J. 2012. AN EXPERIMENTAL COMMUNICATION ARCHITECTURE FOR MONITORING AND CONTROL OF SUB-GRIDS. *1st International Conference on Smart Grids and Green IT Systems, 2012a Porto, Portugal.* 67-72.

- Pourmirza, Z. & Brooke, J.M. 2012b. Integration of Wireless Sensor Networks and Local Computational Unit in the Communication Network of the Smart Grid. *1st Conference on Applied Radio Systems Research*. Manchester, UK.
- Pourmirza, Z. & Brooke, J.M. 2013. The Wireless Sensor Network and Local Computational Unit in the Neighbourhood Area Network of the Smart Grid. *2nd International Conference on Sensor Networks (SENSORNETS 2013)*, 2013 Barcelona, Spain. 84-88.
- Qiu, M., Gao, W., Chen, M., Niu, J. W. & Zhang, L. 2011. Energy Efficient Security Algorithm for Power Grid Wide Area Monitoring System. *IEEE TRANSACTIONS ON SMART GRID*, 2, 715-723.
- Raghunathan, V., Schurgers, C., Park, S. & Srivastava, M. B. 2004. ENERGY EFFICIENT DESIGN OF WIRELESS SENSOR NODES. *Wireless Sensor Networks*. Kluwer Academic Publishers, 51-69.
- Reed, G. F., Philip, P. A., Barchowsky, A., Lippert, C. J. & Sparacino, A. R. 11-13 Oct. 2010. Sample survey of smart grid approaches and technology gap analysis. *Innovative Smart Grid Technologies Conference Europe (ISGT Europe), 2010 IEEE PES*, 2010. 1.
- Stoianov, I., Nachman, L., Madden, S. & Tokmouline, T. PIPENETa wireless sensor network for pipeline monitoring. *Proceedings of the 6th international conference on Information processing in sensor networks*, 2007 Cambridge, Massachusetts, USA. 1236396: ACM, 264-273.
- Tan, Y., Shi, Y., Chai, Y., Wang, G., Liu, J., Wang, J., Li, N. & Chen, Z. 2011. Research and Validation of the Smart Power Two-Way Interactive System Based on Unified Communication Technology. *Advances in Swarm Intelligence*. Springer Berlin / Heidelberg.
- Veleva, S. & Davcev, D. 2012. Implementation Perspectives of Wireless Sensor and Actuator Networks in Smart Grid. *Advanced Materials Research*, 433 - 440, 6737-6741.
- Yang, Q., Barria, J. A. & Green, T. C. 2011. Communication Infrastructures for Distributed Control of Power Distribution Networks. *Industrial Informatics, IEEE Transactions on*, 7, 316-327.
- Youssef, M. A., Younis, M. F. & Arisha, K. A. 2003. Performance Evaluation of an Energy-Aware Routing Protocol for Sensor Networks.



# Effect of soil stiffness on the behaviour of integral bridges under earthquake

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## Abstract

An important consideration for the design of earthquake resistant structure is the condition of the soil the structures are built on for a considered maximum earthquake shaking. Earthquakes create ground movements that can be dangerous for structures, including bridges. In recent years, considerable research about earthquake and soil structure interaction effects has been conducted. In this study, the effect of earthquake on integral bridges built on several different soil conditions is examined, through computer simulation of an integral abutment bridge. The study is made based on Eurocode 8, which provides data for different types of soil to be recommended for earthquake analysis. A symmetrical medium length integral bridge obtained from an existing structure is used to be analysed and modelled. To create an artificial earthquake, a 0.35 g peak ground acceleration is applied to the structure.

The method used was arranging a simulation for a synthetic time history for 5 different types of soil by using Mathcad. The synthetic acceleration time history will be validated by Seisomsoft, a software which allows users to create their own library of ground motion records. This time history is then applied to ANSYS (engineering simulation software) to get the response from the bridge. The results show that lower stiffness soil suffers a worse effect from the earthquake compared to a soil of higher stiffness, because lower stiffness soil yields a larger deflection. It also tends to amplify ground shaking. Therefore, it can be concluded that the damage will usually be more severe on soft soils in comparison to a soil higher stiffness.

## Keywords

Soil stiffness, integral bridge, dynamic load

## 1. Introduction

Integral abutment construction has become an increasingly popular alternative in recent years to conventional construction, and has been applied and constructed largely over the world. Frosch et al. (2009) stated that a recent survey indicates that there are over 13,000 integral abutment bridges in service in the United States. In addition, many integral bridges were built in the United Kingdom, Germany and other European countries. The United Kingdom even states in the advice note BA 42/96, published by the Highway Agency titled 'The design of Integral Bridges, that in principle all bridges should be in continuous over intermediate supports, and bridges with overall lengths not exceeding 60 m and skewed by an angle not exceeding 30° are to be integral with their abutments.

Considering that integral bridges can be constructed in earthquakes zones, the interest of bridge engineers to conduct research and expand possibilities of application of integral bridge in another part of the world has been increased. Much research has been done in this subject and yet still there is a need to study further and gain more knowledge and understanding about earthquakes and integral bridges. Its unique characteristics, such as higher redundancy, rigid connection, its strong relation with the soil behind the abutments, drives researchers to study this structure even more.

An earthquake can cause displacement in the supports of the bridges. Displacement is the difference between the initial position of the support point and any later position. Dangerousness of the displacements depends on the position of the structure and the magnitude of the earthquake. If a structure is subjected to a displacement as can be seen in Figure 1, the overall structure will be struggling by yielding to internal forces such as bending moments and shear forces. This condition is related to the equilibrium and at any point in time the total work done by the external loads must equal the kinetic and strain energy stored within the structural system plus any energy that has been dissipated by the structure.

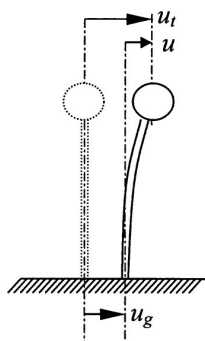


Figure 1. – Displacement of structure under ground motion.

Supports of the bridges always stand on different kinds of soil. This research is conducted to study the effect of different soil conditions to the behaviour of integral bridges, especially by referring to Eurocode 8. Eurocode 8 gives guidance relating to seismic motion acted on 5 different types of ground, as can be seen in Table 1 below.

Ground type	Description of stratigraphic profile
A	Rock or other rock-like geological formation including at most 5 metres of weaker material from the surface.
B	Deposits of very dense sand, gravel or very stiff clay, at least several tens of metres in thickness, characterised by a gradual increase of mechanical properties with depth.
C	Deep deposits of dense or medium dense sand, gravel or stiff clay with thickness from several tens to many hundreds of metres.
D	Deposits of loose to medium cohesionless soil (with or without some soft cohesive layers), or of predominantly soft to firm cohesive soil.
E	A soil profile consisting of a surface alluvium layer with $v_s$ values of $\leq D$ and thickness varying between about 5 to 20 metres, underlain with stiffer material with $v_s \geq 800$ m/s

Table 1. – Types of soil (Source, Eurocode 8).

## 2. Methods

The method used is arranging a simulation for a synthetic time history for 5 different types of soil by using Mathcad. The synthetic acceleration time history will be validated by Seissoft, a software, which allows users to create their own library of ground motion

records. This time history is then applied to ANSYS (an engineering simulation software) to get the response from the bridge.

The design spectrum is an important parameter in the seismic code. The earthquake induced ground shaking is generally represented in the form of acceleration design spectra or displacement design spectra. Earthquake parameters such as soil condition, epicentral distance, magnitude, duration and source characteristics influence the shape and amplitudes of response spectra. While the effects of some parameters may be studied independently, the influences of several factors are interrelated and cannot be discussed individually. As it is known, the damping ratio and the structural vibration period are the other parameters affecting the response spectra.

In all current seismic codes the earthquake actions are represented in the form of a spectrum of absolute acceleration. EC8 defines two types of spectra: Type 1 for the far field and Type 2 for the near field. If the earthquakes that contribute most to the seismic hazard, defined for the site for the purpose of probabilistic hazard assessment, have a surface-wave magnitude  $M_s$  not greater than 5.5, it is recommended that the Type 2 spectrum is adopted, if not, Type 1 is recommended.

For this study, a concrete bridge with three spans located in India (Tandon, 2005) was used as a basis for a parametric study to determine the influence of variables encountered in an integral bridge such as relative displacements, different type of earthquake accelerations and soil spring conditions. India is a region of high earthquake risk, and is comfortable to use one of its existing integral bridges to be analysed in this study. The bridge is an existing pre-stressed and pre-cast concrete integral bridge, which has had some modifications and assumptions to fit it into the study.

The bridge consists of three 20 meter spans, which are supported by 4 reinforced concrete piers. The piers are constructed on a pile cap, which has 2 piles. The height of the piers is 7 metres and they are 750 mm in diameter. Meanwhile, the piles consist of 6 cylindrical concrete piles, which are 800 mm in diameter. The density of the concrete is 2400 kg/m<sup>3</sup>. The superstructure of the bridge is the combination of eleven concrete girders and concrete slabs. The slab depths and heights are 150 mm and 8400 mm, respectively.

The bridge is analysed in a 2D analysis. The system considered is the idealised representation of a bridge existing along the longitudinal direction. In order to simplify the analysis, all piers are assumed to have equal lateral stiffnesses, and each of them carries a portion of deck mass,  $m$ . The bridge deck is assumed to be substantially stiffer than the piers, which are built into the girders. The assumption of a rigid deck greatly simplifies the dynamic analysis of the system by restricting the rotational degrees of freedom at the top of the piers.

To evaluate the seismic response of the bridge, elastic analyses were performed by the response spectrum method, using the computer program ANSYS (version 12). The degrees of freedom at the base nodes are fixed, for other nodes are left free. Therefore, there is no finite element model for subsoil to consider soil-structure interaction. Piers and girders are modeled with beam elements. Slabs have been considered as rigid beams and assumed as in unity with the girder. In the analysis, Young's modulus and the unit weight of concrete are taken to be 30000 MPa and 24 kN/m<sup>3</sup>, respectively. The damping ratio is assumed as 5% in all modes. It is assumed that the bridge is sited in a high seismicity zone, so the reference peak ground acceleration is taken to be 0.35 g, recommended in high seismicity zones.

### **3. Results and Discussion**

Figure 2 below is the response spectrum of 5 different soil conditions, according to Eurocode 8. A response spectrum is a plot of the peak values of the response (displacement, velocity, acceleration) of a number of SDOF systems with different natural vibration periods subjected

to the same seismic input. Therefore, an acceleration response spectrum represents the peak accelerations for that suite of SDOF systems, with a range of natural periods that may be exhibited when subject to a given ground motion component. This response spectrum from the study is derived from 5 different synthetic displacement time histories, relating to 5 different soil types. The results show that soil type A has the lowest response spectrum, meanwhile soil type E has the highest response spectrum.

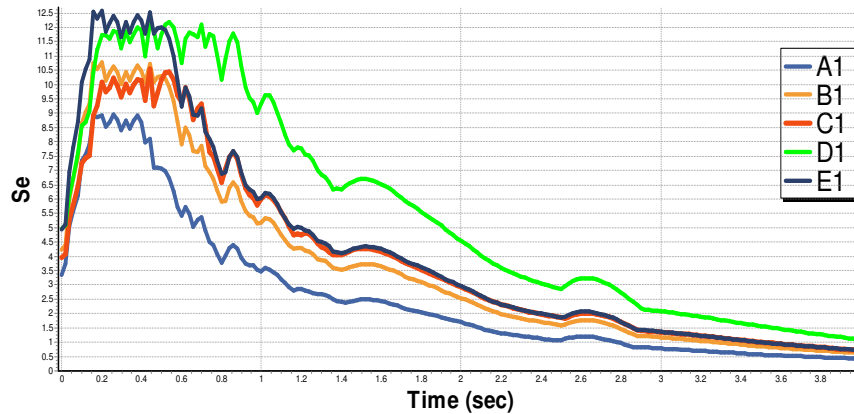


Figure 2. – Response spectra from the analysis.

In case of the displacement, Figure 3 describes the maximum displacement that have resulted in different types of the soil. The graph shows the relationship between maximum displacement of the bridge and the type of soil the bridge is built on. Soil type 1 indicates soil type A in Eurocode 8, soil type 2 refers to soil type B, and so on, with soil type 5 which indicating soil type E in Eurocode 8. In can be seen from Figure 3 that soil type A, as the hardest soil of the bridge support, suffers the minimum displacement, while soil type 4, which means soil type, D has the maximum displacement.

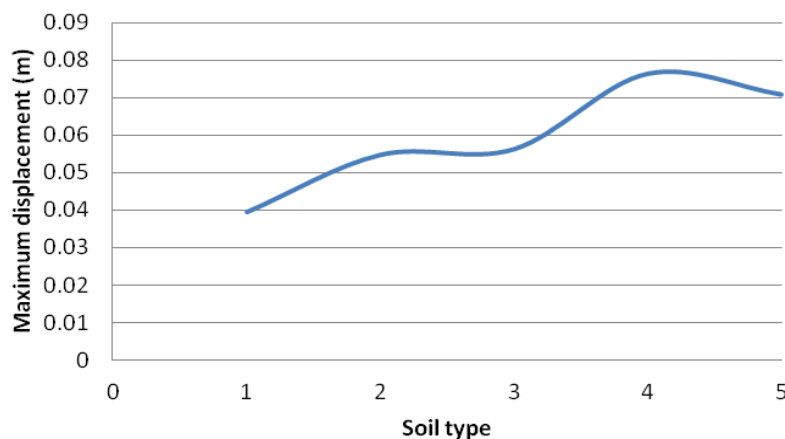


Figure 3. – Maximum deflection comparison of the bridge under different soil conditions.

The results show that lower stiffness soil suffers the worst effect of an earthquake compared to higher stiffness soil, because lower stiffness soil yields a larger deflection. It also tends to amplify ground shaking. Therefore, it can be concluded that the damage will usually be more severe on soft soils in comparison to higher stiffness soils.

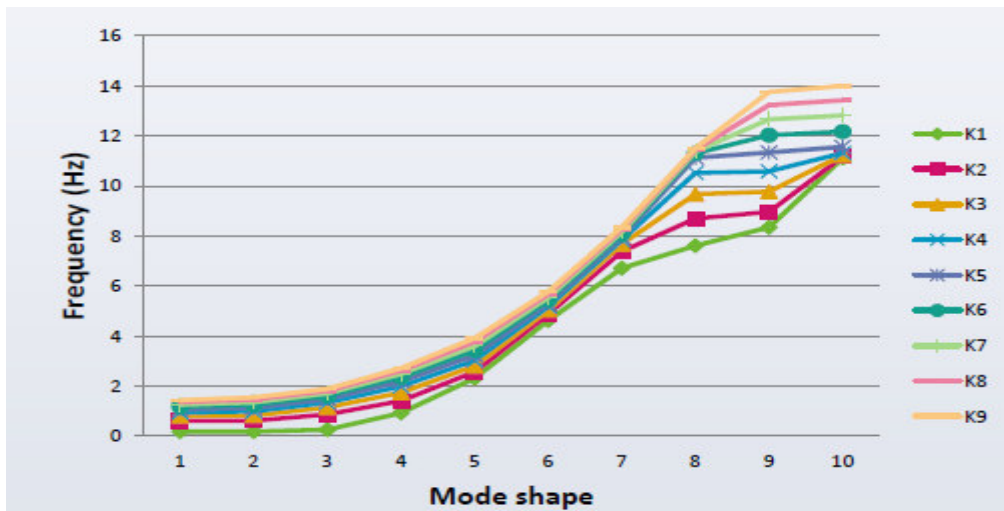


Figure 4. – Frequency comparison of mode shapes for different stiffnesses.

In Figure 4 ten different mode shapes are plotted relating to nine different soil stiffnesses. It is clearly seen that the frequency increases when the stiffness is increased. K1 to K9 in Figure 4 above describe the condition of the soil stiffness from lowest to highest, and the results show that the highest stiffness, namely K9, gets the highest value of frequency.

#### 4. Conclusions

The results show that a lower stiffness soil faces the worse effect of an earthquakes compared to a higher stiffness soil, because a lower stiffness soil yields a larger deflection. It also tends to amplify ground shaking. Therefore, it can be concluded that the damage will usually be more severe on soft soils in comparison to higher stiffness soils.

#### References:

- Algerio, H.J. (1990). *Earthquakes: An Architect's Guide to Nonstructural Seismic Hazards*. Willey Interscience, New York
- Burke, M.P. Jr. (2009) *Integral and Semi-Integral Bridge*, Willey-Blackwell, Singapore
- Collier, C.J. and Elnashai, A.S. (2001). A Procedure for Combining Vertical and Horizontal Seismic Action Effects, *Journal of Earthquake Engineering*, Vol. 5 (4), pp. 521-539
- Chopra, A. (1995). *Dynamic of Structures: Theory and Application to Earthquake Engineering*. Prentice Hall, New York
- Frosch, (2009). *Earthquake Resistance of Integral Abutment Bridges*. Technical Report. Purdue University
- Goel. R.K. (1997). Earthquake Characteristics of Bridges with Integral Abutments. *Journal of Structural Engineering*, 123.11, pp. 1435-1443.
- Rahai, A. (2004). Effect of Earthquake Vertical Motion on RC Bridge Piers. Paper presented at 13th World Conference on Earthquake Engineering. Vancouver, B.C., Canada.

# **Building Schools for the Future – government schools investment programme 2005/2010**

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## **Abstract**

This Educational Doctorate is based on the ‘transformational’ aspects of Building Schools for the Future (BSF), namely, ‘flexible buildings’, ‘innovative teaching and learning’ and ‘the use of Information and Control Technology’, through an ethnographic study of two comprehensive schools amalgamating in a Local Education scheme. This paper focuses on ‘flexible buildings’ and looks at the history of school building through a range of school architecture literature, the practice built up through the Ministerial Office responsible for school building after World War II, the Architects and Building Branch, with their research and development of prefabricated school building and the publication of Building Bulletins and its subsequent closure. It compares this to the free for all of BSF as concluded by the James Report 2010. By comparing other schools built in the first wave of BSF to the subject school, with a particular interest in the Science and Technology facilities, this study will indicate how the environment affects the curriculum, acoustics and well-being of both staff and pupils. Data was collected through questionnaires and interviews of the staff as they were about to close their original school and a year after occupying their new school, based on the PriceWaterhouseCoopers Annual Review of BSF. This data is being used to analyse the facility and make comparisons to other BSF schools and will be drawing on similar studies conducted by Organisation for Economic Co-operation and Development. The findings show that open-plan school buildings are less flexible and do not meet the needs of teachers or pupils and that teachers prefer classrooms situated in subject bases in modern traditional buildings. Furthermore, the school building only plays a small part in pupil attainment and it is false to claim that building a new school will raise school performance.

## **Keywords**

Flexible, innovative, multi-option, open-plan, transformational

## **1. Introduction**

This Educational Doctorate study examines the impact of Building Schools for the Future which was established by the previous Labour Government. This was the biggest school buildings programme at least for a generation, subsequently cancelled by the coalition government but not before a huge investment had been secured. The programme was based on the concept that new buildings would have an impact on school outcomes and would allow new approaches to teaching. The study asks did the ‘transformational’ dream of ‘flexible buildings’, ‘innovative teaching and learning’ and ‘improved use of ICT’ realise? Partnerships for Schools (PFS), the government's delivery agent for capital investment programmes into schools, described ‘transformational’ as ‘this involves a creative and innovative workforce engaged in developing new approaches to learning, teaching and working, while also making enthusiastic use of new technologies and facilities and forging new relationships with parents, carers, communities and a range of partners within, across and beyond schools’.

### 1.1 What was Building Schools for the Future?

The BSF programme aimed to rebuild and refurbish facilities and provide new Information Technology for all 3,500 secondary schools in England by 2020. The National Audit Office claimed that to include all schools in the programme, 250 schools would need to be built every year.

### 1.2 What was the capital investment of BSF?

The New Deal for Schools was a first attempt by the new Labour Government, elected in 1997 after nearly 20 years of Conservative rule, to show its commitment to its Manifesto promise of ‘education, education, education’. Within this David Blunkett, the Education Secretary, announced details of the Local Education Authorities which would share £115m (£163m at today’s value) to repair, replace or renovate over 2,000 schools (£115m made up of £83m (£118m) New Deal for Schools in England and £32m (£45m) partnership funding from other sources). This was Phase 1 of a £2billion (£2.84b) programme of capital investment announced by the Chancellor in his Budget statement on 2nd July 1997. This was dwarfed by the BSF programme which was introduced in 2003 when the Government committed itself to renewing, rebuilding and refurbishing the entire secondary school estate in England. The Government declared that BSF would be one of the largest and most ambitious building programmes in the world and was likely to cost the taxpayer around £55 billion (up from the original estimate of £45 billion, when it was first launched). Tony Blair, the Prime Minister, called it “the greatest school renewal programme in British history”. Building began in the fiscal year of 2005/06 and the graph shows the Government spending budget compared to GDP. It can be seen clearly in the graph that it was at this point that Government spending veered away from the GDP trend. The average total cost of the new school buildings were £27.5million and the total capital cost of each BSF school averages £1,850 per square metre, compared to £4million the average total cost of refurbishment.

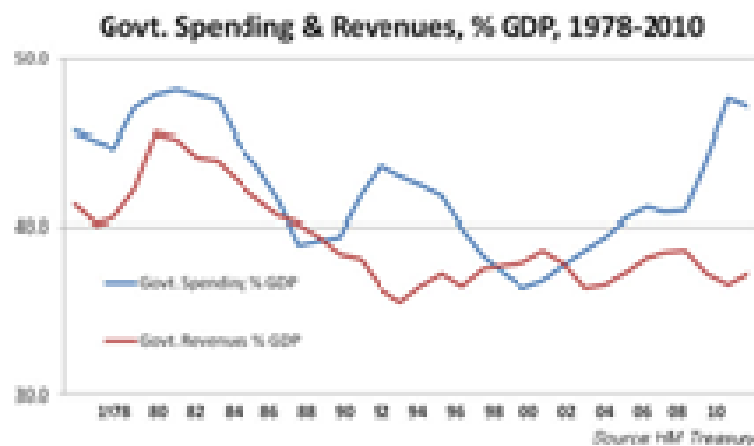


Figure 5: Government spending during BSF programme

Soon after the formation of the Coalition Government in 2010 it articulated a halt in BSF school building. By this time only 178 schools had been rebuilt or refurbished with a further 231 still in construction when Michael Gove the Education Secretary stated that ‘all Building Schools for the Future projects that had not reached ‘financial close’ would be scrapped and a further 123 academy schemes would be ‘reviewed’.

### ***1.3 What were the intentions of BSF?***

The intentions of the scheme were to transform the education experience of secondary school children and raise pupil performance by building schools that were flexible, which could provide opportunities for innovative teaching and learning and an investment in the use of Information and Control Technology. It was stated that this would be achieved in 15 waves of investment starting with waves 1-3 intended for the most deprived areas of the country.

## **2. Literature Review**

This paper concentrates on school buildings with the ultimate aim of understanding what it means for a school building to be flexible. The literature of school buildings can be broken down into two types;

- Sociological
- Technical

### ***2.1 Sociological school building literature***

From a sociological point of view the researcher tries to interpret the social feeling of the time to analyse the reason for the decisions made about the school building programme. Malcolm Seaborne in *The English School, Its Architecture and Organisation, 1370 – 1870* shows how public schools for the wealthy led to the beginnings of public schools for a welfare state. ‘Even schools of little or no architectural interest are important sociologically, since the changing architecture of schools reflects changing ideas about how children should be educated and organized for teaching purposes’.

Ron Ringshall in *The Urban School, Buildings for Education in London 1870 – 1980*, shows how a local public office is manipulated by Government political policy, but due to restrictions of both space and finance its decisions on the provision of school buildings are limited. He includes architects evaluations and studies of schools built in the area that was known as the Inner London Education Authority, determining that this area was worthy of study because of its unique urban restrictions, the authorities’ changing views on educational philosophy and the caps imposed on building costs.

Andrew Saint in *Towards a Social Architecture, The Role of School Buildings in Post-War England* shows how a nondescript Local Authority initiative determined the national policy for school building in the aftermath of World War II and the baby boom that followed. ‘The post-war schools building program was the most ambitious yet... policy-makers, architects, industrialists and builders combined in setting on foot great programmes of building which were intended to improve the environment and life not just of a few but of the whole British people’.

Colin Ward in *British School Buildings, Designs and Appraisals, 1964 – 1974* shows how constant Government legislation led some local planning committees to build experimental school buildings that have not stood the test of time or weathered the changing political climate. For instance a recommendation by the Plowden Report in 1967 proposed the provision of separate schools at key points, which inaugurated the provision in some authorities of middle schools. These ‘critical points’ corresponded with expected stimuli at certain ages in animals and once activated, remained as experiential forever, pseudo-scientific research was referred to in the report, such as that on cats.

Mark Dudek in *Architecture of Schools, The New Learning Environment* shows the difficulties faced by architects when asked to interpret educational briefs that want the best of all worlds. ‘The architect has an almost impossible task when it comes to designing the



ultimate flexible classroom, one which at the drop of a hat can be turned from group discussion or to one for individual study where background noise cannot be tolerated, to a large space where the whole class or more can participate in large scale activities’.

The mutual outcome of these classic school architecture books, written by architects, is the authors’ inexperience of life in school and so they all agree that it is imperative for architects to spend time in schools studying the interaction, understanding the tensions and observing the good and bad, before truly understanding the needs of the inhabitants.

## ***2.2 Technical school building literature***

From a technical angle the literature tends to consist of official Government recommendations and regulations and technical studies by architectural professionals that concentrate on the justification for or the consequence of a building concept or construction method. Examples of this are *The Building Bulletins* published by the Architects and Buildings Branch, on behalf of the Ministry of Education after World War II until the closure of this public office in 1993, which provided Local Authority architects and planning committees unsolicited guidance and information on best practice for school building. The *Building Bulletins* published after this date offer recommendations and regulatory advice on specification and Health and Safety restriction.

Academic studies of acoustic, environment and modelling for design of school building, such as *The Implications of Multi-Optional Schools* by OECD, Edited by Jean Ader, *Acoustic Design of Schools*, Edited by Professor Bridget Shields and P.Woolner et al, *School building programmes: motivations, consequences and implications, A Report by the Centre for Learning and Teaching* highlight the links between environment and teaching and learning.

The conclusion from this literature is the understanding that without clear regulation which has gone through open and rigorous testing and evaluation the design of school building is open to interpretation and the whim of individual gate keepers or unproven philosophy, which more often than not does not stand up to public scrutiny.

## **3. Methodology**

The data collected for this study is formulated from questionnaires and interviews of teachers in the case study school one year before closure of new school and one year after opening of new school. The questions are based on the PriceWaterhouseCoopers (PWC) Annual Reviews of Building Schools for the Future which was commissioned by the Government. The PWC study questioned Headteachers and the main stakeholders of schools and Local Authorities as they were about to start their BSF process, with an average participation of 17% from Headteachers. This study questioned teachers from a school who were part of an amalgamation with another school, both of which were to be closed and amalgamated into one with a new build. The participation rate for the first questionnaire was 38% and the follow up was smaller due to teachers leaving and school management refusal. Interviews were held with a selection of teachers just before the closure of the school. Follow up interviews were held with a selection of teachers from this cohort. The data is corroborated by empirical data of the ethnographic case study as the researcher was teaching in the study school up to school closure. The quantitative evidence from the different elements of the study was compared to evaluate the effect that the programme has had one year after the programme’s realisation. Architectural plans of new schools involved in waves 1-3 have been requested from different architectural firms in order to compare facilities across the BSF programme to look for evidence of the programmes transformational criteria.

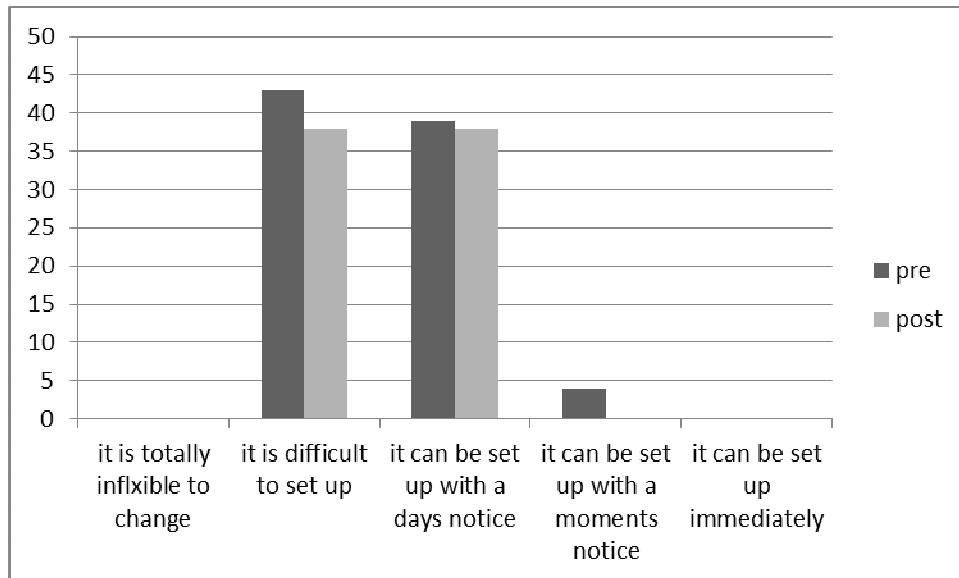
## 4. Findings

The following questions were asked to the teachers: on the left are pre-amalgamation percentage responses and on the right post amalgamation, accompanied by some of the teacher's responses during the various qualitative interviews carried out.

### 4.1 PWC focus – flexible design

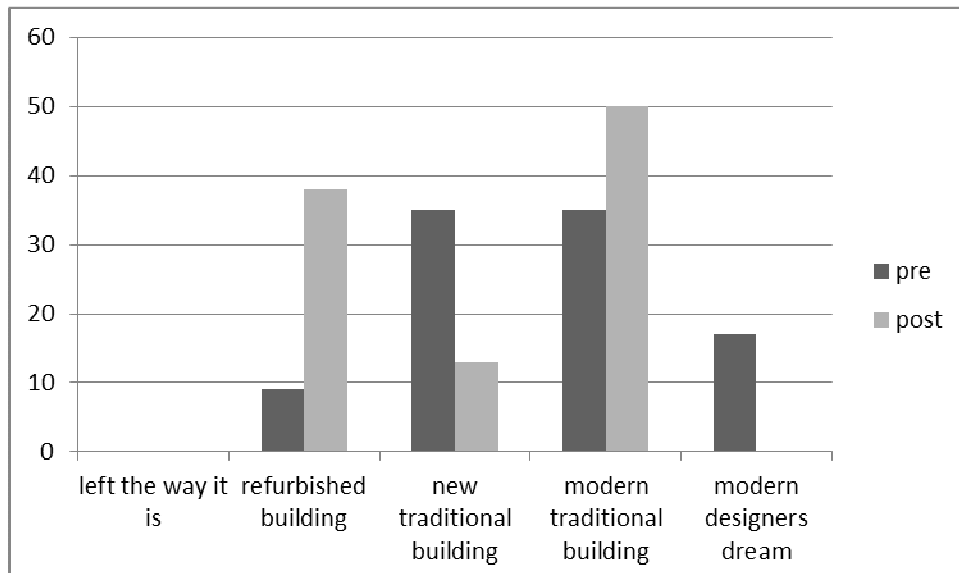
The flexible design aspect of BSF is intended to support innovative teaching and learning;

Q. How flexible is the school building for innovative teaching and learning?



Note the new school is just as difficult to set up, a teacher said “open-space is unworkable due to the distraction and disruption”.

Q. What type of building do you prefer?

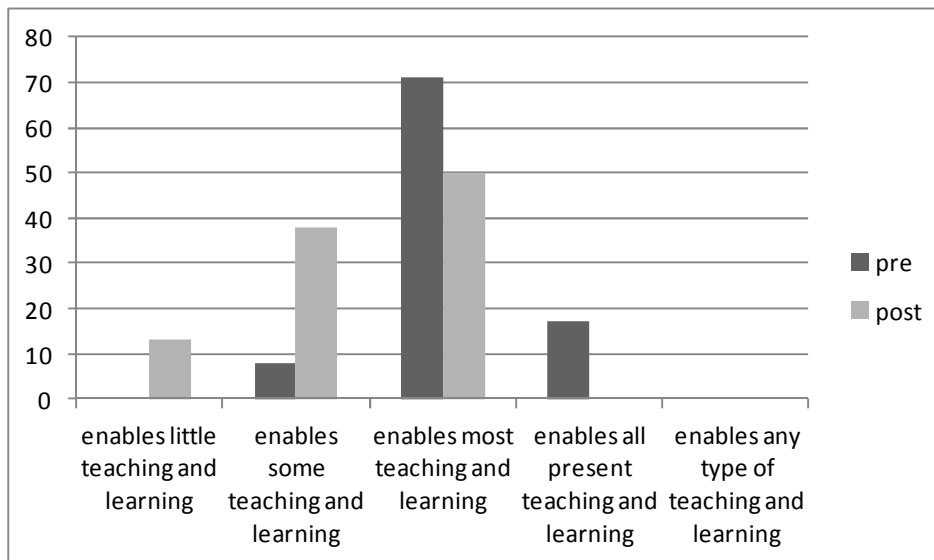


Note, how the refurbishing option has increased, one teacher replied “Home Bases are being used as department bases, instead of ‘topic based learning’, nobody takes ownership, they should be converted to classrooms”.

#### 4.2 PWC focus - buildings ability to cope with new teaching and learning and raise pupil performance

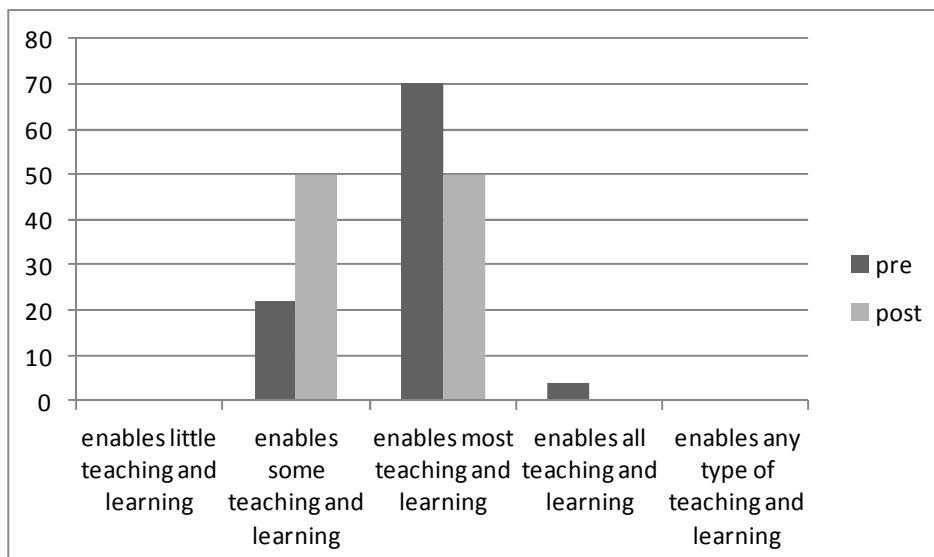
The PWC review claims that the school estate, especially those buildings built more than 25 years ago cannot cope with modern developments in teaching and learning. It also makes reference to study that new buildings contribute to pupil performance, although it does also admit that the same effect can be brought about through refurbishment.

Q. How suitable is the school for traditional teaching and learning?



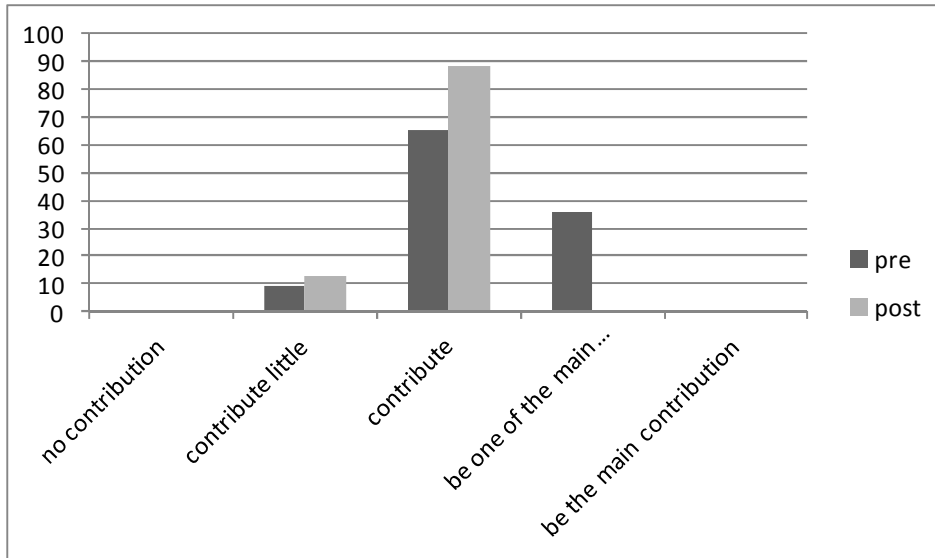
Note how the new building has reduced the ability to teach a class, a teacher said, “it takes five minutes to get concentration when someone walks past”.

Q. How suitable is the school for modern teaching and learning?



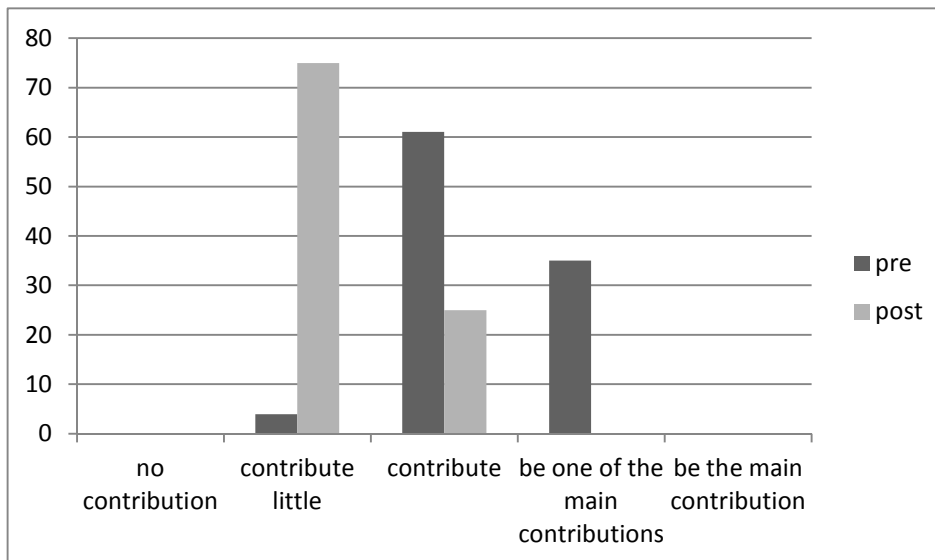
Note once again how the flexibility of teaching methods has reduced, a teacher said “you need specialist rooms to teach specialist subjects, there are constant disruptions and far too many problems in getting resources and equipment to and from learning areas”.

Q. How would refurbishing a school building contribute to pupil performance?



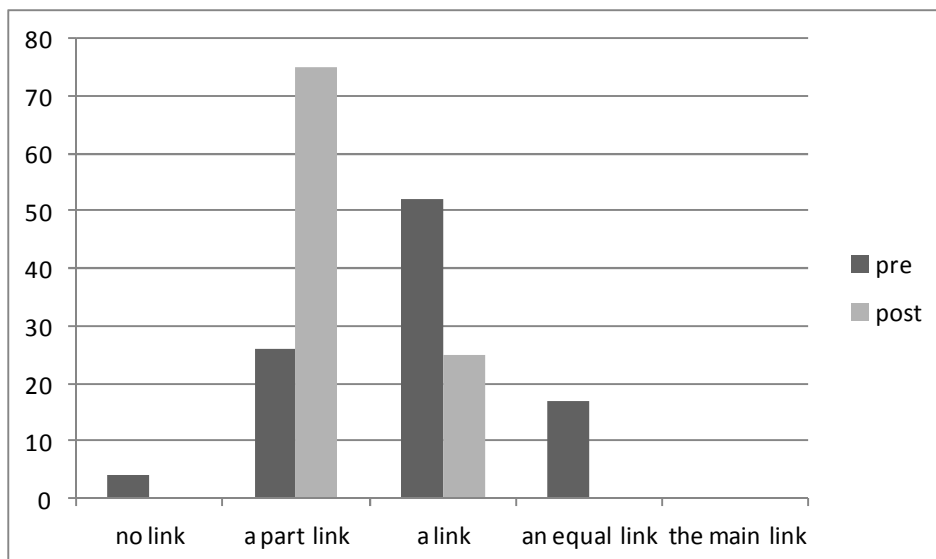
Note how the refurbishing popularity has increased.

Q. How would a new school building contribute to pupil performance?



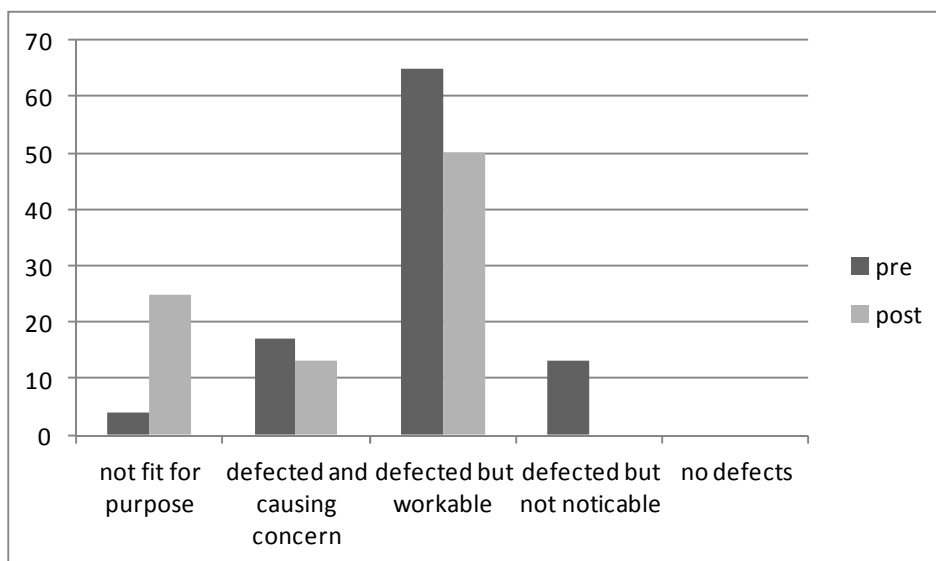
Note the massive decrease in contribution, one teacher said “the school design causes problems and hinders teaching and learning and student progress, someone somewhere should have realised that the subjects should have shaped the environment, not the building dictating the curriculum”.

Q. What is the link between school building and learning and attainment?



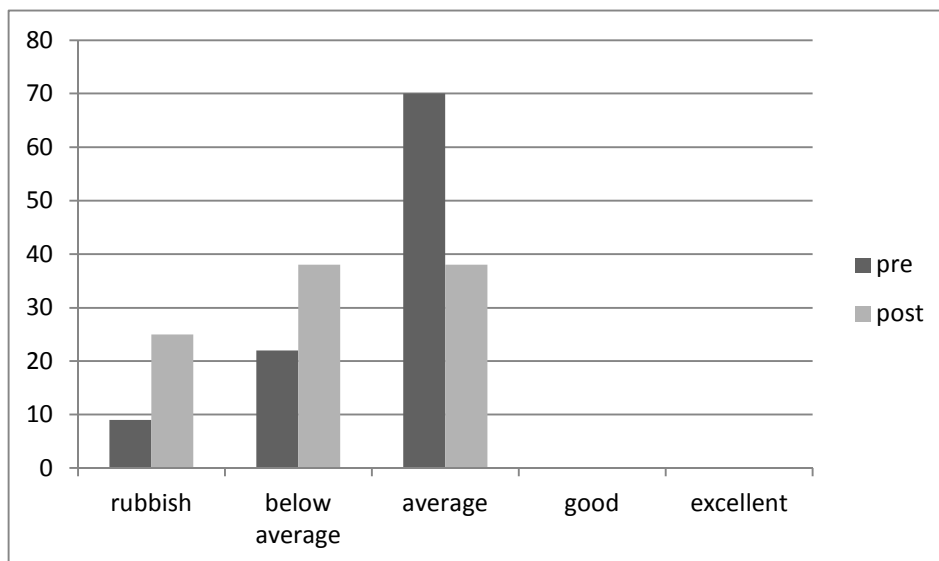
Note how little the school building is contributing, a teacher said “it is very difficult to be heard in these areas and as a consequence the pupils get distracted”.

Q. What is the condition of your school building?



Note the increase in ‘not fit for purpose’; one teacher said “it won’t last long, no classrooms where teachers are responsible”.

Q. What is the quality of your school building?

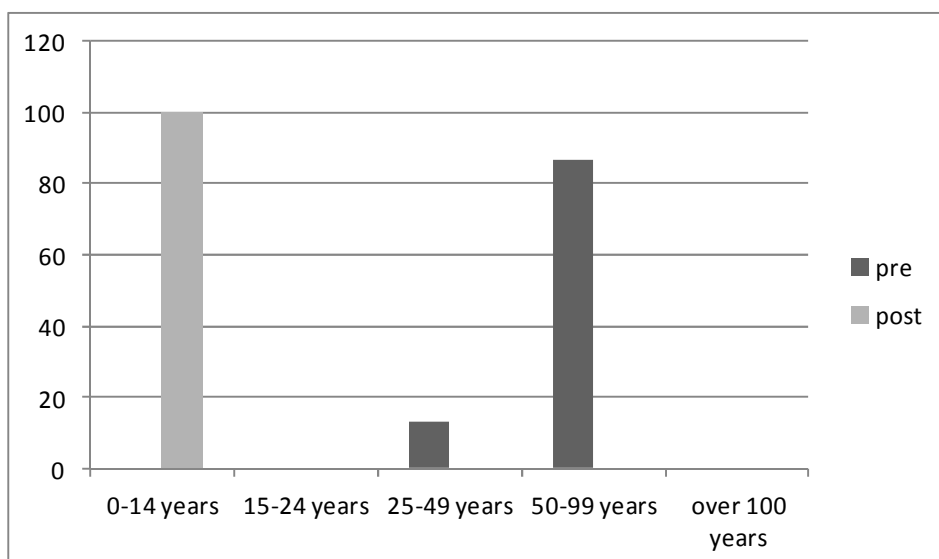


Note the increase in derogatory feeling, a teacher said “the teachers who were on the various planning committees said that the building that we ended up with was the weakest design”.

#### 4.3 PWC focus – age of building

To establish a bench mark on school building age and make a comparison between what is considered old the PWC state that ‘the vast majority of existing schools are now old (i.e. built before 1976)’.

Q. What is the age of your school building?

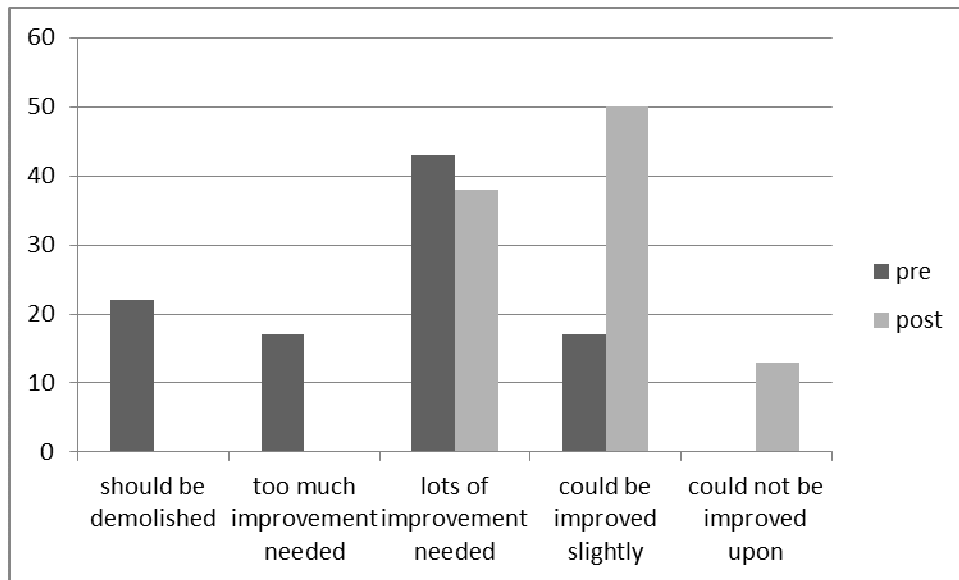


#### 4.4 PWC focus - link between the condition of school buildings and levels of attainment

It was crucial to establish the feelings of teachers to their environment, both before and after new build. Buildings can be utilised for much longer periods than has already been suggested, the perception of the teachers though indicates whether the building is worthy or not. The review states that ‘there is a clear link between the condition of school buildings and levels of attainment’. This indicates that it is the ‘condition’, not necessarily the building

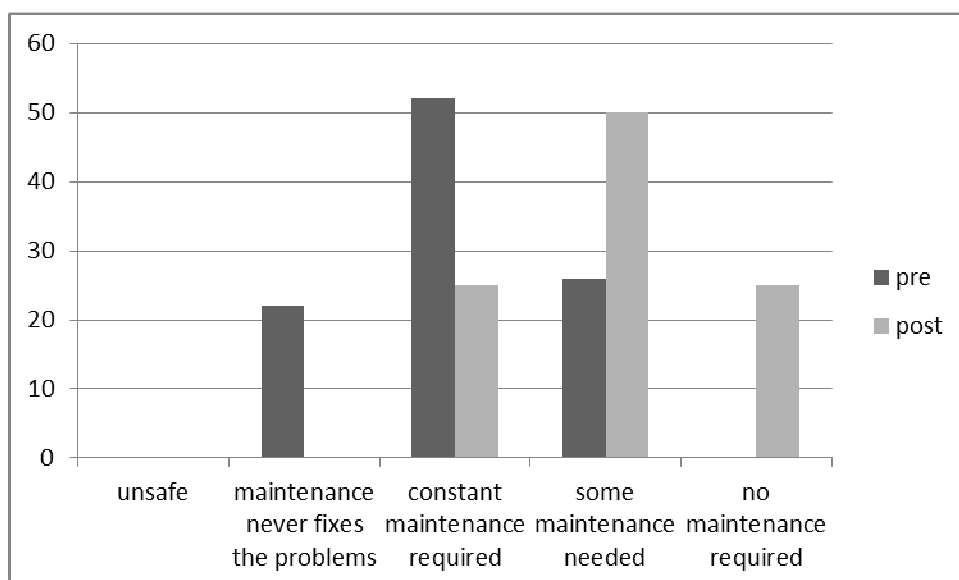
design itself that is the important factor. In other words the state of repair and the buildings ability to function as a school because of this is the most important. Generally, BSF schools are predominantly situated in low socio-economic areas, which in the main are areas of deprivation, with low employment and high amounts of street crime. This inevitably is brought into school and unless checked will reflect the poor condition of the surrounding area. As opposed to the 100 year old school buildings in middle class areas which are cared for by the occupants in day to day use and therefore require less deliberate maintenance through vandalism etc.

Q. How would you describe your school building?



Note how the new building still requires improvement or demolishing one teacher said “as teachers we are still experiencing problems of lack of storage, the building being too hot or cold, things not working, things taking too long to get sorted and the open-plan causing behaviour problems”.

Q. What condition is your school building?

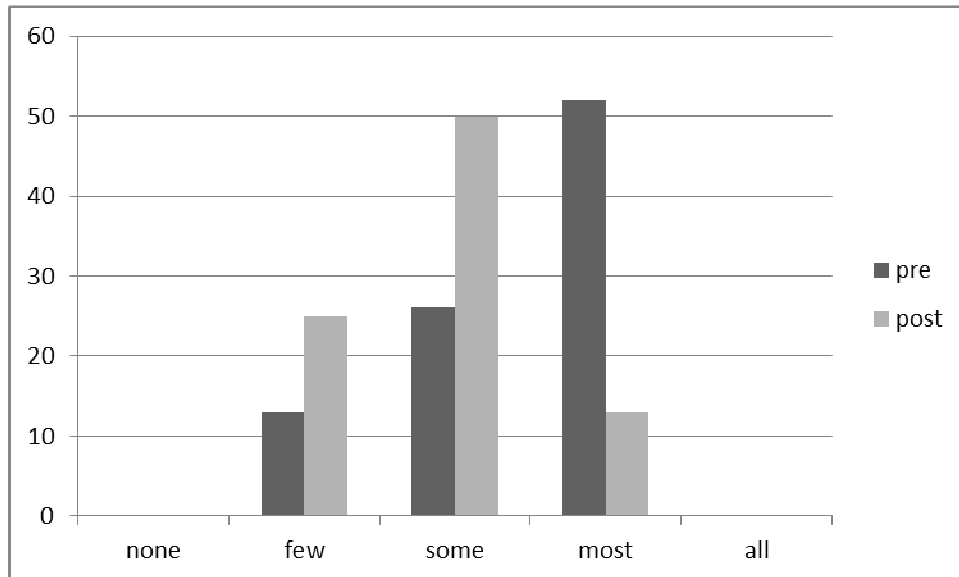


Note the requirement still for maintenance, just one year after opening a teacher said “the building is not robust and gets damaged easily”.

#### 4.5 PWC focus - stakeholders

The Review quotes stakeholders as ‘staff, pupils and the wider community’; the study was particularly interested in the teacher’s perspective of the changes about to happen to them and their involvement in the experiment.

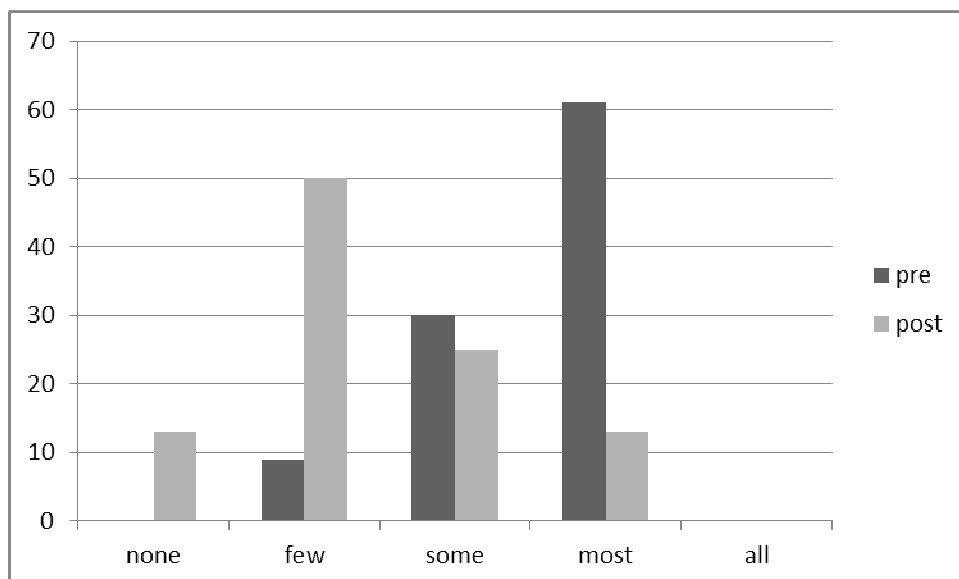
Q. Does your school building meet the needs of all stakeholders?



Note the decrease in meeting needs one teacher said they felt “a lack of control, what I mean is not having your own physical space and your own imprint on what you teach and how to teach”.

The Review states that ‘building design does impact on the attitude, behaviour and morale of staff and pupils’. The needs of staff include the necessary tools for delivering the available curriculum, which involves both abstract concepts and the physical features and functions of the environment.

Q. Does your school building meet the needs of staff?

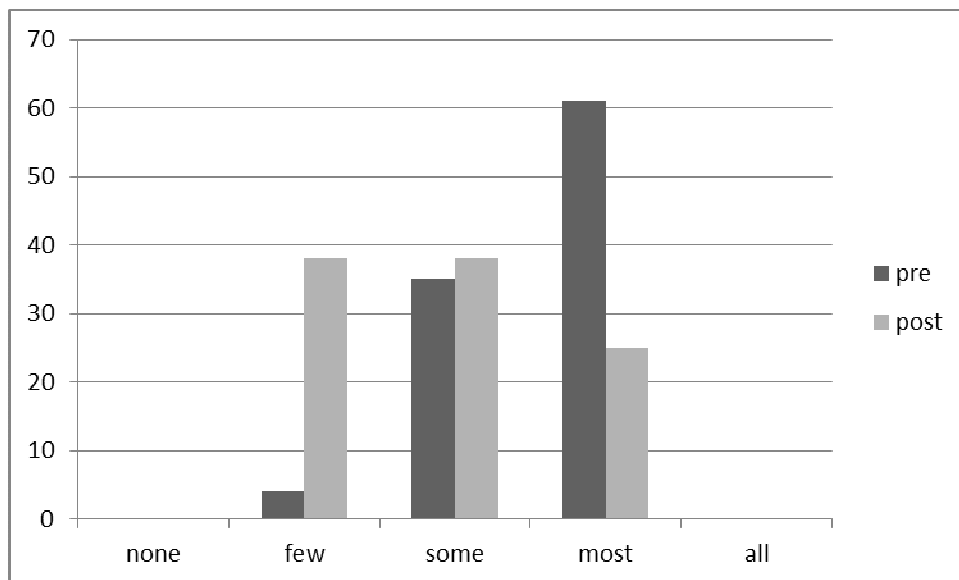


Note how little the needs are being met, a teacher said “the school already opened was changing the Home Base system, as teachers were having difficulty when going in to the children’s domain and taking control”.



It is tentative in the very least to state that a school building is crucial to teaching and learning and is able to compromise for a child's circumstances and in fact PWC admits these relationships are complex and needs more research. However, it is not beyond the realms of human ingenuity to meet some of the educational needs of children, whatever the state of a building. It is questionable whether a school building has any correlation with the children's outcomes whatsoever when taking into consideration all of the other aspects that go to make up a society.

Q. Does your school building meet the needs of pupils?

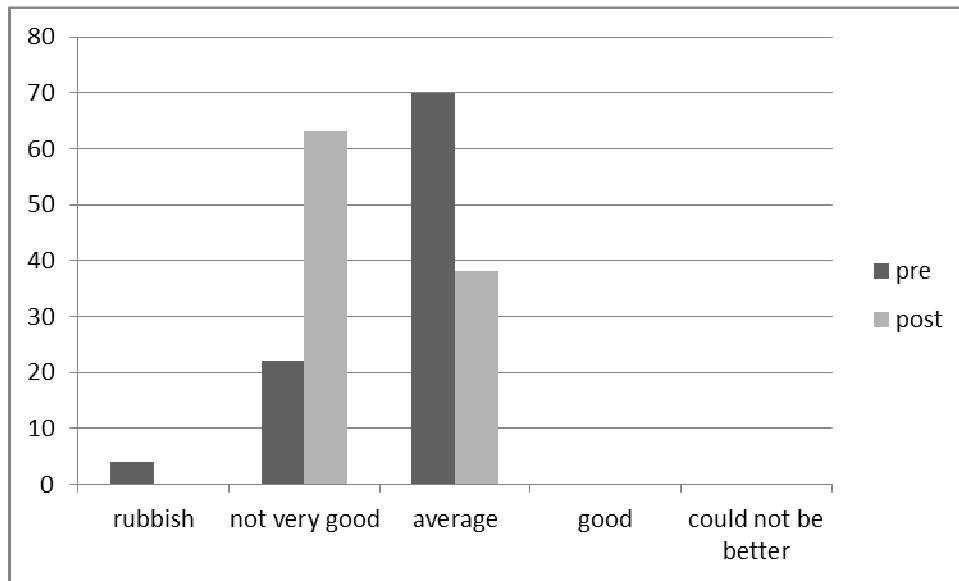


And the childrens' needs even less a teacher said "don't like the balconies, they frighten me, they can jump over them...no obvious staff toilets, sharing with children opens up a can of worms, legal wise and the idea of reinventing a teaching concept in order to participate in BSF is not right".

#### ***4.6 PWC focus – value for money***

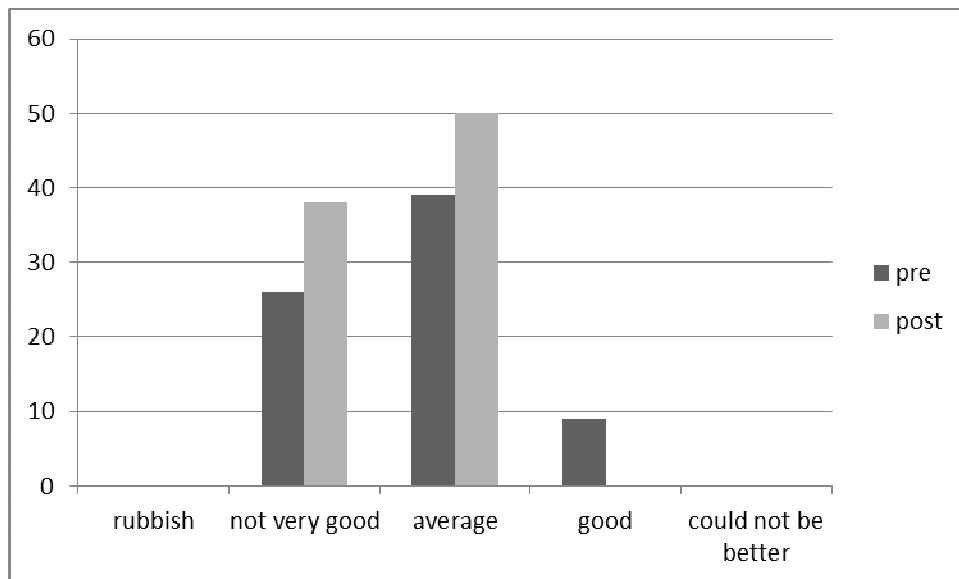
The selection process for involvement in waves 1-3 of BSF considered a number of criteria, one of which was 'deliverability of the overall package of proposals given regional market capacity and value for money'. Value for money implies an adequate or satisfactory recompense of the cost compared to the outcome and in particular in this instance the quality of design, which implies the underlying sense of purpose. In other words for the money spent whether the intentions are met and whether it meets the criteria of 'transformational'.

Q. What value of design quality would you say your school was?



Note how little the new building is liked one teacher said before the move “department will be fragmented if go with KS3 separate to KS4”.

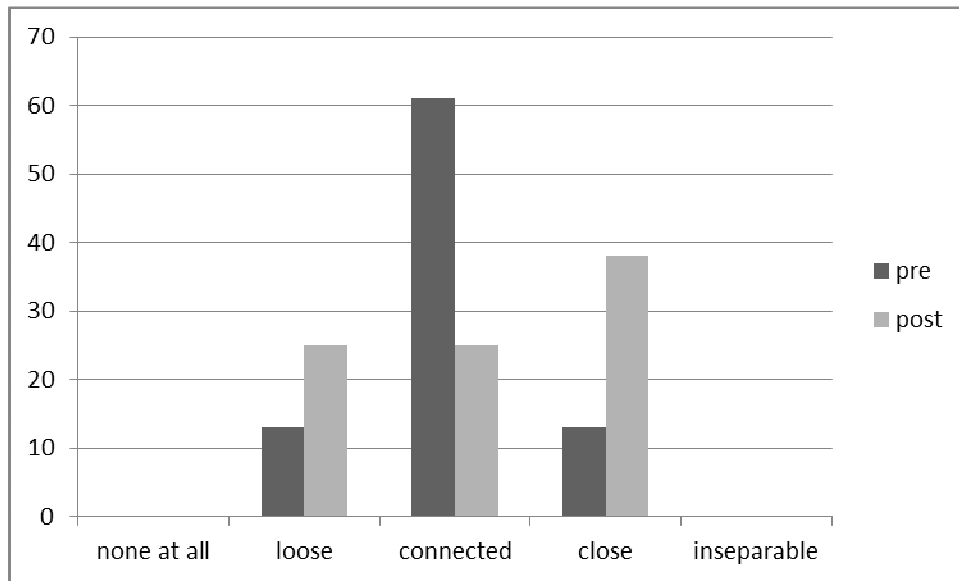
Q. What relative value has refurbishment/rebuild had?



Note how the teachers feel short changed, many teachers stated unrest, one teacher said “there is six Science staff trying to get out, Maths is in a similar position and I think Technology is the same, improving teaching and learning? I don’t think so!”

The Review stresses that there is a need for ‘better evidence’ on the causal relationship between school buildings and an effective school environment. It is too simplistic to imply that an old building is the reason for poor results and therefore if it is replaced is the only detail that should be taken in to consideration.

Q. What causal relationship does school building and effective school environment have?

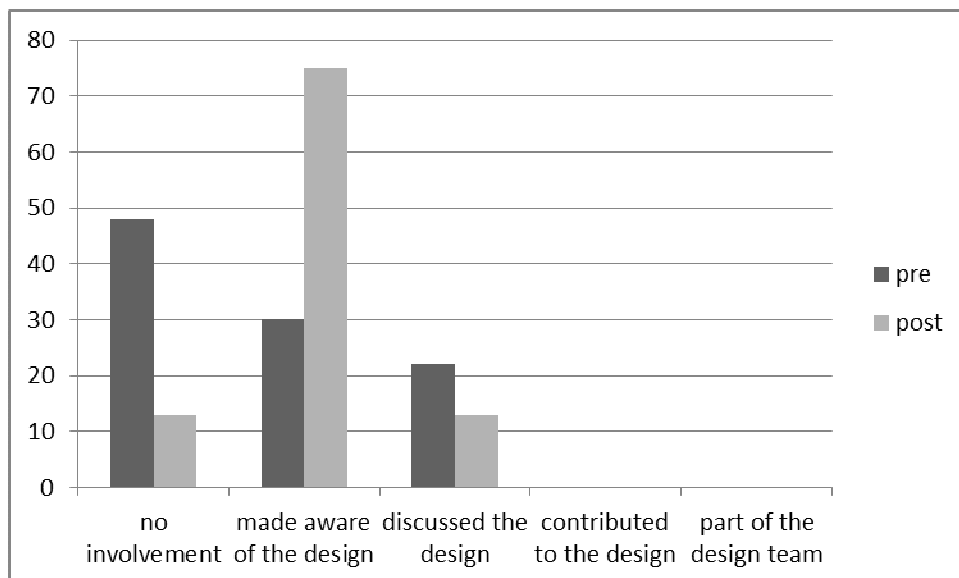


Note how the teachers are beginning to blame the building by the increase in ‘closeness’ link, one teacher said “not in the open spaces, when you are being constantly disturbed”

#### 4.7 PWC focus – stakeholder involvement

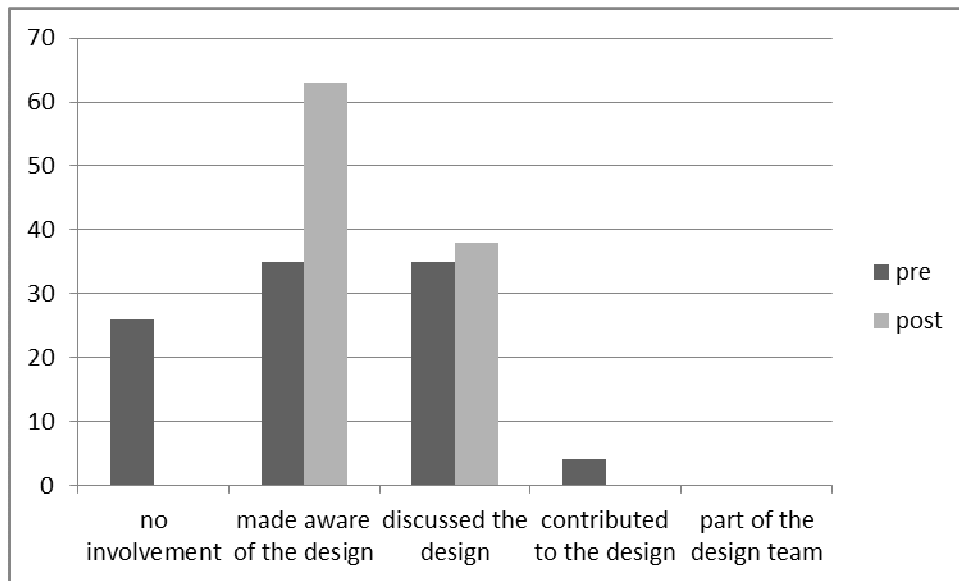
One of the ‘suggestions for the future’ by the PWC Review was ‘everyone involved (including PfS, Local Authorities and schools) should ensure more meaningful involvement of staff, pupils and other stakeholders: particularly in the design of new or refurbished buildings in order to achieve a successful outcome’.

Q. What is the extent of your involvement in the school design?



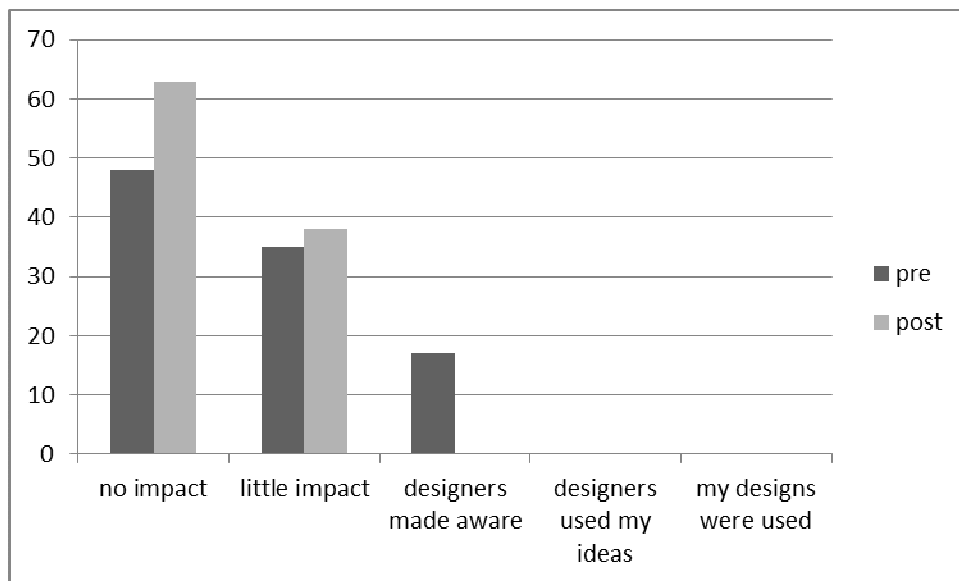
Note how few were involved, a teacher said “there were plans and a consultative meeting just prior to move, points made but nothing taken on board, just a ‘tick box’ exercise”.

Q. What is the extent of pupil involvement in school design?



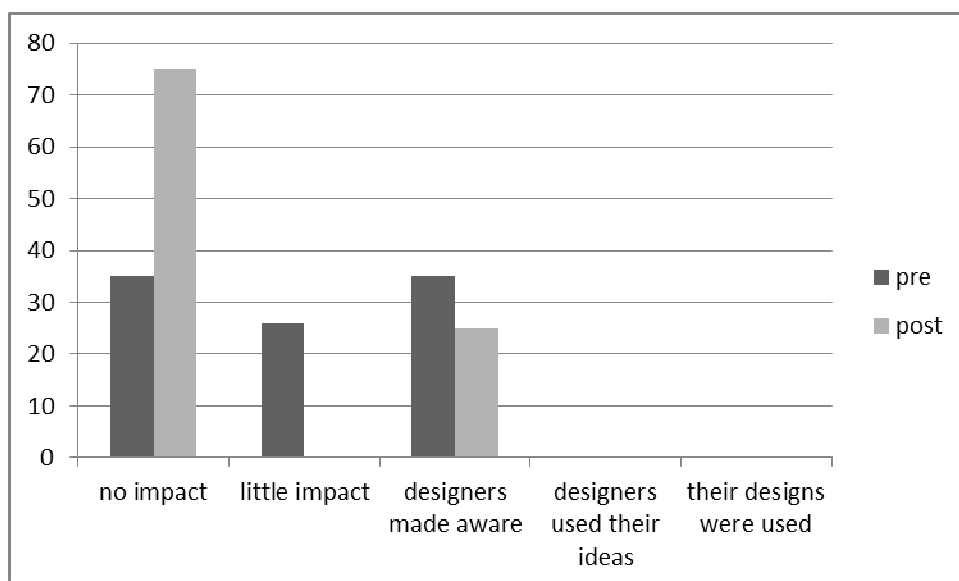
Little pupil involvement was also recorded by the teachers.

Q. What impact has your involvement had?



The teachers were left out of the decisions one teacher said “I’ve always believed that the curriculum should shape the building and not the other way around”.

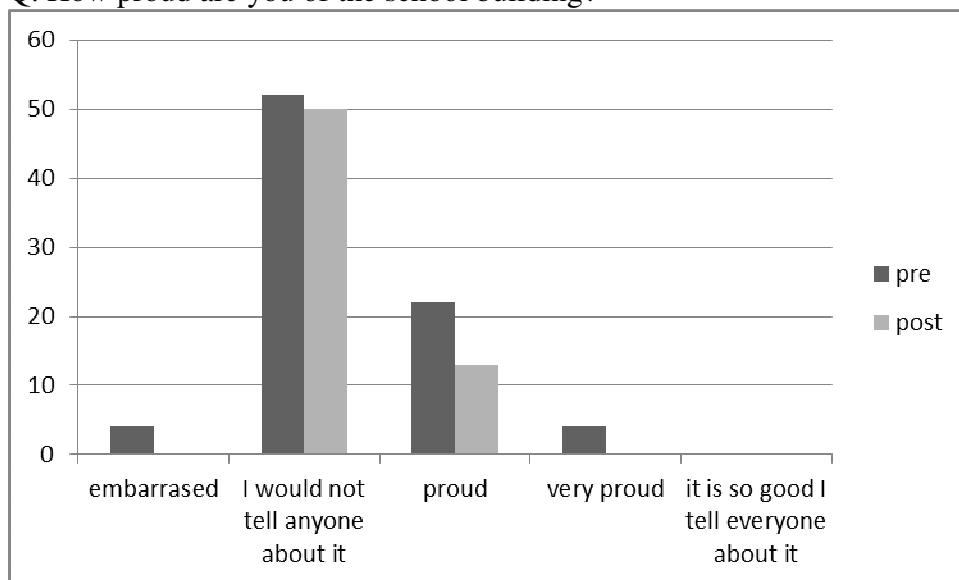
Q. What impact has pupils involvement had?



Similarly the pupils had little involvement, although one teacher said “too open-plan, certain pupils relishing the freedom” and another said “the students get frustrated with the building as much as we do”.

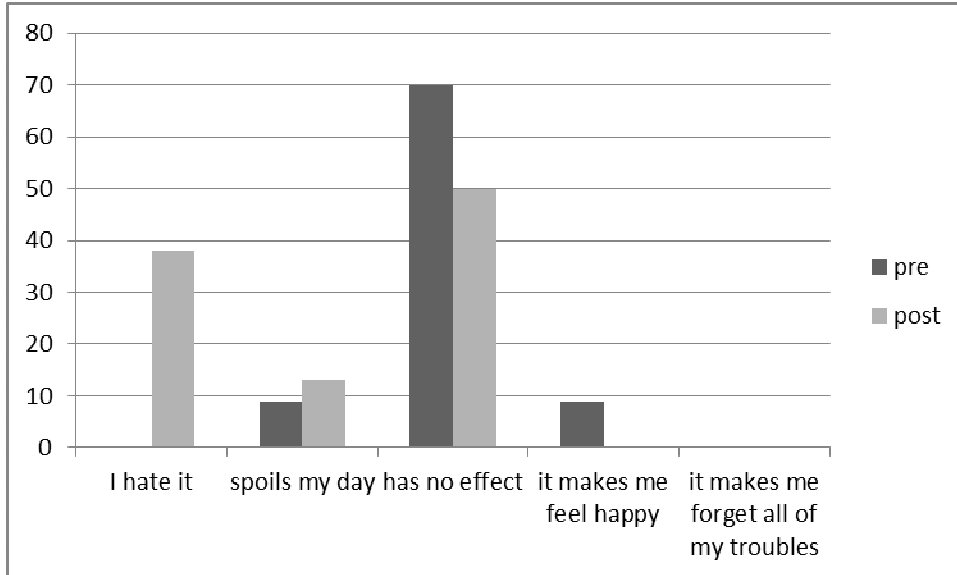
#### *4.8 PWC focus - general wellbeing*

Q. How proud are you of the school building?



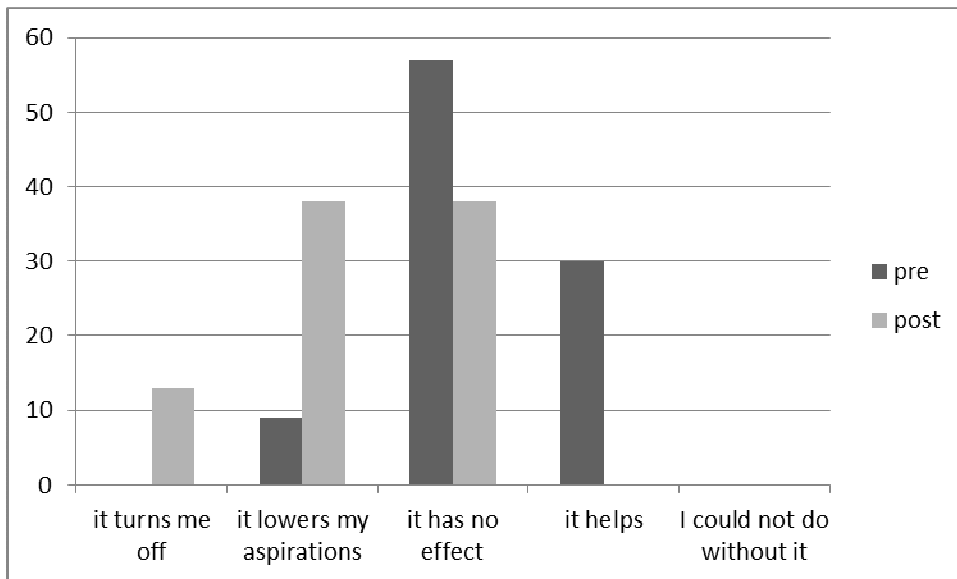
Note how disappointed the teachers are, one teacher said “hate it, only one staff toilet, shared male and female, wee in middle of water, its embarrassing when woman in next cubicle”.

Q. How much does the school building lift your spirits?



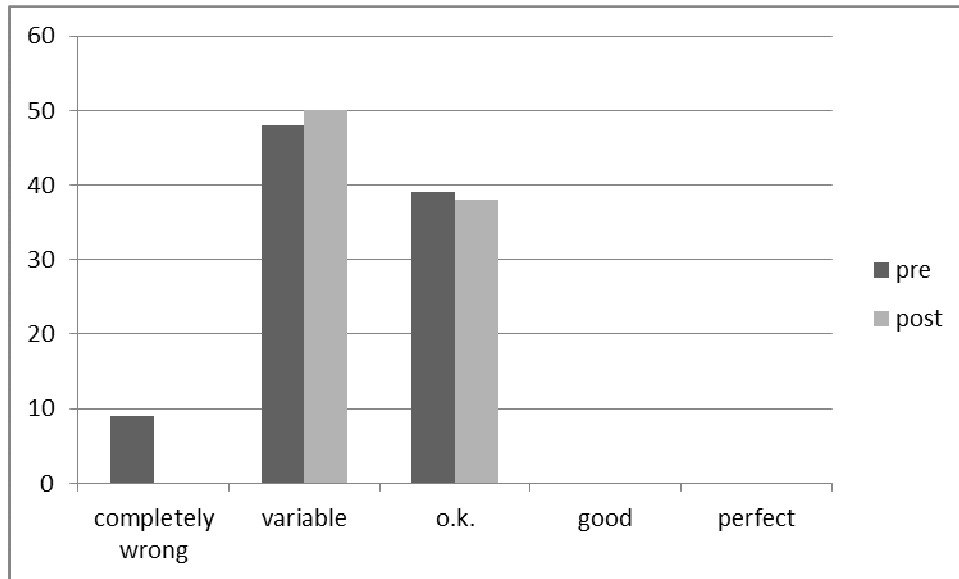
Many teachers have left to find employment elsewhere a teacher said “if you teach in the open spaces you are constantly being interrupted”.

Q. How much does the building raise your aspirations?



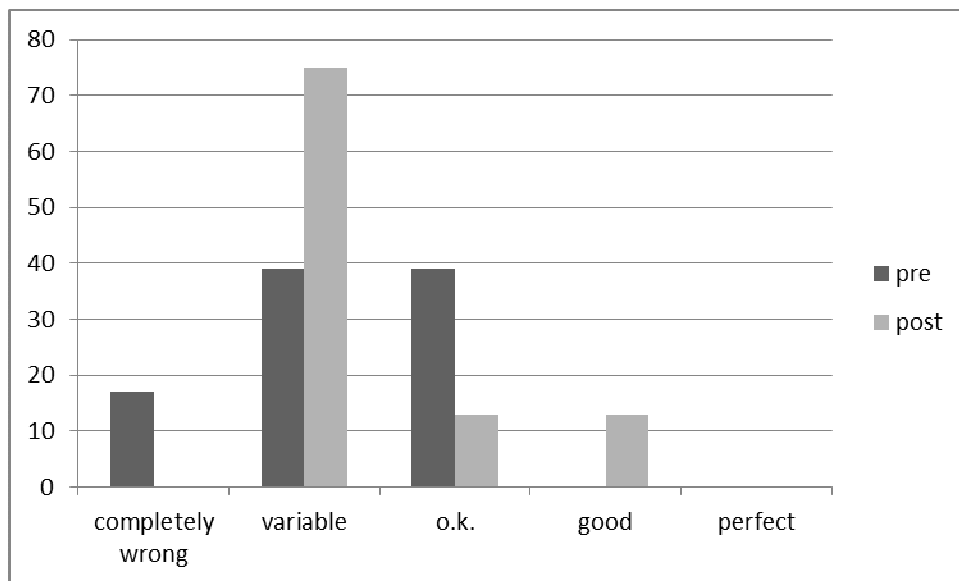
One teacher said “there is nowhere to retire to when not teaching, when you have your own work to prepare”, many teachers felt that they were always on call.

Q. How do you rate the temperature of the school building in winter?



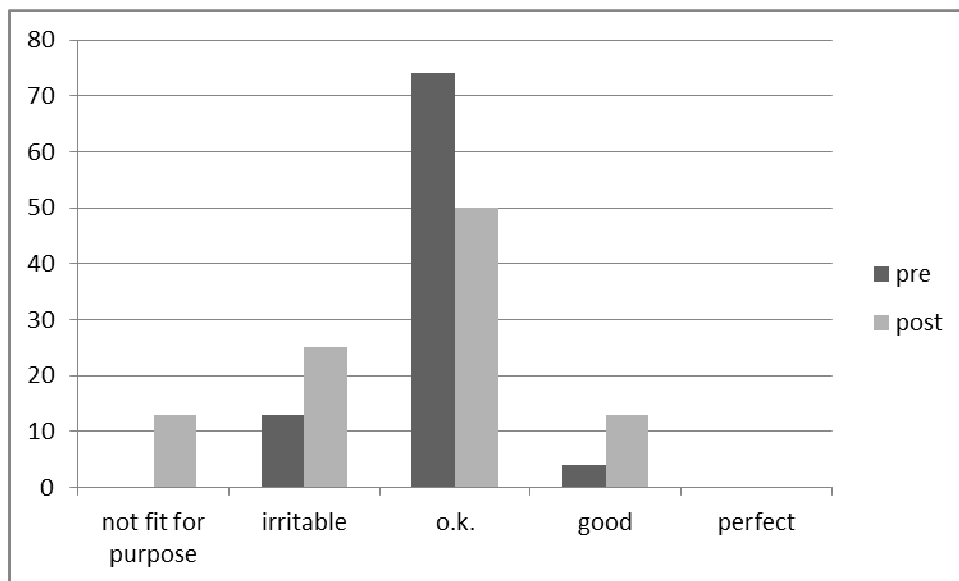
Questions must be asked as to why a new building's environment is not perfect.

Q. How do you rate the temperature of the building in the summer?



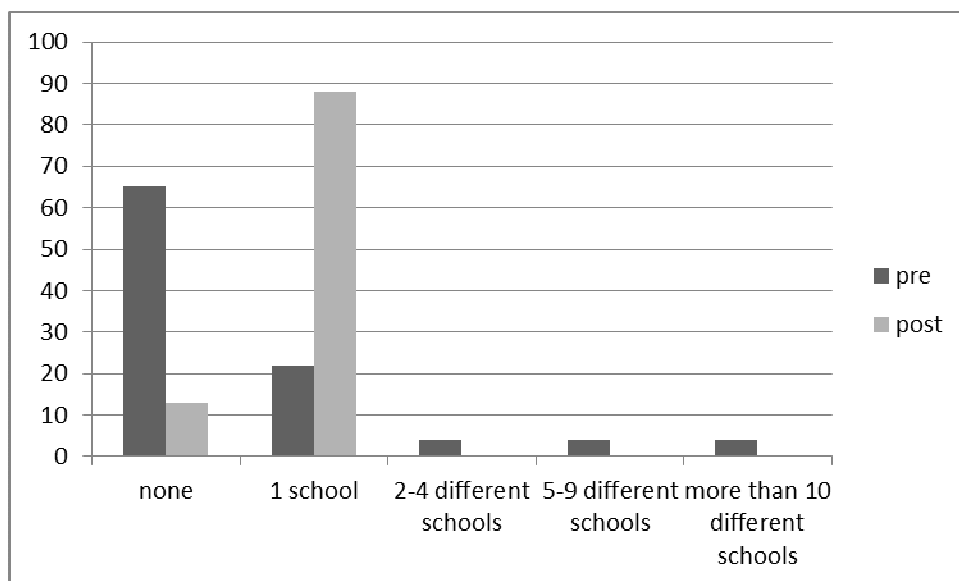
Teachers interviewed complained of headaches and stuffiness.

Q. How comfortable is the classroom furniture?



This is in contrast to a virtual glide through before construction which showed luxurious fixtures and fittings, one teacher said “the furniture is flimsy, cheap material and you have to ring someone up in Abingdon to get support and call someone out”.

Q. How many times have you visited similar school buildings undergoing change?



Most visits occurred just before opening.

## 5. Conclusions

The results shown from the two questionnaires contain only the ‘flexible buildings’ related questions and do not show the results for ‘innovative teaching and learning’ or the ‘use of ICT’. The case study school is largely open-plan with few enclosed classrooms. In fact the design was meant to operate the ‘home base’ concept, in which pupils remain in dedicated areas based on age and either subject teachers travel to these areas or general Key Stage 3 teachers remained in the home base to deliver topic based themes to initiate independent study and group collaboration. This failed almost immediately and the school fell back to



subject based areas and pupils moved on a traditional timetable as normal. However, as the results imply the areas are not designed for this and so subject teachers have to share the classroom facility on a rota and take turns teaching their class in shared areas, which are also used for communal socialising and thorough fairs. The main finding in the OECD study from 1975, was open-plan buildings do not function when a traditional time table is the chosen pedagogy, their design encourages movement, small group collaboration and independent learning, without the constraint of a subject timetable, which is the implication in the phrase 'multi-option' wherein each child is enabled to choose activities with the only constraint being available facilities and expertise. Due to the distractive nature of multiple activities and with the inherent acoustic and movement distraction, it is impossible for a teacher to employ teacher led instruction and subject based curriculum while other teachers are trying to do the same with their classes.

Those countries that were trialling multi-option, namely Sweden in the Malmo region and Canada in Toronto in the 1970s, have since reverted to curriculum based pedagogy or remain few in number. Furthermore, as previous studies have indicated, educational philosophies of one culture will not necessarily translate in other cultures. There were many visits by stakeholders of BSF funding to these places and many of the ideas for the new school buildings originate there. There is no evidence that the BSF programme has actually improved the outcomes of the children which can be associated with the school building design. In some cases the outcomes are worse and the literature shows that with a new political polar comes a different set of aspirations. The necessity for schools to reach benchmark targets, threshold results and meet OFSTED judgement criteria forces schools to continually push teachers and pupils to attain both in teacher assessed Key Stage 3 and exam based Key Stage 4 GCSE national exams. This leads the curriculum into a subject based time table which is orientated towards maximum point's score which requires a detailed teacher lead scheme of work that will achieve the best outcome. The best of both worlds for a teacher is a place wherein they can fully control the machinations of study, important because it is their appraisal that is on the line and a place that can be transformed at a moment's notice for individual and or group work and a place for large gatherings. This implies a multi-facilitated building not an open-plan multi-free for all. In the 21<sup>st</sup> Century school a barn does not provide a mean starting point it restricts the activities that can take place just as much as an enclosed class room does, but with the added problem of distraction. The provision of dedicated facilities with specialised features which can be used by all, different from what an individual can provide for themselves at home is paramount to providing a broad and balanced curriculum that children can function in as required. The average cost of refurbishment was £4 million, 6 times lower than the average cost new build, which means that the programme could have reached 6 times more schools than it did. The schools demolished were functional but due to lack of upkeep were dilapidated, with investment and refurbishment they could have transformed and met the Governments intentions at a much lower cost and a greater coverage.

## **6 Final Summary**

The responses to the questionnaires in this study provide the answers to how a flexible building for school use should meet the needs of its users. Teachers say that the curriculum should shape the building and that specialist subject areas should be enclosed. Teachers cannot function in thoroughfares and pupils lose concentration when disrupted by constant interruption, which also warrants enclosure. However, teachers are responsive to change and constantly undergo continuing professional development, so the school building must be able to cope with future subject requirements without disrupting the rest of the school. Most

significantly is the requirement for constant school maintenance, especially in low socio-economic districts, which is also reliant on using quality materials and good housekeeping. As the responses reveal unless teachers are involved from the very beginning, any innovation is doomed to fail, they will either leave or resist and without the full cooperation of the teaching profession, schools will lack the fundamental part required to function. The health and safety of each specialist environment is paramount and architects must realise that they are designing for minors as well as adults. Children, especially those with an emotional or behavioural disorder are not always predictable and so every contingency must be allowed for unexpected behaviour. An open space is restrictive in use, cannot be controlled acoustically, provides too many distractions and is not what teachers want.

## References

- Ader, Jean. (1975), *Building Implications of the Multi-Option School*, Programme on Educational Building, OECD, Paris.
- Burke, Michael, (26 May 2011), *New Labour taxed and spent much less than Thatcher*, <http://www.leftfootforward.org/>, <http://www.leftfootforward.org/2011/05/tax-and-spending-under-new-labour-and-mrs-thatcher/>, accessed 07 August 2011.
- Department for Children Schools and Families, (December 2007), *Evaluation of Building Schools for the Future – 1<sup>st</sup> Annual Review, Final Report*.
- Dudek, Mark, (2000), *Architecture of Schools, The New Learning Environment*, Architectural Press,.
- <http://www.educationengland.org.uk/index.html>, Plowden Report, (1967), Chapter 32 *Recommendations and Conclusions*, <http://www.educationengland.org.uk/documents/plowden/plowden1-32.html>, accessed 27 July 2011.
- Hogg, Simon, (06 July, 2010) *BSF cuts: Full list of affected schools*, <http://www.architectsjournal.co.uk/>, downloaded from <http://www.architectsjournal.co.uk/news/daily-news/bsf-cuts-full-list-of-affected-schools/8602695.article>, 02 January 2012.
- James, Sebastian, (April 2011), *Review of Education Capital*, , *Capital Review Report*.
- Labour Party Manifesto (1997), *New Labour because Britain Deserves Better*, downloaded from <http://www.labour-party.org.uk/>, at <http://www.labour-party.org.uk/manifestos/1997/1997-labour-manifesto.shtml>, 10 June 2012.
- <http://www.naec.org.uk/>, <http://www.naec.org.uk/events/timeline/new-deal-for-schools>, accessed 30 October 2011.
- National Audit Office, Report (12 February 2009), *Executive Summary, Point 9*, retrieved from [www.nao.org.uk/publications/0809/schools\\_for\\_the\\_future.aspx](http://www.nao.org.uk/publications/0809/schools_for_the_future.aspx), on 18 April 2011.
- <http://www.partnershipsforschools.org.uk/index.html>, <http://www.partnershipsforschools.org.uk/library/BSF-archive/BSF-education-transformation.html>, accessed 02 August 2011.
- Quarmby, Katharine and Fazackerley, Anna, (2009), *Building Blocks? An Investigation Into Building Schools for the Future*, Policy Exchange, Clutha House, 10 Storey's Gate, London SW1P 3AY, [www.policyexchange.org.uk](http://www.policyexchange.org.uk), ISBN: 978-1-906097-51-6.
- Ringshall, Ron, (1983), *The Urban School, Buildings for Education in London 1870 – 1980*, The Educational Press: London.
- Saint, Andrew, (1987), *Towards a Social Architecture, The Role of School Building in Post-War England*, Yale University Press, New Haven and London,.

Seaborne, Malcolm, (1971), *The English School. Its Architecture and Organization 1370 – 1870.*

Shield, Bridget, (2003), London South Bank University and Hopkins, Carl, Editors, BRE Acoustics, Building Research Establishment Ltd (BRE), Editors, *BUILDING BULLETIN 93-Acoustic Design of Schools*, Architects and Building Branch, London : The Stationery Office, DfES, ISBN 0 11 271105 7,

Ward, Colin, Editor, (1976), *British School Buildings, Designs and Appraisals, 1964 – 1974*, The Architectural Press Ltd, London.

Woolner, Pamela, Hall, Elaine, Wall, Kate, Higgins, Steve, Blake, Anthony, McCaughey, Caroline, (2005), *School building programmes: motivations, consequences and implications, A Report*, Centre for Learning and Teaching, School of Education, Communication and Language Sciences, University of Newcastle, CfBT Head Office, 60 Queens Road, Reading, RG1 4BS, United Kingdom, retrieved online, <http://www.cfbt.com/PDF/91078.pdf>, 28 July 2011.

# **An investigation of age, motivations and music use in gym-based exercise sessions**

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## **Abstract**

Music is frequently used to accompany both group and individual exercise and has been shown to have a motivating effect. Despite recommendations to tailor music to exerciser age, there is little evidence to support doing so in gyms, and over-35s are neglected in the existing literature. This study sought to address these gaps. Sixteen members of a local authority gym in the West Midlands area were recruited to take part in semi-structured interviews about their exercise habits and use of media in the gym. Participants were 8 males and 8 females, ranging in age from 17 to 67. Interviews were recorded, transcribed and analysed to establish key themes. The study found two distinct groups of exercisers: socialisers and workers. The two groups engaged differently with the gym environment and showed contrasting media use while exercising. Socialisers were ambivalent towards exercise music, while workers displayed sophisticated tailoring of playlists to facilitate increased effort. Music choices for exercise were mostly contemporary, contradicting the existing literature's suggestion of preference for music released in one's late adolescence or early adulthood. This may reflect changing technologies for music dissemination. The socialiser/worker groups are a new finding and worthy of further investigation into how life stage and age may be influencing exercise behaviours and media use.

## **Keywords**

Age, exercise, gym, music

## **1. Review of Literature**

Gym facilities offer a convenient way to improve cardiovascular fitness, muscular strength and endurance and flexibility through exercise, benefitting both physical health (Myers, 2008) and mental health (Donaghy, 2007). However, many people struggle to adhere to exercise programs (Weinberg & Gould, 2007), and there is a need to both understand and address this. Music during exercise impacts positively on a range of outcomes compared with a no-music control (Terry & Karageorghis, 2006), and exercisers report that music is helpful for working out even when no improved outcomes are measured (Tenenbaum et al, 2004). Music may therefore have potential for developing adherence-boosting interventions, but the current body of research is limited in its understandings.

Karageorghis and Terry's review of the previous 25 years' literature on music in exercise (1997) noted various methodological limitations which they and other researchers have subsequently addressed; Karageorghis has focused on music's motivational qualities, developing the Brunel Music Rating Inventory, or BMRI (Karageorghis, Terry & Lane, 1999) and its successor, the BMRI-2 (Karageorghis, Priest, Chatzisarantis & Lane, 2006). The Inventory has been used regularly by researchers to identify suitable music stimuli, but presents several issues. Firstly, music must be selected for rating; this is typically done through surveying of the sample's peers, and the effectiveness of the BMRI/BMRI-2 depends heavily on the sociodemographic homogeneity of raters and participants. Secondly, the rating system is undermined by poor understanding of musical terms: melody is rated but harmony

is not, as tests found that many participants had no conceptualization of harmony. Thirdly, although intrinsic music qualities affect response (Juslin, 2009), the motivational potential of music in exercise also depends on extrinsic factors, particularly personal associations (Bishop, Karageorghis & Loizou, 2007; Crust, 2008): the Inventory focuses only on intrinsic musical characteristics.

Juslin's framework of emotional responses to music (2009) distinguished between responses pertaining to musical, individual and situational factors; the latter two concern extrinsic qualities. Additionally, Juslin emphasised the way in which intrinsic musical factors create violation of expectation through linear tension and resolution; this is not considered by the BMRI/BMRI-2. Nevertheless, simple manipulation of basic musical parameters can produce dramatic results: when increasing the tempo of a music stimulus by 10%, Waterhouse, Hudson and Edwards (2010) saw a 3.5% increase in power output in a cycling test. Participants did not detect the tempo change, reporting merely that the faster version sounded 'brighter.' If response to tempo is unconscious, then rating tempo for motivational qualities, as per the Brunel Inventories, may be inappropriate.

Synchronizing physical movements to a beat appears to increase output. Unpublished research by Bacon, Myers and Karageorghis, reported by Karageorghis and Priest (2008), indicated a 7% decrease in demand for oxygen during exercise when movement was synchronised. It is not known whether exercisers using personal listening devices such as iPods select music to synchronise with their activities, and this is worthy of exploration. However, in a gym context, where many different activities take place simultaneously, broadcast music may discourage synchronization.

Juslin's individual factors (2009) relate to a person's demographic profile, mood, background and musical training. Age appears to influence music preferences; research suggests that tastes are largely formed by age 24 (Holbrook and Schindler, 1989) and a recent study with over 36,000 participants also found age to be the biggest influence on the style of music preferred (North, 2010). However, Lamont and Webb (2010) found preference shifted in both the long- and short-term, with listeners having current and all-time favourites and refreshing their listening material regularly; this indicates a dynamic process of music preference.

There is little research on how music is accessed and listened to across the lifespan, particularly regarding the use of technology such as iPods, either in exercise or more generally. Existing research has focused on younger cohorts because of the convenience of recruiting undergraduates, with a small body of gerontology literature looking at music-related behaviour among the elderly. Little is known about the practices of those falling into the broad age range between these extremes, particularly beyond the age of 40. Crust (2008) found that among circuit class attendees with a male mean of 38 and female mean of 32, older participants preferred quieter, slower music: 'older' is not defined. Bull, referring to a sample of iPod users aged 17 to 41, discussed creating a "privatised auditory bubble" (2005: 344) but did not refer specifically to exercise.

Situational factors concern issues such as the acoustics of the listening environment and whether others are present. For research carried out in laboratory environments with strict controls, as advocated by Karageorghis and Terry (1997), these factors in particular may be compromised, and this in turn may limit applicability in 'real world' gym environments. The controls used in lab-based studies mean that stimuli and protocols are imposed by the researchers and may have little relevance to physical activity practices in the 'real world'.

While studies have tried to identify motivational music for use as stimuli, tastes vary considerably from one individual to another, and the impact of disliked music has been largely overlooked. Priest and Karageorghis (2008) reported that it may lead to curtailed exercise sessions and, in extreme circumstances, cancellation of gym memberships. Music

considered neither motivating nor demotivating (oudeterous music) has produced similar outcomes to motivational music (Karageorghis & Deeth, 2002; Simpson & Karageorghis, 2006): motivational music was defined as that scoring highly on the BMRI/BMRI-2 and oudeterous as scoring below the mid-range. The basis for this allocation is unclear and tracks selected for rating might all be considered motivational to some extent; there may be too little difference between music labelled as motivational and music labelled as oudeterous to affect exercise output. Dyrland and Wininger (2008) found that exercise enjoyment increases if music from a preferred style is played: they tested classic rock, country, rap, hip-hop, alternative and oldie styles, possibly presenting a greater mix of liked and disliked conditions for participants.

The above discussion suggests a number of areas requiring exploration. Participants aged between 30 and 60 rarely feature in studies, and research is often lab-based limiting the application of findings in real-world gym environments. Anecdotal evidence suggests some gym members dislike the music played in gyms but the extent and possible impact of this has not been explored. Literature on MP3 players and iPods in exercise is scant. Overall, there is little research on gym users across the lifespan and the way in which they utilise media during exercise to motivate themselves.

These issues were investigated using a qualitative study of music and motivation among gym users. Participants were recruited to reflect a wide range of gym users so that their perspectives on exercise activities, music and motivation could be explored.

## **2. Method**

### ***2.1 Sample***

Sixteen members of a local authority gym in a small market town in the West Midlands were recruited to take part in semi-structured interviews. Eight males and eight females participated, aged 17 to 67 ( $M=44.6$ ,  $SD=16.6$ ). All participants had been using the gym regularly for at least a year with the exception of Linda, who had recently returned to regular exercise after a period as a carer. Pseudonyms have been used to anonymise the participants.

### ***2.2 Materials and Equipment***

A semi-structured interview schedule was developed with questions to investigate exercise habits and preferences, motivations to exercise, social interactions in the gym and the use of media during exercise including TV and music provided by the gym or brought in by the exerciser. Interviews were recorded using an Olympus VN-4100 digital recorder, and transcribed using ExpressScribe software.

### ***2.3 Procedure***

Participants were interviewed for 10 to 20 minutes, all on a one-to-one basis except for two members who exercise together and who were interviewed together. Interviews were carried out on the Leisure Complex premises, in the reception area when quiet and in a separate, private room at busier times.

## ***2.4 Analytical Strategy***

Thematic analysis following the 6-stage framework of Braun and Clarke (2006) was used to identify themes in the data. This strategy was chosen because of its flexibility and its potential to deliver rich data. Following initial familiarization with the data through transcription and reading, transcripts were coded and initial themes derived by moving forwards and backwards through the stages of analysis and developing thematic maps, which were reduced to key themes in the late stages of analysis.

## ***2.5 Ethics***

Ethical approval was sought and obtained from Keele University School of Psychology Ethics Committee prior to the study commencing.

## **3 Results**

Two main theme areas were identified: (1) environmental engagement and (2) focus and dissociation. Gym users fell into two main categories with regard to their environmental engagement: ‘socialisers’, who engaged extensively with other people, and ‘workers’, who preferred to disengage from others to focus on their exercise. The focus and dissociation theme found that socialisers preferred to dissociate from their exercise through chat and TV, while workers used music to focus on the quality of their exercise. Those using their own music, which included exercisers up to the age of 57, preferred recent releases, and there was little evidence of exercisers synchronizing to the beat.

### ***3.1 Environmental Engagement***

Retired and long-term sick gym members showed different patterns of motivation and media engagement to those who were in work. For those who worked, the gym was somewhere to ‘switch off’, disengaging from the environment and in particular from other people. The quote below is typical:

“I don’t come to socialise at all.” (Carol, 54)

For instructors, headphones signalled to members that this was their personal exercise time:

“I use an MP3 or use an iPod, just put my own music on and that really, and that’s so I’m not interrupted so even if it’s battery low I put my earphones in.” (Craig, 22)

For retired members and a long-term sick participant, the gym replaced the routine and social contact of employment. David (46), long-term sick, described gym visits as “Just getting out my flat for a couple of hours and meeting people,” and Margaret, a retired member, expressed a similar need for social contact:

“The social thing as well... do the Acorns charity shop Thursday afternoon, Friday morning...do the gym Monday morning, Wednesday morning and that’s the week through.” (Margaret, 67,)

The need for routine was echoed by another retired gym member:

“I think the pattern is more important now because I’ve given up teaching completely so the Monday Wednesday Friday thing is, yeah, as a routine is more important.” (Martin, 60)

For the retired participants, there was a strong theme of interaction with others while for younger participants still in work there was a notable sense of withdrawal and detachment along with the creation of a mini-environment for the self through headphone use. These contrasts appeared to affect media use in the gym, particularly music, leading to the identification of the second theme: focus and dissociation.

### *3.2 Focus and Dissociation*

Non-retired members displayed a pattern of sophisticated use of playlists for workouts and a rejection of music played through the gym's PA system (typically Smash Hits Radio) as not motivational. This was the case for a wide range of ages:

"I find that the music that you play in the gym is just so— it's a bit soporific; it makes you go to sleep a bit. It's not motivational at all. So I've got the old dance music on there [MP3 player]." (Carol, 54)

Carol's antipathy was echoed by a participant half her age:

"Some of the music that comes on is totally inappropriate for the gym...A lot of the James Blunt stuff. It's just so demotivating, when you hear that stuff." (Ben, 23)

MP3 players offered users control over their music, and choice usually related to maximizing workout quality. Participants wanted to boost their effort:

"You never know what's coming on the radio and I know the music that's on my iPod so I know that it's going to get me motivated." (Emma, 32)

Only two participants liked and engaged with the music played in the gym. They were female, aged 48 and 52 and exercised together. The music reflected shared preferences, providing a vehicle for social connection:

Interviewer: So it's more the radio, the chart stuff you'd—  
Elaine (52): Yes, yes if I'm honest.  
Karen (48): We sing along sometimes.

A male participant who did not want to be quoted directly described a group of male exercisers who did resistance work together wanting heavy metal to be played on the gym sound system, although the request was declined. There may be a third, 'grouper' category of exerciser using music in the gym as a shared reference to reflect group identity.

Compared with the workers, the socialisers showed ambivalence to using MP3 players:

"I don't listen to music. I don't bring an iPod or anything along." (Martin, 60)

David described listening to a personal music player as "very, very rare" while Barbara, 65, said that "I mean I have got it, a player but as I say it's easier just to plug in and look at it the television" (TVs are integrated into the cardiovascular machines).

Barbara and Martin, who are retired, disliked the high volume of music played in the gym while semi-retired John did not consider it relevant to him and often tried to ignore it:

"Up to 30, 35-ish [age range] is generally what I would say it's pitching at...if I don't like it I can switch it off anyway, internally sort of switch it away." (John, 62)

For the socialiser group, chatting and watching TV helped dissociation from the activity. David said "I find talking to somebody time goes quicker" while John described watching TV:



“There was one of these auction type programs on and I just caught into something on gold rings and things which just interested me, suddenly find I’ve done 5 minutes without realizing.” (John, 62)

Margaret liked to watch TV if there was nobody to chat to, again to make time pass more quickly. Barbara also described using the TV to dissociate, referring to it as:

“A distraction. You don’t realise that you’re putting in more the effort and the pace in to go then.” (Barbara, 65)

Younger exercisers rejected the TVs for precisely this reason:

“It’s like a distraction, isn’t it? If you’re watching the telly then you might not be going as fast you know, trying to watch your pace and stuff so no, I don’t watch the telly.” (Craig, 22)

### ***3.3 Music Choice***

There was evidence that music was selected to fit certain activities, with dance music mentioned as particularly suited for cardiovascular exercise. Carol described using dance music for cardiovascular training and contemporary heavy metal bands for lifting weights, referencing System of a Down and Linkin Park:

“I’ve got to have something on the cardio that’s got to keep me moving...and then with the weights, you need something a bit more oomph...I feel more powerful when there’s summat heavy on.” (Carol, 54)

This use of contemporary music echoes Elaine and Karen’s liking for chart music, and Linda also preferred recent releases:

“I like dance music. Although I’m 57, I’m very much into house music. I like dance music a lot, and that does make work out better.” (Linda, 57)

These examples call into question the assertion that the era of music played in the gym should reflect the age of the exerciser. It is noteworthy that Linda considers her tastes do not reflect her age yet her contemporaries also preferred recent releases. This suggests a discrepancy between perceptions and realities of taste among various age groups.

Participants were asked whether they synchronized their movements with music, and, given the widespread use of synchronous music in the previous literature, it was notable that only one participant did so, and that synchronization had arisen accidentally:

“It’s got the right beat for me to be doing the right revs, so when I’m on the cardiovascular machines, particularly the cross-trainer, I’m doing about 70 or 80 revs and I seem to be doing it in time with the music...Not that I’ve done it on purpose either.” (Nigel, 48)

The workers’ and socialisers’ use of the gym space and application of media contrasted strongly, with workers more focused on using music to enhance workout quality and socialisers looking for engagement with others, often using this to dissociate from the exercise itself. The genres, styles and artists discussed by the workers were overwhelmingly contemporary, including the preferences of participants in their late 40s and 50s.

## **4 Discussion**

The study presents useful findings regarding gym exercisers’ use of music in exercise across the lifespan. The results indicate distinct categories of engagement with gym exercise which

appear dictated by lifestyle. Employed participants focused on workout quality, using MP3 players and sophisticated selection of music to help facilitate workout effort. They had little interest in engaging with other members. Participants who were retired or long-term sick used the gym as a vehicle to aid maintenance of day-to-day routine and personal interactions, often dissociating from the activity by chatting or listening to the TVs. They had little interest in exercising to music in the gym. There were indications of a third possible category of people who use music as a vehicle for social bonding; this may be more common in exercise classes.

Contemporary music was frequently mentioned by participants from their teens to their fifties, with contemporary dance music considered particularly suitable for cardiovascular exercise. This seems to contradict previous research on general (rather than exercise-related) preferences (Holbrook and Schindler, 1989; North, 2010) and may indicate that music is chosen to fit the gym environment – the popularity of gyms being a relatively recent phenomenon – or that changes in dissemination have impacted on listening habits and tastes in recent years. Counter to Priest and Karageorghis' suggestion to play music from different eras to reflect the age range of gym users (2008), the evidence here suggests that gym users like contemporary popular styles well into their fifties. Retirees engaged differently with music to those in employment and had a lower tolerance of high volume, high energy music. It appears that music is treated with ambivalence by this group, rather than there being a preference for older styles. Although they form a small percentage of gym users, health benefits for older exercisers are considerable in order to preserve health and independence through strength and cardiovascular fitness, and it important not to alienate this group.

The liking for contemporary music among those aged 50 to 60 was unexpected and worthy of consideration. Why was dance music, in particular, so popular? For the exerciser in their mid-fifties, contemporary dance styles emerged at a time when they were aged around 30, by which time preferences are thought to be well-established. However, the style is frequently played in gym environments and exercise classes, perhaps resulting in it being perceived as suited to exercise and experience built in that context. It is also noteworthy that this age group discussed their use of MP3 players, and their engagement with new technology and changes in the way music is disseminated may have resulted in more dynamic preference patterns than suggested in much of the literature.

The study, although small in scale, provides a useful exploratory basis on which to explore the topic in the future. The categories of exerciser are worth further investigation, particularly the third possible category of the 'grouper', which uses music as a shared reference; there was some evidence of this in the gym and may be more in exercise classes.

Existing studies in iPod and MP3 use have largely ignored exercise. This study indicated a sophisticated use of different music styles among exercisers which may be a fairly recent development influenced by the flexibility of new technologies to build playlists and have a large portable music collection. Further study is warranted to explore selection and use of music for exercise in greater depth.

The socialiser group was generally retired and aged over 60, but the observation that a long-term sick participant seemed to reflect the criteria for this group indicates that lifestyle may have more influence than age. The over 60s have not grown up with portable music technology, which may have influenced their responses. Carrying out similar studies in ten or twenty years could uncover far more use of portable music players by retired participants.

Ultimately, this research offers useful information on what exercisers want from their gym experience. The study provides a wealth of information on motivations regarding exercise, the circumstances in which music is viewed positively and the characteristics of the music chosen by exercisers to increase their motivation, and this information should be utilised by

gym managers to help encourage a positive attitude to exercise among members, and by researchers to ensure that their studies reflect real-life exercise practices.

#### **4.1 First Author's Reflection**

In keeping with the qualitative approach taken here, personal reflection on the interviewing process is required. This was affected by my experience of having worked in the gym as an instructor. I felt that this was useful when recruiting participants, most of whom had had regular contact with me during my time working at the gym, but it may have affected responses to questions. Participants may have worried that they were not exercising correctly and would be judged on this. Several participants expressed a need for assistance with their programs, and it was sometimes challenging to maintain the researcher role rather than revisit my instructor role in order to provide guidance. Nevertheless, familiarity with the gym's equipment, gym environment and the principles behind the programs being followed helped provide me with the necessary background knowledge to explore pertinent issues during the interviews.

## **5 Conclusion**

The key findings of this study are firstly the identification of distinct socialiser and worker groups in the gym and secondly indications of a broad liking for contemporary dance music among exercisers aged from their teens to their late fifties. The practical implication is that contemporary dance music appears to be the most suitable soundtrack for the gym, with broad appeal across a wide age range. Nevertheless, any music policy selected will have some detractors, and awareness is needed of socialisers' dislike of loud volumes. These issues need to be taken into account both by leisure centre managers and by researchers designing exercise adherence interventions utilizing music.

This study presents several significant contributions to the literature. It identifies different styles of engagement with media during exercise, and also shows that recent technological developments in music dissemination are operating in gyms alongside a shift in the link between music preference and age. These findings offer the potential to develop interventions using music to help encourage exercise adherence, potentially benefitting the physical and mental health of those wishing to follow exercise programs.

## **References**

- Bishop, D., Karageorghis, C., & Loizou, G. (2007). A grounded theory of young tennis players' use of music to manipulate emotional state. *Journal of Sport and Exercise Psychology*, 29, 584-607.
- Braun, V. & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3, 77-101.
- Bull, M. (2005). No Dead Air! The iPod and the culture of mobile listening. *Leisure Studies*, 24(4), 343-355.
- Crust, L. (2008). Perceived importance of components of asynchronous music during circuit-training. *Journal of Sports Sciences*, 26(14), 1547-1555.
- Donaghy, M. (2007). Exercise can seriously improve your mental health: Fact or fiction? *Advances in Physiotherapy*, 9, 76-88.
- Dyrlund, A. & Wininger, S. (2008). The effects of music preference and exercise intensity on psychological variables. *Journal of Music Therapy*, 45(2), 114-134.

- Holbrook, M. & Schindler, R. (1989). Some exploratory findings on the development of musical tastes. *Journal of Consumer Research*, 16, 119-124.
- Juslin, P. (2009). Emotional responses to music. In S. Hallam, I. Cross & M. Thaut (Eds.), *The Oxford Handbook of Music Psychology* (pp. 131-140). Oxford: Oxford University Press.
- Karageorghis, C. & Deeth, I. (2002) Effects of motivational and outeterous synchronous music on perceptions of flow [abstract]. *Journal of Sports Sciences*, 20(1), 66-7
- Karageorghis, C. & Priest, D.-L. (2008). Music in Sport and Exercise: An update on research application. *Sport Journal*, 11(3). Retrieved March 1, 2011, from [http://www.thesportjournal.org/ article/music-sport-and-exercise-update-research-and-application](http://www.thesportjournal.org/article/music-sport-and-exercise-update-research-and-application)
- Karageorghis, C., Priest, D.-L., Chatzisarantis, N. & Lane, A. (2006). Redesign and initial validation of an instrument to assess the motivational qualities of music in exercise: The Brunel Music Rating Inventory 2. *Journal of Sports Sciences*, 24(8), 899-909.
- Karageorghis, C. & Terry, P. (1997). The psychophysical effects of music in sport and exercise: A review. *Journal of Sport Behaviour*, 20(1), 54-68.
- Karageorghis, C., Terry, P. & Lane, A. (1999). Development and initial validation of an instrument to assess the motivational qualities of music in exercise and sport: The Brunel Music Rating Inventory. *Journal of Sports Sciences*, 17, 713-724.
- Lamont, A. & Webb, R. (2010). Short- and long-term music preferences: what makes a favourite piece of music? *Psychology of Music*, 38(2), 222-241.
- Myers, J. (2008). The health benefits and economics of physical activity. *Current Sports Medicine Reports*, 7(6), 314-316.
- North, A. (2010). Individual differences in musical taste. *American Journal of Psychology*, 123(2), 199-208.
- Priest, D.-L. and Karageorghis, C. (2008). A qualitative investigation into the characteristics and effects of music accompanying exercise. *European Physical Education Review*, 14(3), 347-366
- Simpson, S. & Karageorghis, C. (2006). The effects of synchronous music on 400m sprint performance. *Journal of Sports Sciences*, 24(10), 1095-1102.
- Tenenbaum, G., Lidor, R., Lavyan, N., Morrow, K., Tonnel, S., Gershgoren, A., Meis, J. & Johnson, M. (2004). The effect of music type on running perseverance and coping with effort sensations. *Psychology of Sport and Exercise*, 5, 89-109.
- Terry, P. & Karageorghis, C. (2006). Psychophysical effects of music on sport and exercise: An update on theory, research and application. In M. Katsikitis (Ed.) *Psychology Bridging the Tasman: Science, culture and practice – Proceedings of the 2006 Joint Conference of the Australian Psychological Society and the New Zealand Psychological Society*, 415-419
- Waterhouse, J., Hudson, P. & Edwards, B. (2010). Effects of music tempo upon submaximal cycling performance. *Scandinavian Journal of Medicine and Science in Sports*, 20, 662-669.
- Weinberg, R. & Gould, D. (2007). *Foundations of Sport and Exercise Psychology* (4<sup>th</sup> ed.). Illinois: Human Kinetics

# Determination of spatial problems in post-disaster resettlement programmes

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## **Abstract**

Post-disaster resettlement programmes are being conducted by governments and other relevant organisations to relocate displaced people to the provided safe places with regard to the original land standards to subsequently improve the standard of living. Although resettlement programmes have been broadly implemented within several communities who are exposed to hazards, it appears that there were numerous intricate problems throughout their implementation. Humans perform their activities based upon their locations; likewise, displaced people perform their activities in the resettlement areas. Thus problems in resettlement programmes are not only derived from the many differences between the resettlement and original areas, but also the complex links between problems and certain location criteria.

This paper presents the existing knowledge in resettlement programmes and the initial findings from interviews conducted as a part of a doctoral research. This study considers a single case study with multiple embedded cases in order to gain the knowledge from respondents. The perceptions and experiences of displaced people are explored and analysed by documentary and content analysis showing the links between the problems in resettlement programme and spatial aspects. The finding of this study is presented as a cognitive map which is extremely useful to consider the functions of spatial analysis associated with the explored problems. Regarding the method conducted in this paper, a detailed analysis of the problems associated with spatial aspects in resettlement programmes will be presented showing a feasible way of overcoming the problems associated with location conditions in debris-flow hazard areas.

## **Keywords**

Resettlement programme, hazard area, spatial aspect

## **1. Introduction**

Over the last decade, Asian countries have shared the largest number of victims from natural disaster (Guha-Sapir, Vos, Below, & Ponserre, 2012). According to the recent number of victims and affected people from natural disasters in this region, it was recorded that 23,646 people were killed and approximately 80-million people affected in 2011 (ADRC, 2012). As high as the number of victims and affected people, numerous residents were made homeless and displaced from their original lands. Theoretically, resettlement programmes are being conducted by governments and other relevant organisations to relocate displaced people to the provided safe places with regard to the original land standards to subsequently improve the standard of living. Nevertheless, it appears that there are numerous intricate problems throughout their implementations (Bartolome, Wet, Mander, & Nagaraj, 2000; Heggelund, 2006; Menoni & Pesaro, 2008). Among the problems highlighted in resettlement programmes, social and economic problems play a major role and impact upon displaced

people in various ways. Therefore, a much needed potential method of determining social and economic problems associated with spatial aspects is to be explored in this paper.

This paper is a part of doctoral research into the application of spatial analysis in resettlement programmes. This paper predominantly aims to determine the links between the social-economic problems associated with spatial conditions in resettlement areas. For this reason, an explored result from the findings has been determined in this paper to present the process of overcoming the complexity of the social-economic problems associated with locations. In order to express the determining method, the perception of displaced people in a hazard area from the 2001 debris-flow event in Thailand has been explored to present these complicated links. Several key words regarding spatial aspects have been used to define dimension of social-economic problems. In the final section, an explored result has been used to build up the resettlement area where feasible to prevent several social-economic problems.

## **2. Resettlement programmes and their general problems**

Resettlement programmes include procedures from finding a place for temporary shelters to constructing permanent houses at origin or in the new area (Deruyttere, et al., 1998). Furthermore, Bartolome et al (2000) also distinguished whether resettlement programmes have been predominantly focused on the process of physical relocation rather than on the economic and social development of the displaced and other adversely affected people. Resettlement programmes are generally conducted by governments and relevant organisations in order to provide assistance to displaced people. These programmes generally consist of several activities running through the process of relocating people from original areas to other safe places (Argenal, Funes, Hodgkin, & Rhyner, 2008).

The number of victims affected by disasters has been dramatically increasing around the world with a very high demand of emergency and temporary shelters for each particular basis. An initial problem from the aftermath is the non-balancing supplied shelters, facilities and the high demand of victims in hazard areas (Argenal, et al., 2008). In order to protect peoples' lives and possible damages, the government has to evacuate people who live in hazard areas to safer regions. For this reason, resettlement policy has been implemented in many countries, however, land improvement and land readjustment have been ignored to facilitate those displaced people to live in resettlement areas comfortably (Woube, 2005). Furthermore, displaced people will be informed about the resettlement schemes only once the decision of implementing the programmes has already been taken (Sautoy, 1969). Without any alternative option, a lot of suffered people have to stay in the provided areas since they have no place to go (Gall, 2004). In contrast, suffered people are forced to leave the provided resettlement areas since they have not had the ownership of the original lands, while some suffered people are forced to move to resettlement areas because they cannot identify their land after the devastation. For example, many displaced people, in some hazard areas in Peru, were forced to move to the new resettlement area because they could not offer the proof of their land titles (Argenal, et al., 2008). On the other hand, affected people may relocate out of resettlement areas due to the inconvenient resettlement locations (Sautoy, 1969). This phenomenon can cause communities to shift elsewhere.

Almost all the general problems from displaced people in resettlement programmes fundamentally derive from the different livelihoods between new and original settlement sites (e.g. the accessibility, land-use applicability, available space for agricultural activities and unit of family and household) (Dikmen, 2002). In particular, the relocation situation is possibly in crisis when displaced people have lost their livelihoods and income sources from cultivable lands. The shortage of food from the agricultural communities causes severe

problems to people in the resettlement sites. This situation forces displaced people to be more dependent on others as they need to hold on to a small amount of donation money. Apart from their livelihoods, Dikmen (2002) also found that people, inevitably, refuse moving to new locations due to insufficient facilities provided and infrastructure. In many cases, basic infrastructure and essential facilities have never been considered in resettlement areas (Bartolome, et al., 2000). It was also found that the lack of key effective social services such as hospitals and schools causes major problems to people in resettlement sites (Dubie, 2005). In conclusion, Dwivedi (2002) has identified the problems regarding displaced people by evaluating the resettlement programmes as listed below:

- 1.) Job losses
- 2.) Breakdown of social and food security
- 3.) Credit and labour exchange networks
- 4.) Social capital and kinship ties
- 5.) People's socio-political disempowerment
- 6.) Loss of cultural identity and heritage
- 7.) Economic impoverishment
- 8.) Resettlement practices were carried out at national and global levels
- 9.) Abysmal environmental conditions and inadequacies in resettlement sites
- 10.) Several difficulties that people faced in reconstructing lives and livelihoods after displacement

In cases where displaced people decline moving to resettlement sites, they would surrender to live in high risk areas in their original lands. However, if they choose to relocate themselves to resettlement areas, they may be faced with an un-prepared resettlement site where it is not yet habitable. This dilemma pushes displaced people to relocate back into the hazard zone in their original lands (Dikmen, 2002). The process of physical relocation has been the primary focus in resettlement programmes while the economic and social development is often overlooked in this activity (Bartolome, et al., 2000). Regarding the works mentioned above, social and economic problems are the main factors among those problems. In order to reduce the severity of these phenomena, Sautoy (1969) introduced community development workers whose role was to ease those problems from displaced people and resettlement schemes organised by the government.

### **3. Social-economic problems associated with spatial aspects in resettlement sites**

Theoretically, it is recommended that after the disaster event, the reconstruction should be of better standard than before which in turn promotes safer and better communities (UNDP, 2009). Resettlement programmes require an administrative system to organise the resettlement programme effectively (Woube, 2005). It was recommended that social-economic background including livelihoods and educational skill and level allow to determine inter and intra community linkages which are useful for studying the affected communities in hazard areas (Sugathapala, 2008). Considering the generic criteria based on the comprehensive human rights guidelines of the United Nations, Safety, Security, Accessibility, Affordability and Habitability must be considered in resettlement programmes (Batra & Chaudhry, 2005). Those criteria are able to consider both social-economic and location conditions regarding the resettlement activities upon the site as the context below.

### ***3.1 Safety***

Government and relevant organisations need to ensure affected people can move to the provided areas which are safe from any possible aftermath of the initial event. This criterion can be identified by analysing the susceptible hazard map at local scale (Piyatadsananon, Amaratunga, & Keraminiyage, 2009). Essentially, the safety can be interpreted and illustrated on the risk map by considering certain involved factors to classify the risk levels throughout the vulnerable areas. The regional-scale risk map is essential to all involved organisations to overview and setup any mitigation and protection plan while the local-scale risk map is a crucial tool to identify and manage the vulnerable area in more detail (Maantay & Maroko, 2009).

### ***3.2 Accessibility***

Distance between the new and origin settlement site, and the existing quality and hierarchy of roads are major factors for consideration in resettlement programme. The accessibilities are determined to acquire the basic needs such as agricultural land, over resettlement area, water resource, fuel wood, construction material, security service, emergency centre, community services (Corsellis & Vitale, 2005). However, there is little comprehensive study about accessibility management in the hazard area. The lack of study regarding accessibility causes a major delay in transportation in post-disaster management (Piyatadsananon, Amaratunga, & Keraminiyage, 2012).

### ***3.3 Habitability***

Generally, it takes time to build in the resettlement site as well as to recover the origin site for a suitable habitability. Livelihoods, work and adequacy of housing and land must also be considered in the habitability in order to setup the guidelines and policies (Batra & Chaudhry, 2005). The resettlement site must be as liveable as the original land, the basic infrastructure and essential facilities must be prepared or expanded to the resettlement area to provide the habitability to displaced people (Bartolome, et al., 2000).

### ***3.4 Affordability***

Government and donors are in command for distributing money and essential items to all victims throughout a period of time. Displaced people can earn money in several ways, e.g. a payment for reconstructing their homes, or restoring their farm lands, until restoring their essential items is complete. They may reduce the cost of reconstructing their homes by re-using initial building materials (Argenal, et al., 2008). Affordability also includes the payable cost of living in the resettlement area, i.e. transportation costs and daily life expenditure.

### ***3.5 Security***

The lack of security after a disaster event is a crucial problem that can cause tragedy and chaos to many victims in resettlement areas. Security in resettlement sites can be considered in relation to multiple factors e.g. peoples' lives, personal belongings and public warehouse. It is recommended that police and guards provide the security throughout the sheltering area (UNDRCO, 1982). In addition, the layout of houses in the resettlement site should be designed with a thought to security and community interaction purposes (UNHCR, 2007).



#### 4. Relationship between social-economic problems and with spatial aspects

Considering the entire process of resettlement, there are some concerns through the resettlement activities such as physical, socioeconomic, and environmental issues (SDS/IND, 1999). Predominantly, resettlement programmes have intensively focussed on the process of physical relocation rather than on the social and economic development (Bartolome, et al., 2000). Many critical constraints in a tight environment and the increasing demands of people require a careful judgement for deeper insights in the social and economic sciences (Gerhard Bahrenberg, Fischer, & Nijkamp, 1984). As well as a major problem in resettlement programmes, it requires the deep insights of displaced people into social-economic problems. Due to the complexity of social-economic problems, it is rare to overcome those problems without any effect to other associated links. Among the strong links between social-economic problems and other aspects (such as; administration, political, environmental, etc.), spatial aspect plays another important role associated tightly with these problems. Accordingly, this relationship can be seen from several studies regarding spatial analysis associated with social-economic issues (i.e. G. Bahrenberg, 1984; Gerhard Bahrenberg, et al., 1984; ESRI, 2001, 2007; M. Goodchild, Haining, & Wise, 1992; M. F. Goodchild, 2005; M. F. Goodchild, Anselin, Appelbaum, & Harthorn, 2000; M. F. Goodchild & Janelle, 2004; P. R. Haining, 1993; R. Haining, 1990). It is clearly indicated that those studies consider social-economic information as basis. The social-economic information specifically required in landslide disaster preparation consists of (SDS/IND, 1999):

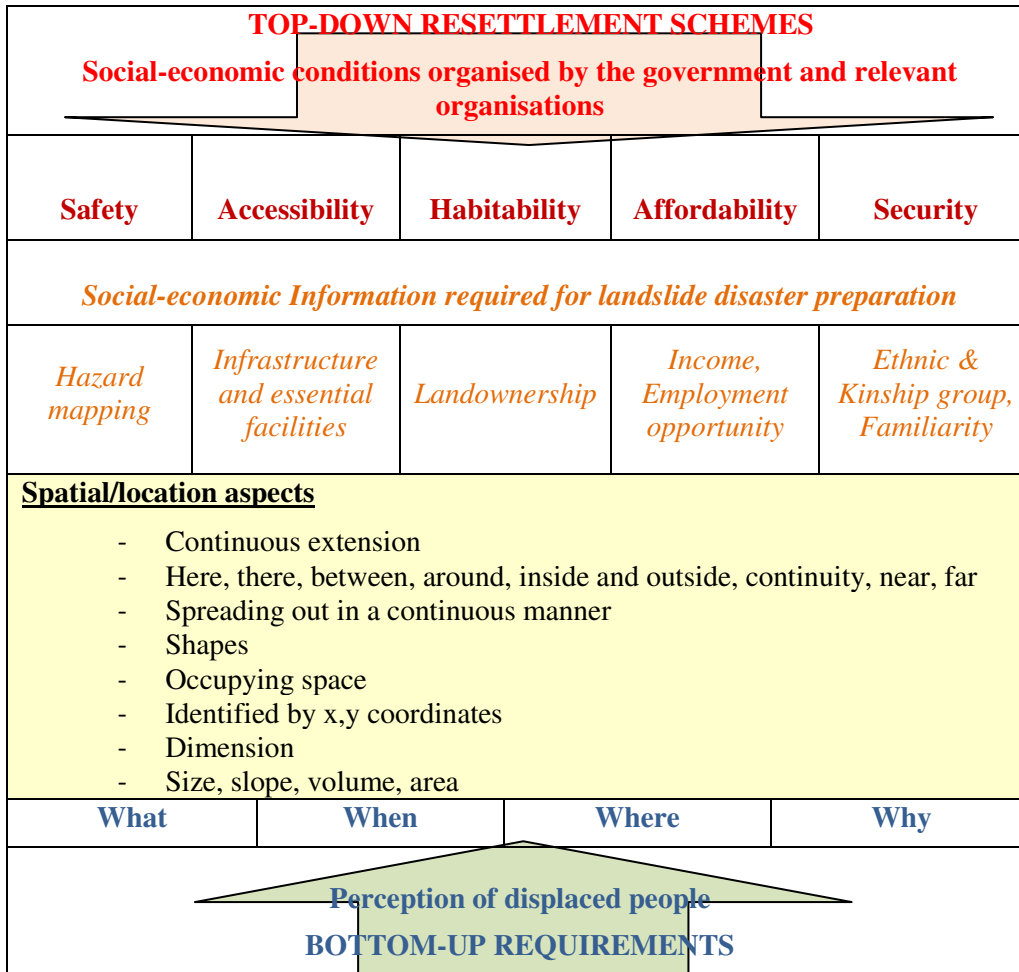
1. Ethnic and kinship groups organised on the basis of their geographical origin
2. Land ownership considered in term of ownership space and tenancy
3. Employment activities considered personal income including economic group
4. Basic service accessibility concerns with infrastructure and facility

Spatial aspect, on the other hand, contains its own dimension which is addressed within some key words of the according locations (Basden, 2004), such as:

- Continuous extension
- Here, there, between, around, inside and outside, continuity, near, far
- Spreading out in a continuous manner
- Shapes
- Occupying space
- Identified by x,y coordinates
- Dimension
- Size, slope, volume, area

Regarding the above context and social-economic conditions organised by the government social-economic information associated with spatial aspects can be identified as in table 1.

Table 1: Conceptual framework of the social-economic conditions associated with spatial aspects



The future trend of applying the spatial analysis has been focused on the link of constraints of human behaviours and the decision making approach (G. Bahrenberg, 1984). Therefore, a critical constraint of the resettlement scheme of people in hazard area is a promising study in social and economic sciences which relates directly to the spatial analysis method. Spatial analysis has been applied in many important schemes including in many vulnerable hazard areas. The tendency of applying the spatial analysis in vulnerable hazard areas inclines towards the analysis method in order to protect and solve particular problems occurring in the potential areas.

## 5. Methodology

Research methodology is a thematic framework of an assumption model to conduct research (O'Leary, 2004). This study uses a case study as the research strategy. Case study research is a strategy to understand the dynamics present within single settings or events (Amaratunga & Baldry, 2001). According the complexity in state of the problems in resettlement programmes, the case study has been conducted to explain these presumed causal, complicated links in real-life interventions. This strategy is able to describe the complex

results according with support of comprehensive details. The nature of this research is an exploratory research attempting to present an effective method to overcome problems associated with spatial aspects in resettlement programmes.

This research takes single-case (embedded) designs to analyse a single unit of the resettlement programme from the different perspectives of respondents who experienced diverse transitional displacement types. The study area was chosen for significant reasons, i.e. as the first place where applied an official resettlement programme in Thailand, as a place that was attacked by the extreme debris-flow event in 2001, as a place that has a large number of deaths and people displaced from their original lands, as a place that has been continuously developed for specific land improvement projects, as a place where there was a potential risks of a reoccurrence disaster from the dam breaking.

The interviews were conducted in April-May 2012 by focusing on three groups of displaced people, (Unit of analysis A) displaced people lived in hazard area whose houses were completely destroyed by the debris-flow event in 2001, (Unit of analysis B) displaced people lived in hazard area whose houses were partly destroyed by the debris-flow event in 2001, and (Unit of analysis C) displaced people living outside of the hazard area whose houses were partly destroyed by the debris-flow event in 2001.

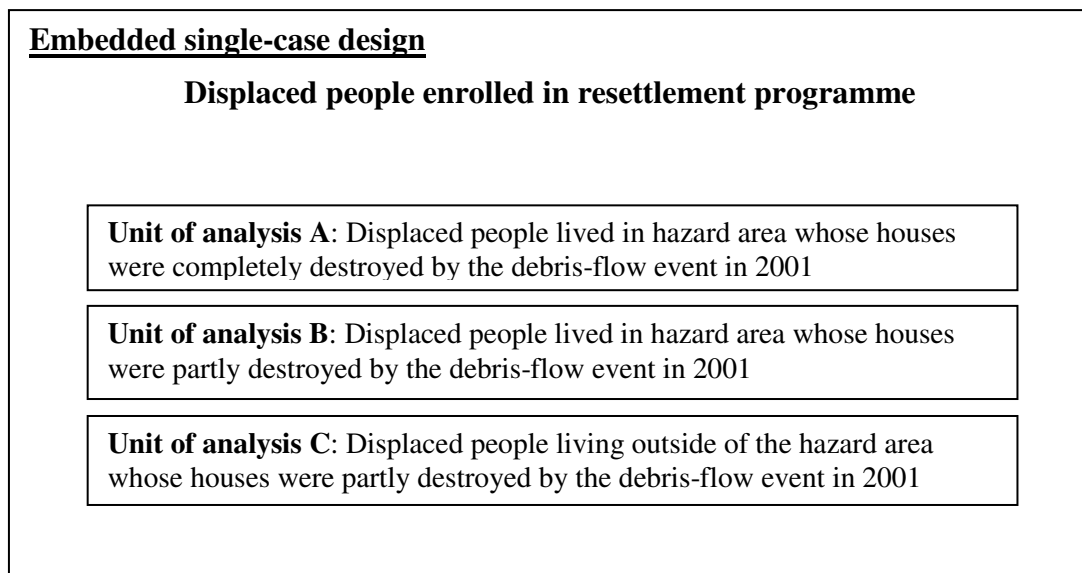


Fig 1. Research strategy and unit of analysis

According to the above context, this study has been analysed as the pattern in Fig 2.

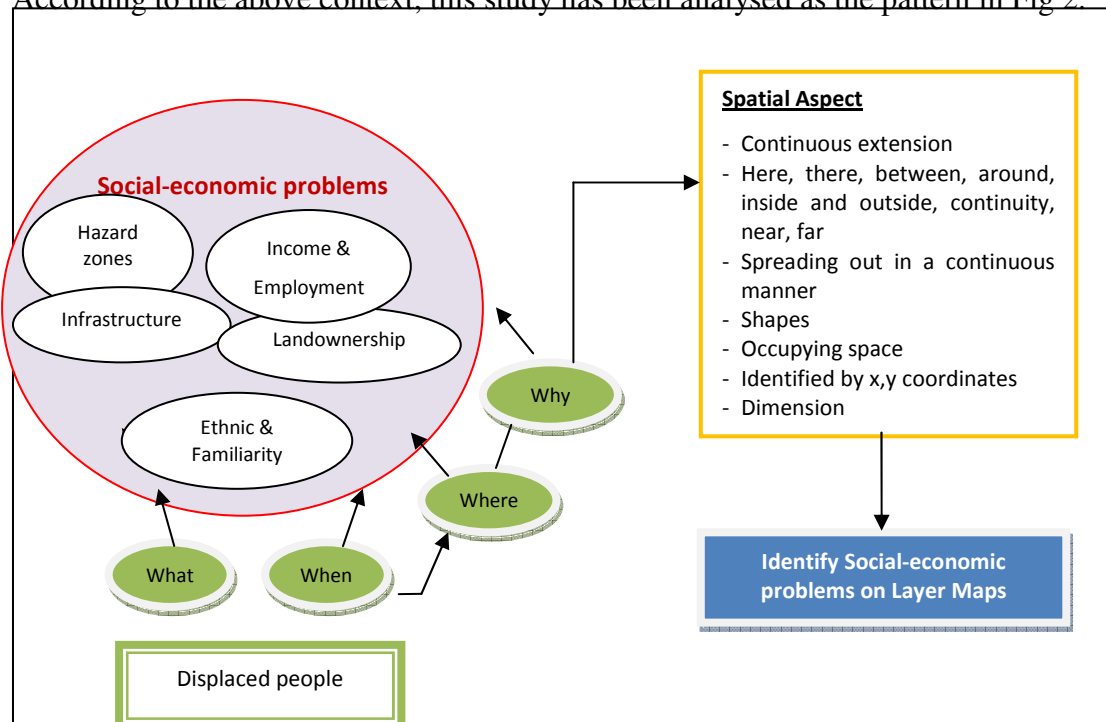


Fig 2. Pattern of analysing the determination of social-economic problems associated with spatial aspects

## 6. Findings

As a result, it has been found that the resettlement programme in this case consists of three resettlement phases regarding the displaced locations; i) emergency evacuation centre, ii) temporary displacement area, and iii) permanent resettlement area. Regarding the pattern of analysis, several sophisticated links are identified from interviews with the displaced people within the study area. As an explored result, a link of “Security” conditions has been raised in this paper as a premise to determine the link between social-economic problems and spatial aspects in resettlement area. Regarding the perception of displaced people, it is shown that one of the social-economic problems, alcoholism, was initially derived from the lack of security in a temporary displacement area. Typically, security provided by guards or police has a main purpose to protect the temporary displacement area from any illegal matters, such as robbery, smuggling, rape, etc. As an explored result, smugglers had been able to enter the temporary displacement area to sell alcoholic drinks illegally to displaced people. On the other hand, displaced people, who suffered from loss, were vulnerable to rely on alcoholic drinks. It was seen that they regularly sneaked out of the temporary area for drinks. It has certainly made an impact on long term impoverishment due to the lack of capacity to maintain the daily job effectively. Based on the perception of displaced people in the interviews, they referred to some key words in spatial aspects which were “into and outside Ban Nam Ko School displacement area”. These words clearly relate to spatial dimensions showing the link between the alcoholic problems and unclosed boundaries of the temporary displacement area. Considering on a high resolution based map, the boundaries of all three temporary displacement areas are shown in Figure 3. This illustration presents clearly on the

based map the unclosed boundaries of Ban Nam Ko displacement area as response to the explored result from the interviews.

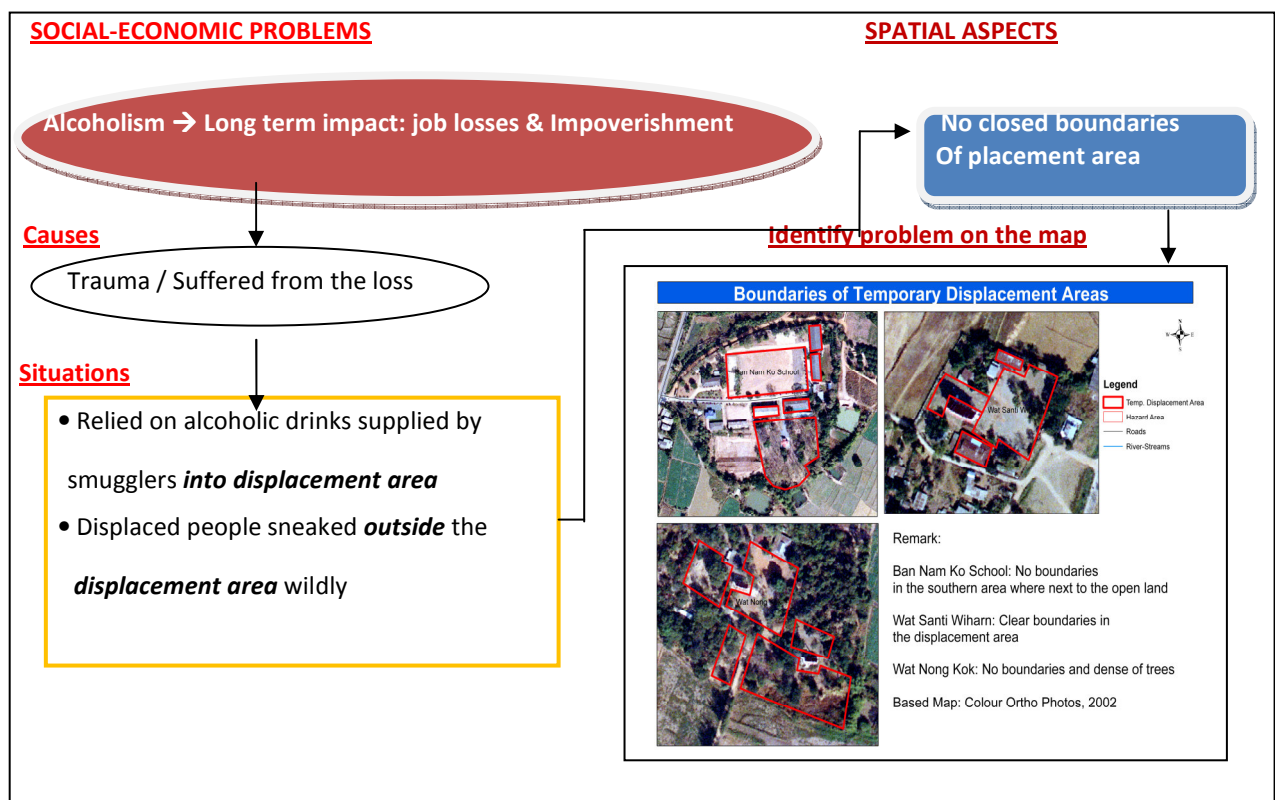


Fig 3. Explored result of determining social-economic problems associated with spatial aspects

## 7. Conclusion & Suggestion

Social-economic problems contain many sophisticated links; these problems can be overcome by considering these links in several ways. This study considers the links associated with spatial aspects in order to propose a feasible way to protect and solve those problems effectively. As the explored result, it would recommend to build the temporary displacement area with closed boundaries to prevent several illegal issues occurring which may possibly cause further long term problems. A high resolution based map is also suggested to be incorporated into spatial analysing processes. According to this method, all spatial aspects would be considered by the government and the authorised organisations in advance in order to establish the temporary displacement area which is able to prevent various social-economic problems.

## References

- ADRC. (2012). *Natural Disaster Data Book 2011 (An Analytical Overview)*: Asian Disaster Reduction Center.
- Amaratunga, D., & Baldry, D. (2001). Case study methodology as a means of theory building: performance measurement in facilities management organisations. *Work Study*, 50(3), pp. 95-104.
- Argenal, E., Funes, M., Hodgkin, D., & Rhyner, K. (2008). *Shelter Projects 2008*: UN-HABITAT.
- Bahrenberg, G. (1984). Spatial analysis: a retrospective view. In G. Bahrenberg, M. M. Fischer & P. Nijkamp (Eds.), *Recent Developments in Spatial Data Analysis: Methodology, Measurement, Models* (pp. 35-45). Hants, England: Gower Publishing Company Limited.
- Bahrenberg, G., Fischer, M. M., & Nijkamp, P. (1984). Methodology, measurement and models in spatial analysis: some major lines of recent developments. In G. Bahrenberg, M. M. Fischer & P. Nijkamp (Eds.), *Recent Developments in Spatial Data Analysis: Methodology, Measurement, Models* (pp. 3-35). Hants, England: Gower Publishing Company Limited.
- Bartolome, L. J., Wet, C. d., Mander, H., & Nagaraj, V. K. (2000). *Displacement, Resettlement, Rehabilitation, Reparation and Development*. Paper presented at the World commission on Dams, Cape Town, South Africa.
- Basden, A. (2004). The Spatial Aspect. *The Dooyeweerd Pages*. Retrieved from <http://www.dooy.salford.ac.uk/spatial.html>
- Batra, B. J., & Chaudhry, S. (2005). *International Human Rights Standards on Post-disaster Resettlement and Rehabilitation*. Geneva: Office of the United Nations High Commissioner on Human Rights.
- Corsellis, T., & Vitale, A. (2005). *Transitional settlement displaced populations*. Cambridge: Oxfam.
- Deruyttere, A., Renshaw, J., Rojas, E., Daughters, R., Branski, J., Perazza, M. C., et al. (1998). *Involuntary Resettlement: Operational Policy and Background Paper*. Paper presented at the The sixth IDB-NGO consultative meeting on the environment, Curitiba, Brazil.
- Dikmen, N. (2002). *Relocation or rebuilding in the same area: An important factor for decision making for post-disaster housing projects*. Montreal, USA: Department of Architecture, Suleyman Demirel University, IF Research Group, University of Montreal.
- Dubie, M. E. (2005). *The socio-economic dimensions of resettlement programme in Ethiopia: The case of Golollee Nonnoo resettlement scheme (West shewa of Oromiya regional state)*. Addis Ababa
- Dwivedi, R. (2002). *Models and Methods in Development-Induced Displacement (Review Article)* (Review Article). Oxford, UK: Institute of Social Studies.
- ESRI. (2001). *ArcGIS Spatial Analyst: Advanced GIS Spatial Analysis Using Raster and Vector Data*. Redlands, New York, California, USA.
- ESRI. (2007). An overview of Spatial Analyst. *ArcGIS 9.2 Desktop Help*. Retrieved 2010, from [http://webhelp.esri.com/arcgisdesktop/9.2/index.cfm?TopicName=An\\_overview\\_of\\_Spatial\\_Analyst](http://webhelp.esri.com/arcgisdesktop/9.2/index.cfm?TopicName=An_overview_of_Spatial_Analyst)
- Gall, M. (2004). Where to Go? Strategic Modelling of Access to Emergency Shelters in Mozambique. *Disasters*, 28(1), pp. 82-97.
- Goodchild, M., Haining, R., & Wise, S. (1992). Integrating GIS and Spatial Data Analysis: Problems and Possibilities. *Int. J. Geographical Information Systems*, 6(5), pp. 407-423.

- Goodchild, M. F. (2005). GIS, Spatial Analysis, and Modeling Overview. In D. J. Maguire, M. Batty & M. F. Goodchild (Eds.), *GIS, Spatial Analysis, and Modeling*. California: ESRI Press.
- Goodchild, M. F., Anselin, L., Appelbaum, R. P., & Harthorn, B. H. (2000). Toward Spatially Integrated Social Science. *International Regional Science Review*, 23(2), pp. 139-159.
- Goodchild, M. F., & Janelle, D. G. (Eds.). (2004). *Spatially integrated social science: Spatial information system*. Oxford: Oxford University Press.
- Guha-Sapir, D., Vos, F., Below, R., & Ponserre, S. (2012). *Annual Disaster Statistical Review 2011, The numbers and trends*. Brussels: CRED: Centre for Research on the Epidemiology of Disasters, IRSS: Institute of Health and Society, Université Catholique de Louvain.
- Haining, P. R. (1993). Issues in analysing spatial data *Spatial data analysis in the social and environmental sciences* (pp. 12-64). Cambridge: University of Cambridge.
- Haining, R. (1990). *Spatial data analysis in the social and environmental sciences*. Cambridge: Cambridge University Press.
- Heggelund, G. (2006). Resettlement Programmes and Environmental Capacity in the Three Gorges Dam Project: Environment frictions? Dams, Agriculture and Biotechnology. *Development and Change*, 37(1), pp. 179-199.
- Maantay, J., & Maroko, A. (2009). Mapping urban risk: Flood hazards, race & environmental justice in New York. *Applied Geography*, 29(2009), pp. 111-124.
- Menoni, S., & Pesaro, G. (2008). Is relocation a good answer to prevent risk? Criteria to help decision makers choose candidates for relocation in areas exposed to high hydrogeological hazards. *Disaster Prevention and Management*, 17(1), pp. 33-53.
- O'Leary, Z. (2004). Methodological design *The essential guide to doing research* (pp. 85-101). London: SAGE Publications.
- Piyatadsananon, P., Amaratunga, D., & Keraminiyage, K. (2009). *Risk assessment in natural hazard areas for the resettlement programmes*. Paper presented at the SPARC 2009 Conference, the University of Salford, United Kingdom.
- Piyatadsananon, P., Amaratunga, D., & Keraminiyage, K. (2012, 24-26 August, 2012). *The capability of spatial analysis in planning the accessibility for hazard community from debris-flow events*. Paper presented at the International Conference on Disaster Management 2012, Kumamoto, Japan.
- Sautoy, P. D. (1969). Community development and problems of resettlement schemes. *Community Development Journal*, 4, pp. 143-150.
- SDS/IND. (1999). *Involuntary Resettlement in IDB Projects-Principles and Guidelines*. Washington D.C.: Indigenous Peoples and Community Development Unit.
- Sugathapala, K. (2008, 18-21 Nov 2008). *Impact on Livelihoods of landslide affected communities duxe to resettlement programmes*. Paper presented at the The First World Landslide Forum, United Nations University, Tokyo, Japan.
- UNDP. (2009). A Contribution to the 2009 ISDR Global Assessment Report on Disaster Reduction, Early Recovery, Vulnerability Reduction and Disaster Risk Reduction Available from <http://www.preventionweb.net/english/hyogo/gar/background-papers/documents/Chap5/thematic-progress-reviews/recovery/UNDPBCPR-ERT.doc>
- UNDRCO. (1982). *Shelter after Disaster: Guidelines for assistace*. New York: United Nations Organization Mission in the Demorcratic Republic of the Congo.
- UNHCR. (2007). Handbook for Emergencies *Operations* (pp. 595). Geneva: United Nations High Commissioner for Refugees.
- Woube, M. (2005). *Effects of resettlement schemes on the biophysical and human environments: The case of the Gambela Region, Ethiopia*. Florida, USA.



# **Collaborative risk management: a team framework for managing risks on construction projects**

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## **Abstract**

There are usually four main stakeholder groups involved in a construction project, namely: the owner, the project manager, the designers and the contractors. Each of these individual parties perceives different types of risks to the project. Therefore there needs to be a high degree of collaboration when managing risks in order to integrate the different perspectives into a coherent and holistic risk management strategy. This research seeks to establish a team-based framework for managing risk in construction, with the aim being to create a high level of interaction between the four main stakeholder groups mentioned previously at each step of the risk management process. The research involved the case of a construction project in the South-West of Germany. Firstly, interviews were undertaken with the parties involved to understand their different perspectives and to identify their requirements from the risk management process. Secondly, a questionnaire was developed. 150 questionnaires were sent out to clients, project managers, designers and contractors. 97 usable responses were received (a response rate of 65%). The survey findings are used to inform the development of a collaborative team-based framework.

## **Keywords**

Construction, Germany, Project Management, Risk Management, Project Team

## **1. Content and motivation**

Every human being interacts with buildings in some shape or form, which means that everyone has an opinion about construction (Woudhuysen and Abley, 2004). Nevertheless, the complexity behind the management of a construction project is not understood by all individuals. This complexity results in project risk. In fact, there are researchers who state that construction projects are those which are plagued most by risks (Harris, 1998; Tah and Carr, 2000). But what is risk in a construction context and for whom are the risks greatest?

In a previous paper (Demir et al., 2011) the authors argued that stakeholders are involved in the risk management process in two ways. Firstly, there are risks which can arise out of a stakeholder's engagement with the project, which need to be identified, analysed and treated in an appropriate way. Secondly, the views, perceptions and perspectives of stakeholders have to be considered when establishing the context and dealing with risks. The former has been covered in the previous paper so the aim of this paper is to deal with the later. Risk means different things to different individuals. Consequently different project participants often perceive different types of risks, because each involved party in a construction project has a different view on the project. Therefore this research seeks to propose a collaborative way of managing risks which has the ability to take advantage of the different views from the different parties involved in a construction project.



## 2. Background

### 2.1 Occupational culture in construction

A construction project requires a high variety of workman (Eccles, 1981) and increasing variety of experts (Walker, 2007). Even on a small project large numbers of parties and contributors are involved (ibid). These involved parties and contributors can be categorised into three groups, namely: the owner/project manager (owner's representative), designers and contractors (Nassar et al., 2005; Kochendoerfer et al., 2007). Each of these individual parties has their own objectives and perceived threats and opportunities, i.e. risks, when undertaking a construction project (Zhi, 1995).

It is often the case that the owners do not have the required skills and qualifications to undertake their projects on their own (Reve and Levitt, 1984). Therefore owners normally hire a project manager to manage the design and the construction processes of the project (ibid.; Low, 1998; Sommer, 2009). A central role of project management is to manage the parties involved in construction (Edum-Fotwe and McCaffer, 2000; Kochendoerfer et al., 2007; Lonergan, 2009). Kochendoerfer et al. (2007) explain how the parties involved in construction have different perspectives on the project aims and objectives, which is related to their occupational culture. They argue further that the owner will always try to achieve the maximum in quality and functionality at the lowest costs and risks. The same applies for the designers, but with the difference that their focus on better solutions might cause higher costs. The focus of the contractors is on costs rather than other factors.

Smircich (1983) as well as Hatch (1993) explored how organisational behaviour and culture has a high impact on an organisation's performance. Marosszky et al. (2002) also confirmed this for project success in the construction industry. Ankrah and Langford (2005) compared the organisational cultures of architects and contractors. This research was expanded through Akiner and Tijhuis (2007), who established that the work goal orientation of both involved parties were in agreement, but the sequence of importance was different. The results of the research from Akiner and Tijhuis (2007) is summarised in table 1.

Table 1: Work goal orientation of architects and contractors (from, Akiner and Tijhuis, 2007)

Rank	Architects	Contractors
1	Freedom	Employment security
2	Challenge	Contribute to company
3	Contribute to company	Challenge
4	Employment security	Freedom

Prior project management research has also focused on the organisational and occupational culture between the owner and the project manager (Edum-Fotwe and McCaffer, 2000; Turner and Müller, 2004; Bryde and Robinson, 2005; Enhassi and Abu Mosa, 2008). According to Turner (2004), the best results in projects are achieved when the owner and project manager work together in partnership and when the project manager is empowered to take decisions about the best way of achieving the project's aims and objectives. Turner and Müller (2004) found that this cannot be always achieved, because there is a difference between the owner's need for information and the information supplied by the project

management. This means that the information expected by the owner about his/her project is in some cases less than that submitted by the project management, which results in distrust between these two involved parties (ibid.). Pavia et al. (2006) also found that there is often a gap between the expected performance of the client and the delivered performance. One of the main reasons for poor performance on construction projects are conflicts between the parties involved in construction (Ankrah and Langford, 2005). These conflicts are mainly based on misunderstandings of cultural differences between the occupational groups (Akiner and Tijhuis, 2007). They argue that “an understanding of occupational, organizational and other subcultures affecting and affected by national culture will reduce or minimize the problems” (ibid. p. 1173). Because of their different occupational cultures, each of these involved parties perceives the project risks differently (March and Shapira, 1987; Mulholland and Christian, 1999; Sjöberg, 2000; Chapman, 2001; Sjöberg et al., 2004; Dastous et al., 2008; Enhassi and Abu Mosa, 2008). Another reason for differences is that the type of risks where realistic perceptions can be made, are those risks in which the occupational groups have direct or indirect experience (Sjöberg, 2000). That means that for implementing and for carrying out risk management on a project, the project management needs “[...] both ‘hard’ technical skills to help control the iron triangle of time, cost and functional scope, as well as relationship management skills to work effectively with people and get the best out of them” (Bourne and Walker, 2004: 226).

## ***2.2 Construction project risk management***

A project risk can be defined as “[...] an uncertain event or set of circumstances that, should it occur, will have an effect on achievement of one or more project objectives” (Association for Project Management, 2006: 26). In general, all project undertakings are risky, because they are unique, complex, based on assumptions and done by people (Association for Project Management, 2006). But, the construction industry is one of the industries with many risks (Tah and Carr, 2000). Roesel (1987, p. 251) identified reasons why construction projects are exposed to more risks than projects from other industries, which are as follows: changing designer teams consisting of architects and engineers and formed only for that project; use of unknown contractors, where decisions are made because of the lowest tender price; the uncertainty about the qualitative, quantitative and physical performance of the successful tenderers and their staff; ground conditions; changing material costs; and weather conditions. Hence, construction projects need to have an effective risk management system, because they are exposed to such risks, and those risks can create a variation (positive or negative) from the project objectives, which needs to be controlled. Therefore risk management can be defined as a “[...] structured process that allows individual risk events and overall project risk to be understood and managed proactively, optimizing project success by minimising threats and maximizing opportunities” (Association for Project Management, 2006: 26). The International Organisation for Standardisation (2009) suggests the following process steps for undertaking risk management: (1) establishing the context, (2) risk assessment, (2.1) risk identification, (2.2) risk analysis, (2.3) risk evaluation, and (3) risk treatment.

According to Rohrschneider (2003) and Pinnells and Pinnells (2007) risk management is implemented in practice when the risky events are occurring or are clearly visible. However, risk management has to be practiced pro-actively (Association for Project Management, 2006; Project Management Institute, 2008; International Organization for Standardization, 2009), because when practiced reactively it ends up in crisis management (Hubbard, 2009). Risk management should not be seen as additional effort for the project management team or project manager but rather as a supportive tool during all project phases (Girmscheid, 2006). Further, Rohrschneider (2003) argues that risk management has to be implemented as soon as

possible, because the risks for the construction project already exist, even before project start-up.

### 3. Problem definition and research aim

A risk is a variation from an aim which needs to be exposed to the project participants (Association for Project Management, 2006). Each involved party has its own view on the project and hence sees things from a different perspective. This can be illustrated with the following diagram.

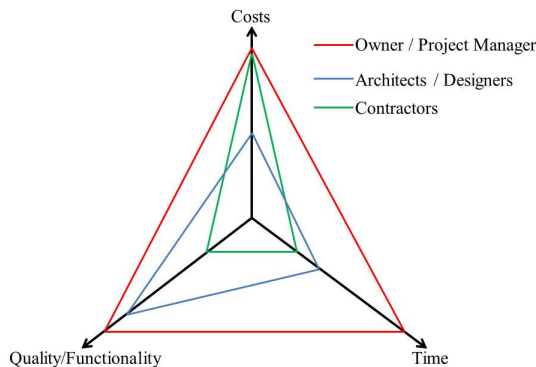


Fig. 1. Different project views (adopted and modified from Kochendoerfer et al., 2007)

Hence, in the best case there should be a high degree of collaboration when managing risks, because this will ensure that the project's risks are explored appropriately and viewed from different angles. Further, Demir et al. (2011) found that the views, perceptions and perspectives of different project participants need to be considered when establishing a coherent and holistic risk management strategy.

However, approaches to a collaborative team framework which take advantage of the different views and perceptions of project risks from different parties involved in a construction project have not to date been developed. Therefore the aim of this paper is to derive a team-based framework for managing risk in construction, with the aim being to create a high level of interactions between the main stakeholders groups mentioned previously at each step of the risk management process.

The developed framework needs to avoid any additional effort for the parties involved in construction in terms of their risk management process. The construction sector prefers tools or methods which are simple and flexible (Garnett and Pickrell, 2000). Therefore the proposed team based framework needs the ability to be easily integrated within the project management system.

### 4. Method

The development of the collaborative risk management framework was achieved in two stages.

Firstly, a detailed understanding of risk management was required. This was facilitated through reviewing the trends in current literature. However, there are still gaps between theory and practice. Hence in order to create a link between theory and practice semi structured interviews were conducted with 3 Risk Management Experts [RMEs]. The interviews, which were explanatory in their nature, were undertaken with highly experienced managers from well-known companies in Germany. The interviews with the RMEs focused on the best practices of the interviewed persons in dealing with risks (tools, setups etc.) and hence knowledge from practice which supplements the literature has been gained. Each interview lasted approximately one hour. The interviews were recorded and then transcribed.

The transcripts were analyzed using the Computer Assisted Qualitative Data Analysis Software, NVIVO.

Secondly, the authors identified how risk management is expected to be done by the parties involved in construction. This is important as it ensures that the developed framework will fulfill the expectations of the project participants. This was facilitated through interviewing the owner, the project manager, the architect and the contractor of one large-scale construction project located in south-west of Germany. The particular focus of these interviews was more on who should do risk management and how it should be done. Again the interviews lasted about one hour and have been analysed in the same way as the RMEs.

However, given that the parties interviewed are from one case study and are only four people might mean that the data gathered within this research is only reliable for this particular case. To be able to claim that the developed collaborative risk management framework has wider validity the interview data needs to be validated. This was achieved through conducting a quantitative survey. The interview findings were used to develop a questionnaire where the aim was to validate the interview findings. The authors faced the problem that the number of owners, project managers, architects and contractors in the wider population is very difficult to establish. Therefore the whole population is not easily identifiable. Therefore non-probability sampling techniques were used. The researchers decided to use a convenience sample technique. Generalizability cannot be claimed when using such a technique, but this is also not the aim of this research. The aim is merely to reinforce the interview findings and to have a solid basis of data for the discussion.

## 5. Findings

### 5.1 Interviews

All the RMEs (RME A, RME B and RME C), the project owner (PO), project manager (PM), the project architect (PA) and the project contractor (PC) stated that project risk management should be done by the project manager who is the representative of the client. This was articulated clearly by RME A: *“the project manager is required to submit the information”* and by the IPA: *“if there is an external project manager then it could be done by him”*. The reason for this was elaborated upon by RME 3 and by the PM as being that the project manager is required to satisfy the customer. RME 2 also argued that it might be appropriate for big projects to hire an external project risk manager. This was not confirmed by the PA, who stated: *“But what is stupid, is to bring in more people. We already have a lot of people and the tables are getting longer and longer. That is not good. That will be counterproductive”*. A completely different perspective was provided by the PC, who said that *“everybody must do their own (risk management). You cannot trust among each other. You have to do it. I would never trust on the risk management from your company (project management), never”*. The PC gave another metaphoric example: *“I was in a conference and there the moderator said that the German construction contract is a declaration of war”*. So to conclude, table 2 provides a summary of the interview findings from asking the interviewees the question, who should do risk management?

Table 2: Summary interview findings

<i>Involved party</i>	<i>Suggestion</i>
<i>PO</i>	<i>Project manager</i>
<i>PM</i>	<i>Project manager</i>
<i>PA</i>	<i>Project manager</i>
<i>PC</i>	<i>Everybody its own</i>

Besides other insights gained during the interview, table 2 shows the expectations of the parties involved regarding who should play the leading role when managing risks.

## 5.2 Survey

The aim of the survey was to confirm or otherwise the above findings. To achieve this, 150 questionnaires were sent out to clients, project managers, designers and contractors, 97 usable responses were received, giving a response rate of 65%. People who are working directly for the owner are representing the biggest part of the survey participants with 32%, 26% are project managers, 21% are designers and 22% are contractors. The survey results were analysed using only arithmetic mean calculations. This is sufficient for the purposes of this research, because the aim of the survey was not to explain causal relationships, but rather to compare and check if the survey results reflect those of the interviews. The survey results are shown in the figure below.

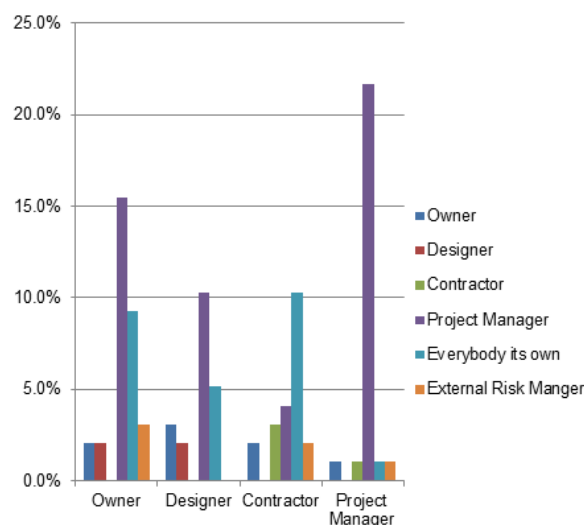


Fig. 2. Extract of survey results

As shown in figure 2, the survey results are consistent with the interview findings. Most of the surveyed owners, designers and project managers stated clearly that they believed that the task of project risk management should be undertaken by the project manager. The data relating to contractors mirrors those of the interviews, revealing their distrust with the other parties involved and their belief that everybody should do their own risk management.

However, what stands out is that none of the designers, who are mainly from an architectural academic background and none of the contractors, who have mainly an academic background in civil engineering, suggested each other for doing the risk management. None of the owners (who also mainly have academic backgrounds as architects) suggested the contractors. The project managers, who consist mainly of civil engineers, in terms of their academic background, did not suggest the designers as the best party to do risk management. But the contractors and the designers did in part suggest themselves for doing risk management. This shows that a neutral person is required on site to avoid conflicts arising because of the issue of who should do risk management.

Based on this, the authors think that the project risk management process should be managed by a person located independently of the different interest groups (contractor and architects), because of the potential distrust between them. The obvious person who could do this is the

project manager. But the other involved parties would need to be involved in the process to create a level of trust, and facilitate the communication flow.

## 6. Discussion

The findings highlight two key things. Firstly, that risk management should be integrated with project management and not require more effort for the parties involved. Secondly, a neutral person is required to perform the risk management process to increase the level of trust among the parties, but that the different perceptions, views and expertise on risks by different project participants should be taken into account when identifying risks.

The crucial enabler for risk management is communication. To increase the communication within the project team, a new organisational sub-structure needs to be established, only for risk management. This organisational sub-structure has to shift from the hierarchical and static project organisation, to a more flat and dynamic organisational structure. Hence the authors propose the following risk management organisation which will enable collaborative risk management, as shown in figure 3.



Fig. 3. Collaborative risk management team

This organisational structure would be added to the project organisation. Hence, the whole project will distinguish between functional and operational responsibilities. The collaborative risk management team is a functional organisational unit. The heart of this dynamic team unit is created by the risk manager. The risk manager is the overall responsible person for the risk management process. This person plans and operates the risk management process. They will moderate all the meetings where the issues which are related to risks are discussed. In addition, all communication about risks will pass through the risk manager and then be distributed to the relevant parties. The risk manager can be the project manager of the project or any other person from the project management team. The subject matter experts are people who have knowledge and expertise in certain work disciplines. These are the members of the whole project team, i.e. designers, contractors, consultants etc.

There are two ways of benefiting from this collaborative framework. One way is to formalise risk management within the project. To achieve this all the project team members have to be informed and eventually contractual clauses have to be established for the different parties, where it is stated that they will become a part of the risk management team. Then workshops or meetings can be established whereby risks can be identified and assessed collaboratively. This approach might incur additional costs for the project owner, so the people can argue that this was not monetarily agreed in their contracts and they can claim additional costs.

However, another approach might be to benefit from the informal nature of current risk management practices. Risk management is always done though it is not always practiced in a systematic way. It is sometimes informal and not particularly organised. But the identification of risks is already a task which is done in each project. There are a lot of

meetings where issues related to risks are also covered. The only problem is the lack of organisation. Further, the authors believe that within a project it might be impractical to insist on additional meetings or workshops which cover only risk management issues. A more workable and easier method is to introduce a discussion topic called “risks” within the existing meetings. In the discussion of this topic two questions have to be asked, namely (1) “what and where may things go wrong?” and (2) “is it possible to be somewhere faster, smarter or cheaper?”

The case study organization from which the interviewees came has seven meetings a month. Every seven days there is a construction execution meeting. Every fourteen days there is a design meeting. Once a month, a general project meeting takes place. These different meetings have different scopes, focus on different issues and have different individuals participating. Hence an informal collaborative risk management team structure, which runs in the background and is moderated by the project manager provides the advantage of being able to detect different risks, get more reliable probability values and develop adequate treatment strategies. This also means that the subject matter experts are more flexible and can change from meeting to meeting.

## **7. Conclusion**

A construction project consists of a high variety of experts and a high variety of different labour professions. Each project team member notices different risks and perceives different probabilities and impacts of occurrence for them. This paper has highlighted the distrust and questioning of capabilities between the different project participants, which characterises construction project environments. This environment creates a situation where the focus is more on the (mainly economic) interests of each involved party rather than on the project as a whole. In addition, such a project environment does not allow for the taking advantage of the different views and expertise for or during the risk management process. One major task for risk management is the identification of risks, because only those risks which have been identified can be analysed. This has to be done frequently. Therefore the authors propose a functional, flat and dynamic project organisation, which allows for collaborative risk management within a construction project. Within this collaborative risk management team framework, risks can be discussed effectively in each meeting as a bullet point on the agenda. This is achieved through establishing new pathways for communicating risks and through letting all project team members contribute to the risk management process.

Following on from this work, further empirical studies are required to test the collaborative risk management framework to a variety of construction project situations. Such study will validate the framework and will allow for refinements and improvements.

## **References**

- Akiner, I., & Tjihuis, W. (2007). Work goal orientation of construction professionals in Turkey: comparison of architects and civil engineers. *Construction Management and Economics*, 25(11), pp. 1165-1175.
- Ankrah, N., & Langford, D. (2005). Architects and contractors: a comparative study of organisational cultures. *Construction Management and Economics*, 23(6), pp. 595-607.
- Association for Project Management. (2006). *APM Body of Knowledge* (5th ed.). Buckinghamshire: Association for Project Management.
- Bourne, L., & Walker, D. H. (2004). Advancing project management in learning organizations. *The Learning Organization*, 11(3), pp. 226-243.

- Bryde, J. D., & Robinson, L. (2005). Client versus contractor perspectives on project success criteria. *International Journal of Project Management*, 23(8), pp. 622-629.
- Chapman, R. J. (2001). The controlling influences on effective risk identification and assessment for construction design management. *International Journal of Project Management*, 13(3), pp. 147-160.
- Dastous, P., Nikiema, J., Marechal, D., Racine, L., & Lacoursiere, J. (2008). Risk management: All stakeholders must do their part. *Journal of Loss Prevention in Process Industries*, 21(4), pp. 367-373.
- Demir, S. T., Bryde, D. J., Fearon, D., & Ochieng, E. (2011). 3dSA: A Tool for Integrating Stakeholder Analysis and Risk Management. *Proceedings of the Salford Postgraduate Annual Research Conference (SPARC) 2011* (pp. 116-127). Manchester: The University of Salford.
- Eccles, R. (1981). The quasifirm in the construction industry. *Journal of Economic Behavior and Organization*, 2(1), pp. 335-357.
- Edum-Fotwe, F., & McCaffer, R. (2000). Developing project management competency. perspectives from the construction industry. *18(2)*, 111-124.
- Enhassi, A., & Abu Mosa, J. (2008). Risk Management in Building Projects: owners`Perspective. *The Islamic University Journal*, 16(1), pp. 95-123.
- Girmscheid, G. (2007). *Projektabwicklung in der Bauwirtschaft - Wege zur Win-Win-Situation für Auftraggeber und Auftragnehmer* (2nd ed.). Berlin: Springer.
- Harris, C. (1998). Why research without theory is not research- A reply to Seymour, Crook and Rooke. *Construction Management and Economics*, 16(1), 113-116.
- Hatch, M. J. (1993). The Dynamics of Organizational Culture. *Academy of Management Review*, 18(4), pp. 657-693.
- Hubbard, D. (2009). *The Failure of Risk Management-Why It`s Broken and How to Fix It*. New Jersey: John Wiley & Sons.
- International Organization for Standardization. (2009). *ISO 31000: Risk Management - Principles and guidelines*. Geneva: ISO.
- Kochendoerfer, B., Liebchen, J. H., & Viering, M. G. (2007). *Bau-Projekt-Management - Leitfaden des Baubetriebs und der Bauwirtschaft* (3rd ed.). Wiesbaden: Teubner Verlag.
- Lonergan, K. (2009). *Free Management Library*. Retrieved November 4, 2009, from [http://managementhelp.org/plan\\_dec/project/project.htm](http://managementhelp.org/plan_dec/project/project.htm)
- Low, S. P. (1998). back to the basics: biblical wisdom for effective construction project management. *International Journal of Project Management*, 16(4), 209-214.
- March, J. G., & Shapira, Z. (1987). Managerial Perspective on Risk and Risk Taking. *Management Science*, 33(11), pp. 1404-1418.



- Marosszeky, T. M., Karim, k., Davis, S., & McGeorge, D. (2002). The Importance of Project Culture in Achieving Quality outcomes in Construction. *Proceedings IGLC-10* (pp. 1-13). Gramado: International Group for Lean Construction.
- Mulholland, B., & Christian, J. (1999). Risk Assessment in Construction Schedules. *Journal of Construction Engineering and Management*, 125(1), pp. 8-15.
- Nassar, K., Nassar, W., & Hegab, M. (2005). Evaluating Cost Overruns of Asphalt Paving Project Using Statistical Process Control Methods. *Journal of Construction Engineering and Management*, 131(11), pp. 1173-1178.
- Pavia, J. K., Wagner, F. G., & Edgeman, R. L. (2006). Using Six Sigma methodology to create a kiln drying workshop. *FPS 60th International Convention & Technology Transfer Group*. Idaho: The University of Idaho.
- Pinnells, J. R., & Pinnells, E. (2007). *Risikomanagement in Projekten*. Wiesbaden: GWV Fachverlage.
- Project Management Institute. (2008). *A Guide to the Project Management Body of Knowledge (PM Guide)*. Pennsylvania: Project Management Institute.
- Reve, T., & Levitt, R. (1984). Organization and governance in construction. *Project Management*, 2(1), 17-25.
- Rohrschneider, U. (2003). 4.7 Risikomanagement. In D. G. Projektmanagement, *Projektmanagement Fachmann* (pp. 1087-1122). Eschborn: RKW- Verlag.
- Rösel, W. (1987). *Baumanagement Grundlagen - Technik - Praxis*. Berlin: Springer Verlag.
- Sjöberg, L. (2000). Factors in Risk Perception. *Risk Analysis*, 20(1), pp. 1-11.
- Sjöberg, L., Moen, B., & Rundmo, T. (2004). *Explaining risk perception. An evaluation of the psychometric paradigm in risk perception research*. Trondheim: Rotunde publikasjoner.
- Smircich, L. (1983). Concepts of Culture and Organizational Analysis. *Administrative Science Quarterly*, 28(3), pp. 339-358.
- Sommer, H. (2009). *Projektmanagement im Hochbau - 35 Jahre Innovationen bei Drees & Sommer* (3rd ed.). Berlin: Springer.
- Tah, J., & Carr, V. (2000). A proposal for construction project risk assessment using fuzzy logic. *Construction Management and Economics*, 18(4), pp. 491-500.
- Turner, R. (2004). Five necessary conditions for project success. *International Journal of Project Management*, 22(5), pp. 349-350.
- Turner, R., & Müller, R. (2004). Communication and Co-operation on Projects Between the project Owner As principil and the Project Manager as Agent. *European Management Journal*, 22(3), pp. 327-336.
- Walker, A. (2007). *Project Management in Construction* (5th ed.). Oxford: Blackwell Publishing.

- Woudhuysen, J., & Abley, I. (2004). *Why is construction so backward*. West Sussex: Wiley Academy.
- Zhi, H. (1995). Risk management for overseas construction projects. *International Journal of Project Management*, 13(4), pp. 231-237.

# **Early stage socio-economic impact evaluation of sustainable regeneration: a perspective of a commercial project**

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In recent years, sustainable regeneration has been recognised as being of major socio-economic concern in the world. In the UK for instance, the government has initiated a number of policies and evaluation methods to deal with some of the environmental problems associated with regeneration projects. However, the approach to the management of these projects has often been seen as not achieving their set objectives. Attempts aimed at evaluating the implementation of sustainability by built environment professionals have primarily been limited to the assessment of environmental impacts with the associated socio-economic aspects of a project's sustainable regeneration often neglected. While there have been a number of studies on sustainability and its evaluation in relation to regeneration projects in the UK, there has not been any well-defined built environment research that has been able to deal holistically with the broader issues of sustainability in terms of impacts of the regeneration projects to the end-user and the communities concerned. The findings of an exploratory study that adopted a semi-structured interviews approach for data collection from five stakeholders involved in a commercial regeneration project in the UK are presented in this paper. The findings reveal a lack of a mechanism to evaluate the socio-economic impacts of sustainability in relation to a commercial project at the early stage of the project's development. The results suggest that the environmental factors of sustainability continue to be the most dominant factor of sustainability considered by built environment practitioners as compared to the consideration of a project's potential socio-economic benefits.

Keywords: Commercial project, socio-economic impact evaluation, sustainable regeneration.

## **1. Introduction**

The awareness and importance of sustainable development and regeneration has been a growing concern around the world for the last few decades (Edum-Fotwe and Price, 2009). In the UK, the concept of sustainable development and regeneration has been an essential focal point of government policy for some time and has contributed to the enhancement of many communities' physical structures (Haran *et al*, 2011). Many of earlier initiatives that were meant to tackle socio-economic disparities have focused on improving the physical and environmental aspects of regeneration. In more recent times, there have been a number of studies which sought to study and analyze how the UK built environment is responding to the challenges of integrating sustainability into regeneration projects (Dixon, 2006). This emerging research has sought to suggest a new approach to delivering regeneration for the 21<sup>st</sup> century and beyond. The Sustainable Development Commission (SDC, 2003), suggested that the development of regeneration has proved to be a testing and on-going challenge for government agencies, construction industry practitioners and communities within the UK. The appreciation of such challenges has led to the development of various management strategies and systems to guide and direct industry practitioners to achieve higher and improved sustainability standards. However, attempts aimed at implementing sustainability

assessment have primarily been limited to the assessment of the environmental performance of building. According to Brandon and Lombardi (2011), several studies undertaken on sustainable regeneration have shown that they lack a conceptual clarity related to sustainability assessment. They identified sustainable regeneration/development as an evolving subject and suggested the need for further study as there has not been a well-defined research or evaluation framework that has been able to deal with the issues of socio-economic impact/benefits and their evaluation in a comprehensive and a decisive manner. Consequently, the quest for sustainable development and the need for better sustainable regeneration outcomes calls for an exploration of new ways of evaluating, at an early stage, sustainable regeneration projects that are under-pinned by strong socio-economic considerations; and which better address sustainability concerns in a holistic manner to maximise the sustainability benefits of these projects.

The early stage socio-economic impact evaluation of commercial sustainable regeneration projects in the UK is explored in this paper. Initially, literature is reviewed on sustainable development and regeneration projects, overview of the current evaluation methods and their limitations. A discussion is then presented on the findings from an exploratory study that adopted semi-structured interviews with five stakeholders of leading construction industry organizations involved in commercial regeneration projects in the UK, and draws a conclusion. The work draws from on-going research which is concerned with the development of a framework for socio-economic benefit evaluation of regeneration projects in the built environment.

## **2. Literature Review**

### ***2.1 Sustainable Development and Sustainable Regeneration - a shared objective***

The post war era has seen a significant number of transformations in a form of regeneration schemes, designed to improve the social and economic well-being of areas that have experienced a dramatic decline in their socio-economic fortune (CLG, 2010). According to Boyko *et al.*, (2006) such transformation of the urban environment has often been viewed largely in physical terms, for instance, the construction of new a hospital, school, housing etc in a community. The Department for Community and Local Government report outline the need to strive for a greater balance between the creation of physically environment and the creation of sustainable communities where people want to live and feel secure (CLG, 2009). The UK regeneration strategy has traditionally focused on housing conditions of the poorer communities (Special Economics Research Center Strategies (SERC), 2011). It sets out an agenda for the provision of quality facilities to meet the needs of society in a comprehensive and integrated manner to contribute towards the creation and maintenance of sustainable communities. Ultimately, regeneration is about closing the socio-economic gaps (Community and Local Government (CLG), 2010) and tackling the spatial disparities that exist within the communities (HM Treasury, 2007). It also means meeting the needs of the people in a way that delivers social progress, economic growth, environmental protection, and better quality of life (Office of Government Commerce (OGC), 2007; SDC, 2003). Yet, the conventional project management approach adopted to deliver such regeneration goals has accounted for their failure (Sorrell and Holti, 2007). It has also been argued that many of such regeneration initiatives have been planned without the fundamental elements of sustainability as a parallel strand, resulting in their failure to deliver on such shared objectives underlying sustainable development agenda. The UK government Audit Commission report (2007) has revealed that

many regeneration activities are yet to have a consistent, positive impact on the most deprived localities in which they are sited. For example, it reported that the level of long-term unemployed in such regeneration communities has remained static and targeted work to develop skills and access to employment for these communities remains under developed. The bottom line is that regeneration shares many goals with sustainable development, therefore any effort aimed at improving the efficiency of regeneration projects should pay greater attention to the sustainability factors. To deliver sustainable regeneration goals as advocated by the UK government's reports (CLG, 2009; 2010) will require a strong and strategic approach to sustainable regeneration development to meet local needs. Since socio-economic differences are seen to be directly rooted in our community set up, focusing on sustainable regeneration has enormous potential to drive the regeneration process towards the attainment of a sustainable community and development agenda (Smith, 2006). An empirical study by Coaffee (2004) suggested that the previous attempts to delivery regeneration programmes were seen to be lacking the vision of improving the local communities in a way that meets the sustainable development requirements of the area. A subsequent study by Granger (2010), supported this view by suggesting that much of what has been perceived to be sustainable regeneration in recent years in urban communities has been redevelopment rather than regeneration. Granger went on to argue that the objectives of such regeneration projects have been focused on improving the physical 'appearance' rather than addressing socio-economic needs of the communities concerned, hence their inability to address fundamental objectives underlying sustainable regeneration projects. It is believed that if future regeneration will make greater sustainable impact on the community then the current regeneration projects' priorities will have to be altered to reflect the priorities in achieving the sustainable development objectives for the communities (Raco and Henderson, (2009). In a series of stakeholder consultation events reported in CLG (2008), the majority of the participants suggested that socio-economic development should be seen as a key driver for sustainable regeneration outcomes. The participants emphasised a sustainable regeneration framework that pays a greater attention to deliver tangible and sustainable benefits in a holistic manner. Such evaluation framework and their processes must embrace other dimensions beyond the current consideration of sustainability and not one that is only environmentally oriented (Dixon, 2006) if regeneration projects are to attain their sustainability objective and to stand the test of time. It has been suggested that the sustainable regeneration processes which are based on a strategic evaluation plans that are holistic in nature are more likely to drive sustainable regeneration agenda in achieving the sustainable development outcomes for the communities (Hemphill *et al*, 2004).

## ***2.2 Conceptual overview of current evaluation methods and their limitations***

There has been a number of assessment methods developed in the past notable among them are the conventional parametric and construction cost models (Fortune and Cox, 2005). Recently, there has been a significant growth in the number of environmental and sustainability assessment methods available for use in the construction industry such as the fuzzy logic, neural network, neurofuzzy systems and environmental and sustainability life cycle cost models (Mateus and Bragança, 2011; Fortune and Cox, 2005). While some of these system and tools have focused mainly on evaluating the environmental and sustainability performance of the proposed developments, others have placed emphasis on the assessment of their environmental and sustainability impacts (Ding, 2008). The development of these various forms of evaluation methods has largely been informed by the desire to provide building projects with a better profile of environmental performance and the achievement of the best practice in sustainable building design, construction and operation.

Empirical work by Haapio and Viitaniemi (2008) identified shortcomings in the design tools used, which limits their usefulness to the environmental building designs. Several other studies have also drawn similar conclusions. A recent work by Brandon and Lombardi, (2011) pointed out that the current lists of available methods do not reflect the complexities of issues they were designed to address. They noted that most of the existing evaluation methods were based on environmental criteria that were derived from ideas and assumptions of individual practitioners. A study conducted by CLG (2010) suggested that several attempts to evaluate the impact of the regeneration projects to date have been seen to be partial in their nature. The report went on to advise practitioners to undertake a vigorous evaluation on regeneration projects and challenged them to be prepared to act on any evidence pointing to lack of project success. In order for evaluation frameworks to form an acceptable basis for the evaluation of sustainability in regeneration projects, it is essential that the fundamental constraints underlying the current systems are tackled simultaneously to achieving the optimum balance between sustainability factors. Such evaluation frameworks should set out standards and consider innovative solutions that can lead to the maximization of the sustainability benefits that are higher than the current standards and improve the performance that is required. It is suggested that the assessment methods which are flexible and multi-dimensional in nature are likely to offer the best sustainability solutions (Hurley, *et al*, 2008).

### 3. Research approach

In order to meet the objectives of the study, an initial exploration was undertaken through a literature review as a starting point to ascertain the background information relating to the current sustainability practices. A qualitative research design was then adopted with semi-structured interviews used to collect rich data. This approach reflected an interpretivist philosophical position that made use of inductive research strategy and qualitative methodology. A qualitative research approach is considered as an effective method that occurs in a natural setting which enables the researcher to develop a level of detail from involvement in the practice (Creswell, 2009). Initially, 14 leading construction (contractor) organisations in the UK were selected, based on their experience and knowledge in sustainable regeneration projects, through a purposive snow balling sample technique. They were then contacted through formal letters as an invitation to participate in the study. Follow up telephone calls were also made to these organisations to explain the purpose and the context of the study. In all, a total number of five (5) organisations agreed to take part in the study. The profiles of these agreed organisations/interviewees are shown in the table 1 below. Face-to-face in-depth semi-structured interviews were then undertaken with the sustainable/regeneration managers of these organisations. Each interview lasted for 45-50 minutes. The interviews were formatted around a range of open-ended questions to explore the sustainability and evaluation issues under investigation. The qualitative data collected were analysed and presented using verbatim extracts from respondents' responses to identify the emerging themes and issues in the current practices related to early stage evaluation of sustainable commercial regeneration projects.

Table 1: Profiles of interviewees and their leading organisations.

<b>Interviewee</b>	<b>Position</b>	<b>Organisation Type</b>
A	Regeneration manager	Contractor organisation
B	Regeneration manager	Contractor organisation
C	Regeneration manager	Contractor organisation
D	Regeneration manager	Contractor organisation

E	Regeneration manager	Contractor organisation
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### ***3.1 Sustainability Factors***

The first interview question put to the interviewees explored their organisations' understanding of sustainability and the importance the practitioners and their organisations attached to such sustainability factors when evaluating project viability. A significant theme that emerged from their responses was the lack of conceptual clarity of what are 'sustainability factors' by the interviewees. All the interviewees provided relatively simplistic definitions and understanding of sustainability in relation to their business operations. Typical of the comment made by one of the interviewee was:

*“Sustainability is something ingrained and inherent in our business processes something that the business has to pay attention to in order to stay competitive...It is about protecting our business from the risks of today and ensuring that we respond to the challenges and opportunities that tomorrow brings...”* (Interviewee C).

The responses highlighted the limitation in the practitioners' perception and understanding of sustainability. The ambiguity of what constitutes sustainability was also identified as a major problem in works done by Brandon and Lombardi (2011) and Evans and Jones (2008).

### ***3.2 Sustainable regeneration objectives and impact/benefits***

When the practitioners were further asked about their understanding of the main objectives of sustainable regeneration projects, the respondents provided mixed responses. Some interviewees commented:

*“... To be aware of the social and physical environment and to endeavour to improve the quality of life to residents...It is about achieving the right balance through our innovative design solutions and area transformation, while maintaining a clear focus on the overall objectives of creating a robust infrastructure and services”*(Interviewee A).

*“All regeneration needs to be profitable and if it isn't profitable, there's no point doing it, if there won't be any kind of benefit. So without the benefit element, no regeneration happens unless you get a philanthropic developer who just wants to spend millions of pounds to make people happy for things to happen. So it's got to be regeneration development which generates the commercial returns they want because without these commercial returns, there won't be any development and if there is no development, there won't be any regeneration...”* (Interviewee D).

Discussing the issues further about the impact/benefits to their organisations and the end-users, most of the respondents indicated that company reputation and profit making was the main benefit for adopting the sustainability principles by their organisations. However, the

majority of respondents were of the opinion that issues related to energy usage and in particular cost savings on fuel bills was the main benefit to the end-user.

### **3.2 Evaluation and evaluation framework/mechanisms**

According to Kazmierczak *et al.* (2009), the evaluation process provides an effective management mechanism on which decision-makers can base their judgements. In exploring the evaluation mechanisms currently in practice, many of the interviewees indicated BREEAM as being the main evaluation mechanism used for their projects. As one of the interviewee noted:

*“...BREEAM is easy to use as it provides a guideline and specifies the environmental impact of the final products. BREEAM ultimate benefits are recognisability of sustainability in the sense that it tends to capture the main environmental aspects of projects...Compliance with the existing environmental legislation and principles and best practices”* (Interviewee B).

Evidence from the interviewees showed that sustainable regeneration practitioners still consider environmental factors to be the most dominant feature of sustainability and they tend to neglect the consideration of any socio-economic factors. Most of the respondents emphasised the environmental credentials of BREEAM and also regarded its application as representing the industry’s best practice in relation to sustainability. It is worth noting that BREEAM parameters are prescriptive in nature and largely based on quantitative assessment which tends to ignore the processes and issues relating to socio-economic factors of sustainability of the projects. When asked further about just when the evaluation frameworks were being applied during the project life cycle, there were mixed responses. Some interviewees noted:

*We adopt a flexible and innovative approach based on the requirements of the project we are involved in by demonstrating compliance with the specific targets and key performance indicators agreed by all parties on sustainability relating to the construction and operation of the facility...”* (Interviewee C).

*“We do not have a structured evaluation framework per se, what we do have is some models for planning and benchmarking...Yes we tend to apply our models throughout our project duration to identify and address actions as soon as possible where the greatest sustainability impact may be available...”* (Interviewee E).

These responses however revealed the lack of a structured evaluation framework and a lack of an appreciation of early stage evaluation mechanisms for appraising the direct and indirect socio-economic benefits/impacts of their sustainable commercial regeneration projects.

### **3.3 Socio-economic impact/benefit**

Finally, when interviewees were asked for their views about the socio-economic impacts of their commercial regeneration projects on the communities, a significant misconception



emerged between sustainable regeneration projects, community redevelopment and renewal projects. Although all the respondents interviewed were involved in sustainable regeneration projects, their responses indicated a limited knowledge of socio-economic aspects of sustainable regeneration projects. This was demonstrated by a comment given by one of the respondents as:

*“It is the social and economic impacts that we find most problematic. Our main goal across all our disciplines is to take a responsible attitude toward renewal of our communities. We are keen on providing modern community facilities, improving the physical environment of our communities as well as safeguarding the environment as a whole for the benefit of our communities”* (Interviewee D).

Many of the interviewees expressed their views in line with the potential environmental impact/benefits of a project and also gave emphasis to sustainability factors that fitted within their own understanding and agenda (Evans and Jones, 2008). The limited consideration given to socio-economic factors in practice was also identified in a study carried out by (Carpenter, 2011). It can also be suggested that the strong emphasis placed on the environmental features could partly be attributed to the government policy on green building and the existing evaluation tools such as the BREEAM which are inclined towards measuring environmental successes of the projects. However, it can be argued that environmental sustainability by itself cannot function properly in any successful regeneration project if it is not accompanied and complimented by social and economic impacts.

#### **4. Conclusion**

The early stage socio-economic impact evaluation of sustainable commercial regeneration projects in the UK has been explored through an initial exploratory study that used a semi-structured interview approach to collect data. The study identified a disparity between the theoretical concept and the reality in practice of sustainability factors on a personal and organisational level. The main findings from the study established that the consideration of sustainability was still viewed as being concerned with environmental issues by built environment practitioners to the neglect of the social and economic factors of sustainable regeneration projects. Another major limitation that was identified in the interviews was the lack of any structured evaluation frameworks and mechanisms for evaluating the direct and indirect impacts of socio-economic outcomes during the early stages of sustainable regeneration projects. The findings also identified that while all the interviewees seemed to have accepted the sustainability concept in principle, their responses indicated a lack of appreciation of the wider meaning and understanding of the components of sustainability. The results of this initial exploratory study support the need to collect more data from other built environment regeneration projects to enhance the reliability of the findings.

## References

- Audit Commission (2007) *Service Inspection Report, Regeneration, West Lindsey District Council.UK.*
- Boyko, C.T. Cooper, R. Caroline L. Davey, C.L and Wootton, A.B. (2006) Addressing sustain ability early in the urban design process, *Management of Environmental Quality: An International Journal*, Vol. 17, No. 6, pp. 689-706.
- Brandon, P.S. and Lombardi, P. (2011) *Evaluating sustainable development: in the Built Environment*, 2<sup>nd</sup> ed, Wiley and Sons Ltd Publication, UK.
- Carpenter, J. (2011) ‘Money’s too tight to mention’? Urban regeneration in a recession and beyond: The case of Oxford, *Journal of Urban Regeneration and Renewal*, (4), 3, 228 - 239.
- Coaffee, J. (2004) Re-scaling regeneration, *The International Journal of Public Sector Management*, Vol.17, No (5) pp. 443-461.
- Communities and Local Government (2010) *Valuing the Benefits of Regeneration: Economics.*
- Communities and Local Government, (2009) *Transforming Places; Changing Lives – A Framework for Regeneration: Summary of Consultation Responses.*
- Communities and Local Government, (2008) *Transforming Places; Changing Lives: A framework for regeneration.*
- [1] Creswell, J. (2009) *Research design: Qualitative, quantitative and mixed methods approaches* (3rd ed.). Thousand Oaks, CA: SAGE Publication.
- Ding, G.K.C. (2008) Sustainable construction—The role of environmental assessment tools, *Journal of Environmental Management*, 86, 451–464.
- Dixon, T. (2006) Integrating Sustainability into Brownfield Regeneration: Rhetoric or Reality? – An Analysis of the UK Development Industry, *Journal of Property Research*, 23:3 237–267.
- Edum-Fotwe, F.T and Price, A.D.F. 2009. A social ontology for appraising sustainability of construction projects and developments, *International Journal of Project Management* 27 313–322.
- Evans, J and Jones, P. (2008) Rethinking sustainable urban regeneration: ambiguity, creativity, and the shared territory, *Environment and Planning*, Vol. 40, pp. 1416 -1434.
- Fortune, C and Cox, O. 2005. Current practices in building project contract price forecasting in the UK. *Engineering, Construction and Architectural Management* 12(5), 446-57.
- Granger, R. (2010) Proceedings of the Institution of Civil Engineers, *Urban Design and Planning*, 163 Issue DP1 Pages 9–16.
- Haapio, A. and Viitaniemi, P. (2008) Environmental effect of structural solutions and building materials to a building, *Environmental Impact Assessment Review*, 28, 587–600.
- Haran, M; Newell, G; Adair, A; McGreal, S; Berry, J. (2011): The performance of UK regeneration property within a mixed asset portfolio, *Journal of Property Research*, 28:1, 75-95.

- Hemphill, L; Berry, J; McGreal, S. (2004) An Indicator-based Approach to Measuring Sustainable Urban Regeneration Performance: Part 1, Conceptual Foundations and Methodological Framework, *Urban Studies*, Vol. 41, No. 4, 725–755.
- HM Treasury (2007) *Review of sub-national economic development and regeneration*.
- Hurley, L; Ashley, R; Mounce, S. (2008) Addressing practical problems in sustainability assessment frameworks, *Engineering Sustainability*, 161, Issue ESI, pp. 23-30.
- Kazmierczak, A.E; Curwell, S.R; Turner, J.C. (2009) Regeneration of large urban area: assessment methods, *Proceedings of the Institute of Civil Engineers*, Issue ME2, 117-124.
- Mateus, R and Bragança, L. 2011. Sustainability assessment and rating of buildings: Developing the methodology SBTool<sup>PT</sup> – H, *Building and Environment*, 46, 1962-1971.
- Office of Government Commerce (2007) *Achieving Excellence in Construction Procurement Guide*.
- Raco, M and Henderson, S. (2009) Flagship Regeneration in a Global City: The Re-making of Paddington Basin, *Urban Policy and Research*, Vol. 27, No. 3, 301–314.
- Smith, R. (2006) Housing Stock Transfer: Investing in Renewal as a Tool for Sustainable Regeneration, *Housing Studies*, Vol. 21, No. 2, 269–282.
- Sorrell S. and Holti, K. (2007). Approaching regeneration in partnership: Models for private and public section collaboration, *Journal of Urban Regeneration and Renewal*, Vol. 1, 1, 37-43.
- Special Economics Research Center Strategies (SERC) for underperforming places (2011): Policy Paper
- Sustainable Development Commission (SDC), (2003) Mainstreaming sustainable regeneration: A call to action. *A report by the UK Sustainable Development Commission*.

# Online banking in Libya: customers' trust and acceptance perspective

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## Abstract

Libyan banks continue to conduct most of their banking transactions using traditional methods. Given the prevalence of online technology adoption by the banking industry in developed countries, reasons for the lack of such innovation in developing countries such as Libya is of interest in any consideration of technological innovation. After reviewing literature on online banking technology, this study considers various factors that might act to determine whether a given technology is likely to be trusted and accepted by customers of banking industry in developing country like Libya. Jayawardhena & Foley (2000) argue that the fundamental reasons for the online banking technology are the transactions-processing cost and time savings. At the same time online banking technology brings with it a number of challenges such as privacy, legal and security issues (Sathye, 1999). Banks in Arab countries have recently acknowledged the benefits of online banking in improving their productivities, efficiencies and customers' trust. However, some banks in Arab countries like Libya have struggled to provide their customers with online banking technology within its existing banking system (Khalfan & Akbar, 2006). This is not primarily because they are unable to afford the technology, but rather, due to customers' trust and acceptance issues preventing them from trusting online banking technology (Khalfan & Alshawaf, 2004). Data was collected using quantitative method by questionnaire survey distributed to more than 200 carefully selected Libyan bank customers' (individuals). The data was based on customers' decisions whether to trust or not trust online banking technology in Libya. This study develops a framework for the trust and acceptance of online banking technology. It thus addresses the question: How can the Libyan bank customers' trust of online banking be improved?

## Keywords

Libya, Online banking, Trust,

## 1. Background to the study

The new financial system has brought up new concepts, structures and strategies for retail banking, and banks across the world are now facing new prospects and challenges. The internet, the driving engine of the new economy, has given birth to online banking, a new and increasingly popular way of banking for most customers nowadays (Mukherjee & Nath, 2003). Online banking for customers refers to several types of banking activities through which bank customers can get information and carry out most retail banking services. Online banking services such as balance reporting, inter-account transfers, bill payment, etc can be done by the bank customers simply through a telecommunication network without leaving their homes or offices (Danial, 1999; Mols, 1998; Sathye, 1999). The usage of online banking provides information of products and services through network or telecommunications

technologies, leading to the establishment of digital value (Jones et al, 2000). Due to the fact that banking services are almost informational (Bradely and Stewart, 2002) and can be easily computerized and automated (Porter & Millar, 1985). Most banks consider the technology of online banking as a means for customers trust and satisfaction, and service quality improvement (Robinson, 2000).

The term of online banking technology is relatively new (Moenaert & Lievens, 2000), and several online banking definitions have been cited in the literature. Nevertheless, banking technology researchers and practitioners (e.g., Daniel, 1999; Keyes, 1999; Pikkarainen et al, 2004; Nikola et al, 2002; Richard, et al 2003; Lassar, et al., 2005) agree that the concept of online banking technology refers to the system that enables banks to offer their customers access to their accounts to transact business and obtain information via electronic communication channels; these channels are, Tele-banking, Home banking, Automated Teller Machines ATMs and Internet banking.

The need for the online banking technology in the banking industry is important. According to Nehmzow & Seitz (1997), traditional banking methods (e.g., back office processes and tasks such as: file details of bank customers, process paperwork, sorting cheques and cash handling, from both the bank and customers' perspective), have become the most costly way to bank. In addition Kerem (2003) stated that the complex requests of bank customers, such as bill payments, cash withdrawals, loan applications and cheque clearings, were huge tasks for traditional banks, thus there was a clear need for customers to trust and accept technology to automate back office duties (Keyes, 1999).

Jayawardhena & Foley (2000) argue that the fundamental reasons for the online banking technology are the transactions-processing cost and time savings. It has been proven that online banking technology is the cheapest delivery channel for banking products once trusted and accepted (Sathye, 1999; Robinson, 2000). Moreover, the technology creates new market places and opportunities for banks. It reduces physical trade difficulties, increases market access and trade efficiency (Seitz & Stickel, 1998). From the customer's perspective, the online banking system has additional convenience, functionality and accessibility (Mols et al, 1998). Bank customers argue that branch banking takes much more time and effort, and the costs of banking services are dramatically reduced when they are accessed through online banking channels compared to at a branch (Sohail and Shanmugham, 2003). At the same time online banking technology brings with it a number of challenges such as technology cost, privacy, legal and security issues (Sathye, 1999; Davis et al, 1989).

The level of trust in and acceptance of online banking technology varies from one culture to another across the world. For example, the level of trust in and acceptance of online banking technology in USA, Western Europe and Asian Pacific countries seems very high, whereas in developing countries it is very low especially in the Arab region (Aladwani, 2001).

Banks in Arab countries have recently acknowledged the benefits of online banking technology in improving their productivities, efficiencies and customers' trust. However, some banks in Arab countries such as Libya have struggled to provide their customers with online banking technology within its existing banking system (Khalfan & Akbar, 2006; Touati, 2008; Abukhzam and Lee, 2010).

This is not primarily because they are unable to afford the technology, but rather, due to customers' trust and acceptance factors preventing them from trusting IT in general, and online banking technology in particular (Khalfan & Alshawaf, 2004). Arabic academic researchers (e.g., Aladwani, 2001; Kamel & Hassan, 2003; Khalfan & Alshawaf, 2004; Touati, 2008; Abukhzam & Lee, 2010) pointed to a combination of factors which have

prevented customer trust. These include a lack of basic technological infrastructure, low levels of computer literacy and education, lack of technology trust and awareness among bank customers, shortage of IT skilled personnel, technology investment costs and IT language differences have all been found to make online banking unattractive in Arabic countries in general and Libya in particular.

In reviewing literature on the wider domain of online banking and technology trust, it seems that prior studies have primarily concentrated on technology adoption from the individuals within organisational structure - bank managers and their employees - and limited consideration has been given to the individuals outside the organisational structure – bank customers. Thus most studies have covered the trust and acceptance in online banking and related factors rather broadly from the customer's point of view and little detailed attention has been paid to the factors that influence the online banking trust and acceptance from the perspective of bank customer (Mols, 1998; Luhmann, 2000). Thus, perception and attitude of bank customers about the trust and acceptance of online banking will be studied in this research. As Davis et al (1989) argue, customers build up trust, attitude and feeling about the new technology, and that feeling could direct them to the acceptance or rejection of the proposed technology. As has been revealed earlier in this section, customers may have different feeling or attitude related to their cultures and as this study is focusing on Libyan customers, the next section of this paper will provide an overview of the banking environment and online banking technology in Libya.

### ***1.1. Technology level in Libyan banking industry***

The level of technology in the Libyan banking industry in general is limited, and is still in its early stages (Economic Forum, 2007). The development of Libyan banks faced many obstacles in the past ten years. The international sanction that was imposed against Libya, which lasted nearly eleven years from 1992 to 2003 (Wikipedia, 2008c), had a significant impact on the Libyan economy in general, and the banking system in particular was isolated from communicating with other advanced banking systems and access to modern information technologies. Other reasons include the unreliable national telecommunications infrastructure, lack of education of bank customers, lack of technological knowledge among bank staff and customers, and the distance between bank branches and their headquarters, all of which were slowing the development of Libyan banking system (Danowitz et al, 1995).

Recently, to keep up with the rest of the world, Libya has been trying to introduce online banking facilities to promote the use of efficient services to customers, and for them to be competitive and to encourage the trade with foreign investors (CBL, 2007). This can only be achieved by the trust of modern banking technology such as online banking technology (Danowitz et al, 1995).

Recently and as an exceptional circumstance, Libya faced a conflict for more than eight months which has resulted in a change to the government that was in power for more than four decades. Now the country is returning gradually to stability. Banks and other financial institutions work in exceptional circumstances; there is a shortage of money, reduced opening hours and less security provided.

### ***1.2. Libyan banking Customers***

Bank customers are those people who use or deal with the bank and they benefit from using the bank services and technology.

The Libyan banking Customers can be divided into three types regarding their educational, technology, internet, and online banking knowledge which are: (Human Development Report, 2009)

- illiterate customers (this type of people usually includes elderly people, aged over 60 years);
- educated customers without computer knowledge (this group usually comprises of customers aged 25-46);
- Educated customers with computer knowledge who have limited or no access to online banking (this group of customers can be the same as the previous group, aged 25-46).

According to the Human Development Report (2009), Libya is number 60 in the world in term of poverty with 13.4 per cent of its population of 5 million in poverty, which indicates that there are a significant number of people who may not be considered in terms of both online banking and a wide range of developments. Moreover, the adult illiteracy rate for people aged 15 and above is not as bad as concerned compared to the fast growing population and the country's speed development in different aspects such as education, IT, and banking systems (Touati, 2008).

In summary, the banking technology usage rate in Libya is at present very minimal, despite the fact that Libya is one of the wealthiest countries in Africa as it is a major oil producer and one of the Europe's biggest North Africa oil suppliers (Touati, 2008). The Libyan banking industry is now lagging behind and in extreme need of essential change to enhance its banking system, as it has been continuously criticised for its inadequate and inefficient services (Libyan Investment, 2004). These processes require extensive and comprehensive study of online banking related factors in order to achieve customers' trust in online banking technology. Customers in Libya also needs to be looked at, as they are characterised in three groups, which are; the first group are illiterate people, who have never been to school, the second and the majority are the educated people with no computer knowledge, and the third group are people who educated with computer knowledge but who have limited access to online banking. Accordingly, this study aims to address this research gap.

## **2. Aim and Objectives**

The main aim of this research is to develop framework to improve the Libyan bank customers' trust for online banking technology. To achieve this aim, the following objectives are specified in the research.

- To explore i) the Online banking technology, ii) the different issues and challenges affecting customers' trust on online banking and iii) strategies for technology adoption and use for online banking.
- To investigate the beliefs that Libyan bank customers' hold about online banking and to investigate potential country-related factors that influence the bank customers' trust in online banking.
- To investigate the roles of trust and accepting online banking system in Libyan banking industry through the case study bank, which is Bank of Commerce and Development in Libya, and identify a framework for the improvement of customers' trust in online banking in the Libyan banking system

- To examine the extent to which the identified framework can improve customers' trust in online banking in Libya through quantitative analysis of the survey data obtained from the customers and employees of Bank of Commerce and Development.
- To draw conclusions and make recommendations for both the bank, in terms of how to encourage trust in online banking technology and the customer, in terms of when to trust online banking technology in the Libyan banking industry.

### **3. Online banking trust and acceptance framework**

This study is to introduce a framework for the trust and acceptance of online banking technology. The framework was grounded by technology adoption and acceptance theories. These theories including Technology Acceptance Model (TAM), Theory of Reasoned Action (TRA) and trust related theories such as trust and risk theory. The framework explains clearly the relationships between factors in this study by identifying the key factors and deterrents affecting customers trust and acceptance of online banking technology.

The theoretical framework of online banking trust and acceptance developed in this study followed the theory of reasoned action (TRA) and the Technology Acceptance Model (TAM), and explaining both, the intention towards the actual trust and acceptance of using online banking by proposing three main direct determinants: acceptance which includes relative advantages, ease of use, trust and risk and online banking issues which includes security issues, technical and legal support issues, reputation issues, privacy issues, transactional/operation issues. Technology adoption frameworks like the TRA and TAM offer effective theoretical bases for factors contributing to customers' acceptance of new technology and have been successfully applied in customer behaviour, technology acceptance and system use, and variety of instances of human behaviour. The practical utility of considering TAM is that the online banking is a technology-driven behaviour. Given the uncertain environment of online technology, trust and issues/risk are theorised as direct of intentions. In addition, trust and issues/risk are viewed under the online banking challenges that are facing customers. Moreover, technology readiness and demographic characteristics (age, gender, occupation, educational qualifications, internet experience and online banking experience) are proposed as having a moderating effect on the relationship between intention and challenges affecting customers trust and acceptance. Figure 5-1 represents the research framework developed for the present study.



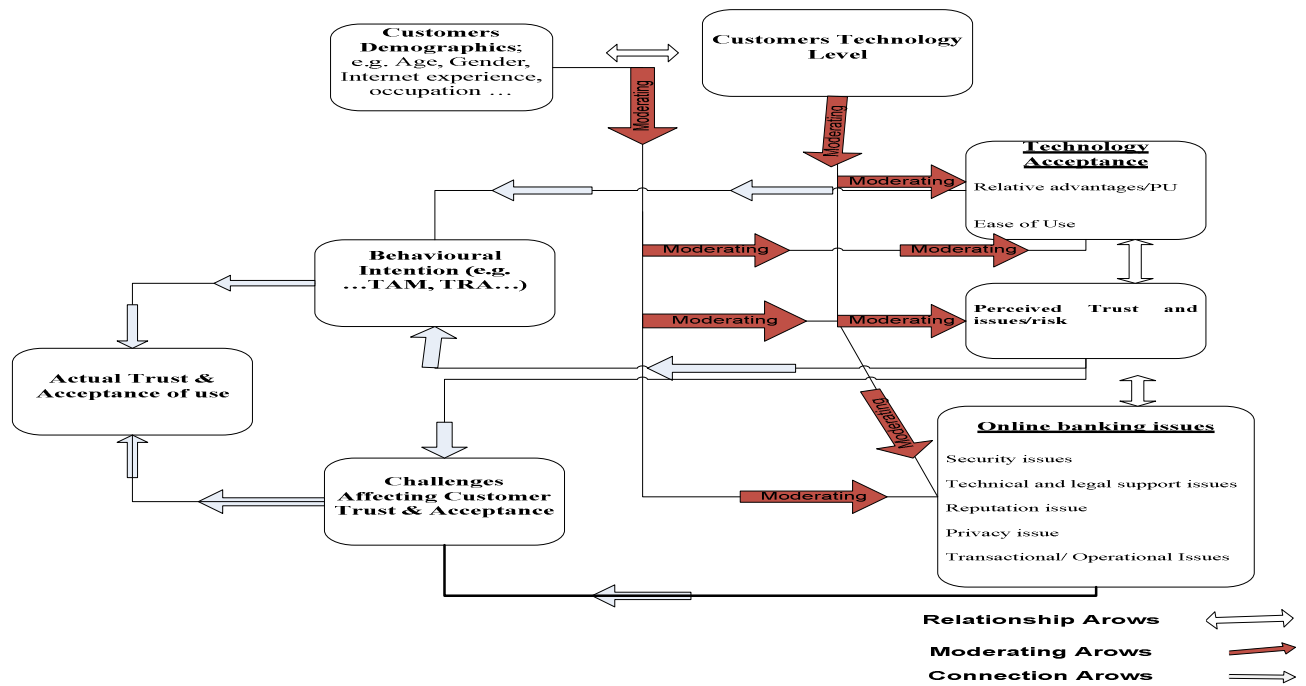


Figure 1: A framework to improve the trust and acceptance of Libyan customers in online technology

#### 4. Research Design and Methodology

The ontological position of this research is based on the belief that there exists a real physical world beyond our knowledge and comprehension. But there also exists a social world that is being constructed, shaped and influenced by our life experience, knowledge and desires. Nevertheless, this study takes the position that one can only apprehend reality to a limited extent; one can never obtain the entire picture of a studied phenomenon. This study agrees that all types of research involve some degree of subjectivity (Hammersley 1992).

The epistemological position of this study can be considered as normative; it is not concerned with knowledge creation for its own sake, but as an instrumental means of contributing to a better understanding of customers' behaviour towards the trust and acceptance of online banking technology in Libyan perspective. In this respect a middle ground of realism might be the suitable selection.

To accomplish the main aim of the study, this research is based on a case study with more emphasis on quantitative methods. Quantitative research involves precision and can yield statistically significant effects, although their meaning and practical validity are open to question (Smith and Louis 1986). The quantitative methods provide a representation of a large sample and are seen to have considerable relevance to policy makers (Yin 1994). The present study relies on the quantitative methods (literature review, survey questionnaire). Data was collected through drop and collect survey.

This study primarily targets customers of Bank of Commerce and Development (BCD) in Libya including customers who are currently employed in the BCD. The data is gathered by means of a drop and collect survey during the third quarter of 2010.

## 5. Statistical analysis

Using SPSS, frequencies and percentage distributions of respondents' demographic information were developed in tables to ensure that these responses were representative of large number of customers of the Libyan Bank of Commerce and Development. The Cronbach's Alpha was applied and computed to test the reliability.

Multi-linear regression analysis was conducted to test models' prediction capabilities. Furthermore, correlations between internet experience, gender, education, age and bank account and technology knowledge, were also conducted using Spearman's rho test; this test was used because the data is non-parametric. Due to space restraints, it has not being possible to show these tests within this, but they can be obtained from the research department of College of Science and Technology at the University of Salford.

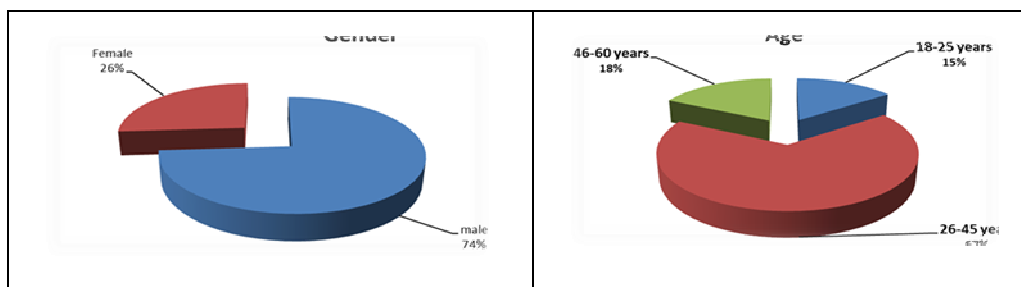
Table 1 below shows the Cronbach's Alpha as 0.933, which shows the reliability of the questionnaire used. This implies that the results obtained from the analysis of this questionnaire are trustworthy, repeatable, dependable and reliable to an excellent reliability extent.

Table 1: Reliability statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Questions
.933	.929	82

### 5.1. Overall sample demographic profile

The demographic profile of the survey respondents presented in figure 2 shows that 26% of the respondents were female and 74% male. The largest age group consisted of those aged 26-45 years with percentage of 67%, followed by the age group 46-60 years (18%). 15.1% were between 18-25 years. The education level of the participants was high, as 43% had postgraduate university education, 33% had undergraduate university education and 1% had Secondary School/ College education. 22% had professional diploma and only 1% had no educational qualification. The largest group of respondents had postgraduate university education, thus the general relationship drawn between education level and technology trust and acceptance is proved in this study. The occupational distribution of the respondents varied widely. The largest group of respondents was technical staff or teachers ranking at (35%) followed by students which was (32%), professionals (14%), self-employed (9%), Housewife/Husband (6%), others 3%, and clerical staff were (1%).



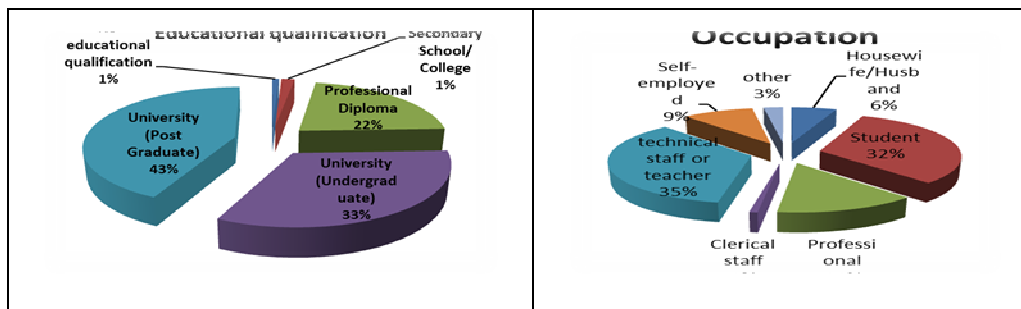


Figure 2: Overall sample demographic profile

Regarding the pattern of Internet usage, Figure 3 suggests that 60% of the respondents had internet access at home and 23% of respondents accessed the internet through cafés. 14% were using internet at their workplaces, however only 3% of the respondents had no access to internet at all. In term of internet experience of the respondents, 29% had 1-5 years and also 29% had 6-10, 27% had less than 1 year, and 15% of the respondents were using internet for over 10 years. The average of internet experience of the respondents was 2.59 years. 50% of the respondents had done shopping over the internet and of these 82% had spent less than 50 Libyan Dinars in a single transaction. 50% of respondents had never done any shopping over the Internet. Regarding having a bank account and online banking experience, 77% of the respondents have been using online banking for only a year, another 13% for less than 3 years, and only 10% of them were using the service for over 3 years.

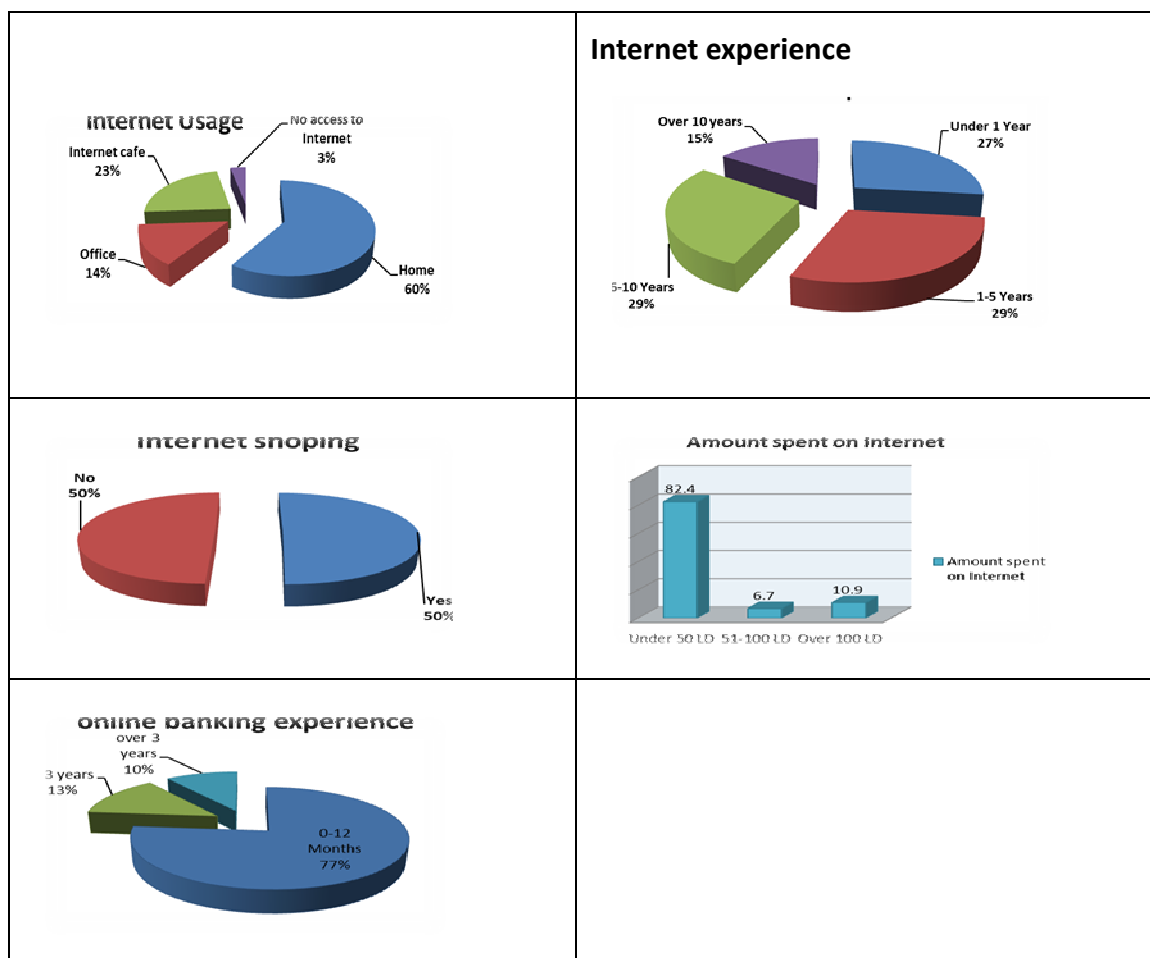


Figure 3: Internet-related behavior of the Survey Respondents

## 5.2. Banking channels

The results of questionnaire analysis of the banking channels are summarised in both table 2, a summary of respondents' frequencies and percentages, and figure 4, which shows the comparison between respondents' selection of choices provided using Lickert scale by drawing curves and lines using Excel pie charts. Question No. 1 was a screening question in which respondents were asked about their frequency of use of four different banking channels. Figure 6.5 suggests that the following few times a week (21%), once a week (19%) and once a month use (24% of respondents) of online banking is higher amongst all channels, followed by branch banking and ATMs (cash machines). Telephone banking was the most unpopular channel among the respondents, as 87% mentioned that they never used it.

Table 2 describes banking channels with letters as (B) for branch banking, (T) for telephone banking, (C) cash machine and (O) for online banking. The reason for stating different banking channels is to show the differences in customers' intention towards banking channels. It is also compares online banking in terms of other banking channels and show how important is online banking for Libyan current and perceived customers. Using Likert scale, respondents were given multiple choices to select from to indicate their available and preferred banking channels for conducting their banking transactions.

Table 2: Different banking channels

		Questions	Daily	Few times a week	Once a week	Once a month	Few times a year	Once a year	never
Banking channels	Q 1	B	25%	12.9%	4.4%	54.4%	14.6%	6%	1.7%
		T	5.2%	4.4%	2.5%	7.7%	6%	5.2%	87.9%
		ATMs	20.6%	12.9%	2.5%	4.4%	0.8%	6%	70.7%
		O	4%	21%	19%	24%	5%	3%	43%

Based on results obtained from SPSS descriptive statistics, figure 4 shows pie charts using Excel interpreting the relationships between customers' probabilities of using banking channels and percentages of using these channels. Probabilities of using banking channels including daily, few times a week, once a week, once a month, few times a year, once a year, never. Percentages are started from (0-100) and mistakenly appeared as from (0-1). Figure 4 was prepared using Excel based on descriptive analysis conducted by SPSS software.

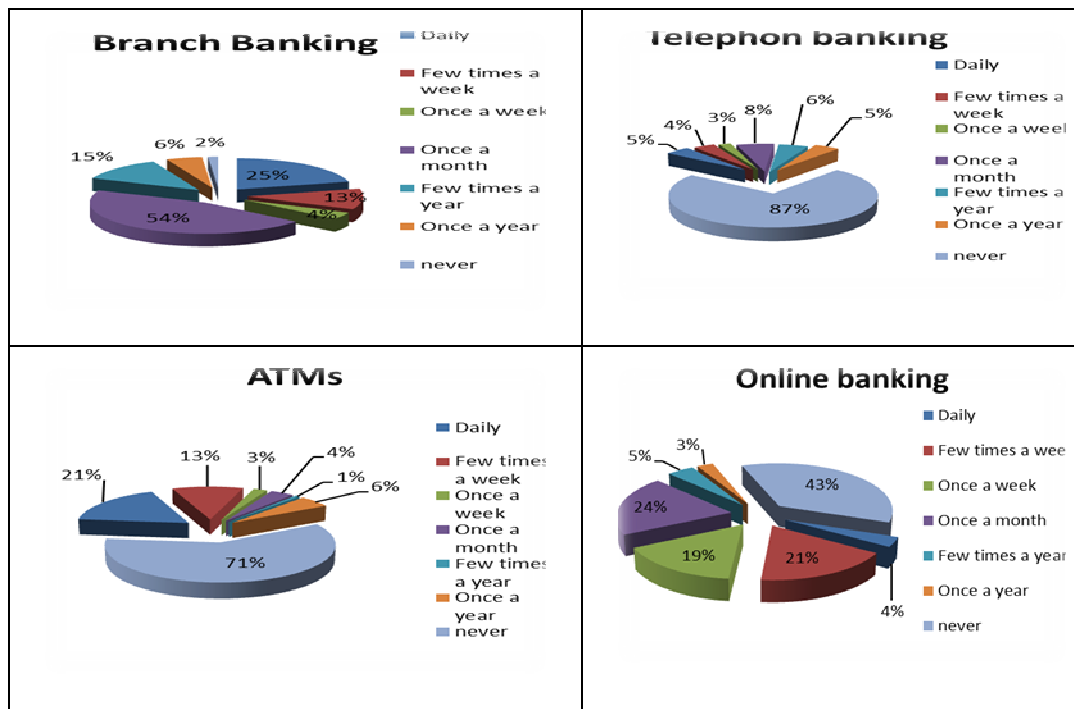


Figure 4: Different banking channels

### 5.3. Linear regression test

The Backwards linear regression is a statistical test used to predict the online banking based on all variables. Variables that have significant scores (sig. <0.05) are good predictors for the use of online banking (table 3). To make the regression test more understandable and explaining factors that explained earlier in figure 1 as the mechanisms of the framework and empirically tested and analysed using the Backwards Linear regression. As mentioned above, this test gives us good predicted scores for variables that have the best relationship to the dependent variable which is “online banking”. Online banking used here to interpret the relationship between the dependent and independent variables. The independent variables containing all other variables tested against the dependent variable “online banking”. Table 3 below corresponds to the framework factors that explained earlier and showed in figure 1.

Table 3: Regression test, second round

Model		Sig.
41	(Constant)	.677
	1. Influence my behaviour; think that I must use online banking.	.002
	2. Use Online banking for most of my banking needs	.001
	3. do not require a lot of mental effort	.002
	4. to become confident in my sue of the transactions on my online banking website	.004
	5. will only be used for the purpose of the original transaction	.001

6. does not allow unauthorized changes to a transaction	.005
7. stop any unauthorized changes to a transaction	.001
8. Provides a secure environment in which to bank	.007
9. provides online banking	.000
10. provides 24 hour access to online banking	.002
11. is fair with its online banking customers	.003
12. I trust online banking for its safety	.005
13. I trust the internet as a reliable medium for banking transactions	.001
14. I have knowledge to use online banking	.000
15. A significant risk equal to a significant opportunity	.007
16. High potential for loss equal to high potential for gain	.000
17. It is safe to give credit card number over the internet	.000
18. The human touch is very important when doing business with a company	.000
19. If I provide information over the internet, I can never be sure if it really gets to the right place	.000
20. What is your Gender?	.000
21. What is your age?	.000
Dependent Variable: online banking	

## 7. Conclusion

In summary, this study looked at the trust in and acceptance of Libyan online banking in many ways and after reviewing literature on online banking technology, this study considered various factors that might act to determine whether a given technology is likely to be trusted and accepted by customers of banking industry in developing Arab country like Libya. Data were collected using a quantitative method by conducting a questionnaire survey distributed to more than 200 carefully selected Libyan bank customers. The data was based on customers' decisions whether to trust or not trust online banking technology in Libya. This study develops a framework for the trust and acceptance of online banking technology. It thus addresses the question: how can the Libyan bank customers' trust of online banking be improved?

Quantitative data was empirically collected and analysed using more than one method including SPSS and Microsoft excel and as a result the following findings are stated below.

Firstly, half of the respondents were using branch banking once a month to communicate with their bank and mostly to withdraw their salaries on a monthly basis. Secondly, the majority of respondents never used telephone banking to communicate with their bank, or ATMs to do any transactions. However, more than a quarter of the respondents used online banking to open their bank website and to communicate with it. The reason for this is because online banking is fast and easy to use. Thirdly, more than half of the respondents strongly agreed that 7day/24hours bank services are very important for them. Lastly, findings related to the intention shows that the majority of the respondents agreed that they use online banking to communicate with their bank. However in terms of challenges affecting online banking such as transactional issues, the results show that nearly half of the respondents strongly disagreed with online banking transaction information will be shared with others with their accounts. Security issues were not exceptional as nearly a third of the respondents strongly agreed that their bank provides 24 hour secure access to online banking.

Future research needs to determine the extent to which the findings of the present study can be extended to include other persons, settings, and time. One way of doing this is to extend the work to include other financial firms and banks in Libya.

## References

- Abukhzam, M, and Lee. A. (2010). Factors affecting bank staff attitude towards e-banking adoption in Libya, *The Electronic Journal on Information Systems in Developing Countries* Vol. 42, No. 2, pp. (1-15).
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, Vol. 50, pp. (179-211).
- Aladwani, A. (2001). Online banking: a field study of drivers, development, challenge, and expectations, *International Journal of Information Management*, Vol. 21, pp. (213-225).
- Al-Gahtani. S. and King. M. (1999). Attitudes, satisfaction and usage: factors contributing to each in the acceptance of information technology, *Behaviour & Information Technology*, Vol. 18, No. 4, pp. (277-297).
- Bradley, L. and Stewart, K. (2003). A Delphi study of Internet banking , *Marketing Intelligence & Planning*, Vol. 21, No. 5, pp. (272-281).
- Daniel, E. (1999). Provision of Electronic Banking in the UK and the Republic of Ireland, *International Journal of Banking Marketing*, 17(2), pp. 72-82
- Hammersley, M. (1991). *What's wrong with ethnography?* London: Routledge.
- Human Development Report. (2009). [Online Resource], available at:  
[http://hdrstats.undp.org/en/countries/country\\_fac\\_sheets/cty\\_fs\\_LBY.html](http://hdrstats.undp.org/en/countries/country_fac_sheets/cty_fs_LBY.html), accessed on: 25/11/2009

- Jayawardhena, C and Foley, P. (2000). Changing in the banking sector – the case of Internet banking in the UK, *Internet Research: Electronic Networking Applications and Policy*, Vol. 10, No. 1, pp. (19-39)
- Khalfan,A., & Alshawaf,A. (2004). Adoption and Implementation Problems of E-banking: A study of The Managerial perspective of the Banking Industry in Oman, *Journal of Global Information Technology Management*, Vol. 7, No. 1, pp. (47-64).
- Keyes, J. (1999). *Banking technology handbook*, CRS Press. London
- Libya investment. (2008). General news, [Online Resource], available at:  
[http://www.libyaninvestment.com/libya\\_news.php](http://www.libyaninvestment.com/libya_news.php), accessed at 12-10-2008.
- Moenaert, R. K. and Lievens, A. (2000). Project team communication in financial service innovation, *Journal of Management Studies*, Vol. 37, No. 5, pp. (733-766)
- Mols, N.P. (1998). The Internet and the banks' strategic distribution channel decisions, *Internet Research: Electronic Networking and Policy*, Vol. 8, No. 4, pp. (331-73)
- Mukherjee, A. and Nath, P. (2003). a model of trust in online relationship banking, *International Journal of bank marketing*, Vol. 21, No. 1, pp. (5-15)
- Nehmzow, C. (1997). The Internet will Shake Banking Medieval Foundations, *Journal of Internet Banking and Commerce* (2:2), Retrieved from:  
(<http://www.arraydev.com/commerce/jibc/9702-01.htm>) accessed on: 20/05/2009
- Sathye, M (1999). Adoption of Internet banking by Australian consumers: an empirical investigation, *International Journal of bank Marketing*, Vol. 17, No. 7, pp. (324-334)
- Yin, R. (1994). *Case study Research: Design and Method second edition*’. Thousand Oaks CA: Sage Publishing.



# **An evaluation of voluntary disclosure in the annual reports of commercial banks: empirical evidence from Libya**

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## **Abstract**

The purpose of this paper as a part of my PhD research project is to help develop the disclosure literature in relation to the banking sector, which is currently sparse due to the limited empirical research studies on the extent of banking disclosure. The intention is to examine empirically the extent of the current voluntary disclosure practices by listed and unlisted commercial banks and their association with commercial bank-specific characteristics, and to do this with particular reference to Libya as an emerging country. Specifically, this paper seeks to accomplish two main objectives. The first aim is to evaluate voluntary disclosure practices in the annual reports of nine commercial banks (seven listed and two unlisted) in Libya, over a five-year period (2007-2011). It also seeks to determine whether there have been any significant changes in the levels of voluntary information disclosure in the published annual reports of Libyan commercial banks over the period 2007 to 2011. The second objective is to test the significance of the relationship between six commercial bank-specific characteristics, namely, age, size, liquidity, government ownership, profitability, and listing status, and the extent of voluntary disclosure of five types of information: background about the bank, corporate social disclosure, financial ratios and other statistics, accounting policies, and corporate governance information by listed and unlisted Libyan commercial banks. The expected outcomes of the present study are likely to contribute to the limited empirical research on banking disclosure and to the growing academic accounting literature on the association between corporate specific attributes and the extent of voluntary disclosure.

**Keywords:** commercial banking, disclosure index, Libya, voluntary disclosure.

## **1. Introduction**

The issue of corporate reporting disclosure behaviour is influenced not only by environmental factors but also by corporate-specific attributes (e.g. firm age, firm size, profitability, liquidity, listing status, and government ownership), and this has attracted many academic researchers in several countries to investigate the impact of corporate attributes on the extent of different disclosure levels (i.e. mandatory, voluntary or aggregate disclosure).

A recent review of the academic disclosure literature has revealed that accounting researchers in both developing and developed countries have conducted a large number of empirical studies on the subject of voluntary disclosure practices and its association with corporate characteristics, but the majority of these studies have focused on non-financial companies. To date, less attention has been paid by academic researchers to voluntary disclosure practices by financial institutions in general, and banking disclosure practices in particular, despite the fact that the banking sector plays a major role in economic growth in a country.

## **2. Research Aim and Objectives**

The principal aim of this paper is to evaluate to what extent the Libyan listed and unlisted commercial banks provided voluntary information disclosure in their annual reports. The research is also intended to determine whether the extent of voluntary information disclosure is associated with commercial bank-specific characteristics.

In order to achieve this principal aim, the following objectives are set:

- To measure the level of voluntary information disclosure provided in the annual reports of Libyan listed and unlisted commercial banks over the period of time from 2007 to 2011.
- To examine if there has been any significant improvement in the levels of voluntary information disclosure provided in the annual reports of Libyan listed and unlisted commercial banks over the period of study.
- To investigate whether there is any significant association between six commercial bank-specific attributes (i.e. age, size, liquidity, government ownership, profitability, and listing status) and the extent of voluntary information disclosure in the annual reports over the period of the study.
- To explore the views and perceptions of commercial banks' annual report preparers related to the current commercial banking financial reporting and voluntary disclosure practice issues.

## **3. The Background and Motivation for the Research**

In today's globalised world, financial and non-financial information disclosure is increasing in importance for many businesses, since their international and national stakeholders use such information as a basis to make economic decisions. Financial accounting theory has identified that the main objective of corporate financial reports is to provide material and useful information to a wide range of users for use in the decision-making process (Harahap, 2003). The corporate annual report has been found to be the most important source of financial and non-financial information for many interested parties (e.g. see Abu-Nasser and Rutherford, 1996; Al-Razeen and Karbhari, 2004).

Banking financial reporting, in particular has been accorded greater importance by many international organisations, such as the International Accounting Standards Board (IASB) which has established unique accounting standards for banks. For example, IAS 30 "Disclosure in the Financial Statements of Banks and Similar Financial Institutions", IAS 32 "Financial Instrument: Disclosure and Presentation", and IAS 39 "Financial Instrument: Recognition and Measurement" (superseded by IFRS 7 "Financial Instruments: Disclosure" on 18th August 2005, effective 1 January 2007).

Additionally, the Basel Committee on Bank Supervision (Basel Committee) has issued a number of papers and guidance notes concerning disclosures in the banking sector. For example, in September 1998, it published a report entitled "Enhancing Bank Transparency", which gives general guidance to banking supervisors and regulators on regulatory frameworks for public disclosure and supervisory reporting, and to the banking industry on core disclosures that should be provided to the public. The Basel Committee's paper also recommends that banks provide sufficient information in their financial reports to the public in order to facilitate market participants' assessment of them.

#### 4. An Overview of the Banking Sector in Libyan

Libya, as a developing country with a socialist-oriented economy, has started to privatise a number of state-owned enterprises, commercial banks included, which have been under state control since the 1970s. In recent years, the Central Bank of Libya (CBL) has taken significant measures to attract greater foreign direct investment in the banking sector and to open up the sector to international banks. The CBL has enacted legislation permitting foreign banks to establish branches in Libya and allowing them to hold up to 50% of the shares of some domestic banks. At present, the banking sector in Libya comprises the Central Bank of Libya (CBL), which represents the monetary authority, responsible for the supervision and control over the banks, and 15 commercial banks, in operation, 6 commercial banks public sector-owned with foreign participation in two banks, 8 private commercial banks owned by Libyans individuals and foreign participation (joint ownership), and one commercial bank owned jointly by the Libyan state and the United Arab Emirates, 50% for each. Within the components the Libyan bank sector there are also four specialised banks which have been created for the purpose of financing specific activities, such as housing activity, agriculture, industry and financing small projects. In addition to these, there is a Libyan foreign bank (LFB) (offshore).

#### 5. Research Philosophy

The term research philosophy (paradigm) according to Hussey and Hussey (1997, p. 47) refers to the “progress of scientific practice based on people’s philosophies and assumptions about the world and the nature of knowledge”. According to Collis and Hussey (2003) there are two main traditional research paradigms or philosophes: the positivism paradigm and the phenomenological paradigm. Denscombe (2007, p. 299), defines the positivistic paradigm as “an approach to social research which seeks to apply the natural science model of research to investigations of the social world”. In contrast, the phenomenological paradigm was defined as “a fact or occurrence that appears or is perceived, especially one of which is the cause in question” (Allan, 1991, p. 893).

From the underlying research aim and objectives of this study, both positivist and phenomenological paradigms have been adopted. The main reason for utilising both paradigms is that the study will rely upon the hypothetic-deductive method of conducting the study (i.e. deductive reasoning), identifying causal effects, test pre-existing theory, exploring the views and perceptions of commercial banks annual reports preparers (i.e. inductive reasoning), using semi-structured interviews technique. In this context, Collis and Hussey (2003, p. 55) outline a list of the main features of the two philosophy paradigms, as shown in Table 1.

Table 1: Distinctive features of the two philosophy paradigms

<b>Positivistic Paradigm</b>	<b>Phenomenological Paradigm</b>
Tends to produce quantitative data	Tends to produce qualitative data
Uses large samples	Uses small samples
Concerned with hypothesis	Concerned with generating theories
Data is highly specific and precise	Data is rich and

	subjective
The location is artificial	The location is natural
Reliability is high	Reliability is low
Validity is low	Validity is high
Generalises from sample to population	Generalises from one setting to another

Source: *Collis and Hussey (2003)*

## 6. Research Approach

The two main research approach methodologies are the empirical inductive approach and the deductive approach. The empirical inductive approach is typically an empirical investigation of current practices and attempts to generalise from them. In contrast, the deductive approach is not dependent on existing practice; the deductive approach seeks an identified problem based on testing a theory (Elliott and Elliott, 2007). Abdolmohmmadi and McQuade (2002) recommended that both the hypothetico-deductive and the inductive approaches could be used in scientific research to conclude results from evidence, and both approaches are useful for accounting research. Saunders et al. (2003) identified the major differences between deductive and inductive approaches to research, as presented in Table 2.

Table 2: Distinctions between Deductive and Inductive Approaches

<b>Deductive approach</b>	<b>Inductive Approach</b>
Scientific principles	Gaining an understanding of the meanings humans attach to events
Moving from theory to data	A close understanding of the research context
The need to explain causal relationship between variables	The collection of qualitative data
The collection of quantitative data	A more flexible structure to permit changes of research emphasis as the research progresses
The application of controls to ensure validity of data	A realisation that the researcher is part of the research process
The operationalisation of concepts to ensure clarity of definition	A realisation that the researcher is part of the research process
A highly structured approach	
Researcher independence of what is being researched	
The necessity to select samples of sufficient size in order to generate conclusions	

Source: *Saunders et al. (2003, p. 89)*

This paper is aiming to test the significant relationship between six commercial bank-specific attributes as independent variables and the level of voluntary information disclosure in annual reports as dependent variables. It is therefore the hypothetico-deductive method which is considered suitable for testing such causal relationships. According to Cavana et al., (2001, p. 36), induction is “a process by which we observe certain phenomena and arrive at certain conclusions”. Therefore, this approach also will be considered suitable for the current study which aims to explore the views and perceptions of commercial banks annual reports preparers related to the current commercial banking financial reporting and voluntary disclosure practices. Thus, a combination of both approaches (deductive and inductive) may be essential to provide a more comprehensive research result.

## **7. Research Strategy**

Research strategy is a general plan of how the researcher will go about answering the particular research questions. A variety of research strategies are available to researchers to use in their studies, some of these strategies belong to the deductive approach others to the inductive approach, and include experiment, survey, case study, grounded theory, ethnography, action research, cross-sectional and longitudinal studies, and exploratory, descriptive and explanatory studies (Saunders et al., 2003). Using mixed methods in one overall research study have more advantages than using a single method (Creswell and Clark, 2011). Therefore, a mixed-method research strategy will be adopted in the current study; a quantitative longitudinal study and qualitative approach. By combining both research techniques within the current study, it will help the study provide stronger evidence for a conclusion by convergence and validation of results.

## **8. Literature Review and Development of Hypotheses**

To date, the number of academic studies exploring financial reporting and disclosure practices by the banking sector, in both the advanced and the developing countries, remains low compared with other industry sectors. A few of the studies that have been undertaken in this area have concentrated on commercial banks' voluntary disclosure practices and their determinants (Kahl and Belkaoui, 1981; Hossain and Taylor, 2007; Hossain and Reaz, 2007). The first empirical study attempted to measure the extent of commercial banking disclosure was conducted by Kahl and Belkaoui (1981). They measured the overall extent of disclosure adequacy by 70 commercial banks selected from 18 countries located in the non-communist world. The researchers also measured the degree of association between the extent of disclosure and the commercial bank size (measured by total assets). Their results revealed that the level of information disclosure in the annual reports of commercial banks differs from country to country. Hossain and Taylor (2007) investigated empirically the relationship between a number of commercial bank attributes (commercial bank size, audit firm link, and profitability) and the extent of voluntary disclosure in the annual reports of 20 domestic private banks in Bangladesh. A total of 45 voluntary disclosure items were identified as relevant. The study findings revealed the bank size and audit firm link to be significant in determining the disclosure levels of the banks, but no statistically significant relationship was found between the extent of voluntary disclosure and the profitability variable. In another contemporary study, Hossain and Reaz (2007) investigated empirically the extent of voluntary disclosure by 38 listed banking companies in India, also examining the association between six bank-specific characteristics (bank size, age, multiple listing, complexity of business, board composition and assets-in-place) and the extent of voluntary disclosure of the sample companies. A disclosure index was constructed consisting of 65 items of voluntary information. Their results indicated that bank size and assets-in-place are statistically

significant in explaining the level of disclosure. However, the bank age, diversification, board composition, multiple exchange listing and complexity of business were found to be insignificant in explaining the level of voluntary disclosure. According to the previous empirical research, a number of variables can be utilised to observe associations with the extent of voluntary disclosure and to explain the difference in the amount of voluntary information disclosed by the companies in their annual reports. Six independent variables (commercial bank attributes) were selected and will be examined in this study. The following discussion about the development and formulation of the six research hypotheses:

**(i) Age of the Commercial Bank (AGE)**

The age of a business entity is a critical factor in determining the level of information disclosure in its annual reports (Akhtaruddin 2005; Owusu-Ansah 2005). An older company is likely to be more expert in collecting, processing and releasing information (Owusu-Ansah 2005). Accordingly, it may seem that long-standing commercial banks having more experience of the way to provide more extensive disclosure about their financial results and current position to satisfied users' needs than young commercial banks. Therefore, the age of the commercial bank is chosen as one of the independent variables for testing. This leads to formulation of the first research hypothesis:

**H1:** There is a significant positive association between the extent of voluntary information disclosure in annual reports and the age of a commercial bank.

**(ii) Size of Commercial Bank (SIZE)**

A company's size was found in previous disclosure studies as a significant explanatory variable in explaining variation in the extent of information disclosed by companies. Most of the prior disclosure studies in various countries have empirically agreed that corporate size has a positive relationship with the level of corporate voluntary disclosure (e.g. Singhvi and Desai, 1971; Buzby, 1975; Kahl and Belkaoui, 1981; Chow and Wong-Boren, 1987; Cooke, 1989b; Cooke, 1991; Hossain and Reaz, 2007). Agency theory suggests that agency costs are associated with the separation of management from ownership, which is likely to be higher in larger companies (Jensen and Meckling, 1976). Hence, large companies have more incentive to voluntarily disclose additional information in their annual reports than smaller firms to reduce agency cost. Based on the above argument, the second research hypothesis is formulated as follows:

**H2:** There is a significant positive association between the size of a commercial bank and the extent of its voluntary information disclosure in the annual reports.

**(iii) Commercial Bank Liquidity Position (LQDP)**

Bank liquidity is an important factor in enhancing a bank's business activity and determines the bank's ability to deal efficiently with decreases in deposits and other liabilities. Several empirical disclosure studies have been found a positive association between liquidity and the level of information disclosed in the company annual reports (e.g. Owusu-Ansah, 2005; Alsaeed, 2006). On the other hand, other previous disclosure studies have found no positive relationship between liquidity and the extent of mandatory disclosure (Wallace et al. 1994; Wallace and Naser, 1995; Owusu-Ansah, 1998). To determine whether or not the liquidity of a commercial bank has an impact on the level of voluntary information disclosure, the third research hypothesis is formulated as follows:

**H3:** Commercial banks with higher liquidity positions disclose more information voluntarily than do commercial banks with lower liquidity positions.

**(iv) Government Ownership (GOVR)**

A number of empirical disclosure studies have tended to assess the effect of the ownership structure on the level of corporate voluntary disclosure (e.g. Craswell and Taylor, 1992; Hossain, et al., 1994; Raffournier, 1995; Alsaeed, 2006). These empirical studies revealed no significant association between the level of voluntary information disclosure and ownership structure. In contrast, Barako et al. (2006) examined three aspects of a company's ownership structure (ownership concentration, foreign ownership and institutional ownership). The result indicates that institutional ownership and foreign ownership are significantly associated with the level of information voluntarily disclosed by listed Kenyan companies. Hence, the fourth research hypothesis is formulated as follows:

**H4:** There is a positive association between the level of information voluntarily disclosed in the annual report of Libyan commercial banks and the governmental ownership share.

**(v) Listing Status (LIST)**

Prior studies have argued that listed companies are more likely to disclose more financial and non-financial information in their annual reports than unlisted companies. Several empirical studies have shown that there is a positive relationship between listing status and disclosure levels (e.g. Cooke, 1989a; Wallace et al., 1994; Hossain et al., 1995; Cooke, 1991; Inchausti, 1997; Abdul Hamid, 2004). For instance, Wallace et al. (1994) reported that comprehensive disclosure increases with listing status. However, an empirical study conducted by Buzby (1975) indicated no significant positive association between listing status and the extent of information disclosure in the corporate annual reports. The fifth research hypothesis is established as follows:

**H5:** There is a positive significant association between the commercial bank listing status in the Libyan stock market and the level of information voluntarily disclosed in the annual report.

**6. Profitability of the commercial bank (PRFT)**

The influence of profitability on the level of information disclosure in the corporate annual reports is well documented in disclosure literature (e.g. Singhvi and Desai, 1971; McNally, et al., 1982; Raffournier, 1995; Inchausti, 1997; Owusu-Ansah, 1998; Akhtaruddin, 2005; Owusu-Ansah, 2005; Hossain and Taylor, 2007; Hossain, 2008). However, past empirical disclosure studies have produced mixed results on the relationship between profitability and the extent of companies' disclosure. For example, Singhvi and Desai (1971) show a significant positive relationship between these two variables. In contrast, McNally et al. (1982) examined the correlation between company profitability and the extent of voluntary disclosure finding no significant association between the two. Thus, the sixth research can be hypothesised as follows:

**H6:** Commercial banks with higher profit are more likely to disclose higher voluntary information than are commercial banks with lower or negative profit.

## 9. The Research Methodology and Methods

### 9.1 Sample selection and data sources

The sample covers the annual reports of seven listed and two unlisted Libyan commercial banks, whose annual reports are available for the five-year period 2007-2011 (see Table 3). Copies of the five annual reports for the year 2007, 2008, 2009, 2010 and 2011 were collected from each commercial bank. Finally, the total number of annual reports analysed were 45. A semi-structured, face-to-face interview was also conducted with the annual reports preparers from 4 Libyan listed and 2 unlisted commercial banks (mainly the directors of the accounting departments or representatives who are involved directly in the preparation of annual reports). The purpose of the interviews was to obtain accurate and more detailed information from the participants about the current commercial banking financial reporting and disclosure practices.

Table 3: List of the Libyan Commercial Banks Covered by the current Study

<b>Commercial Banks Name</b>	<b>Year Established</b>	<b>Ownership Status</b>	<b>Listing Status</b>
1. Sahara Bank	1964	Public	Listed
2. Al-Joumhouriya Bank	1970	Public	Listed
3. The National Commercial Bank	1970	Public	Listed
4. Wahday Bank	1970	Public	Listed
5. Alwaha Bank	2006	Public	Unlisted
6. Commerce and Development Bank.	1996	Private	Listed
7. Mediterranean Bank	1997	Private	Listed
8. Alsaraya Trading and Development Bank	1997	Private	Listed
9. Al-Wafa Bank	2005	Private	Unlisted



## ***9.2. Research method to measure the level of voluntary disclosure***

Measuring the level of voluntary information disclosure in the annual reports of each individual commercial bank for each year involves a two-step process. A brief explanation of each step is given below.

### ***9.2.1. Construction of the voluntary disclosure index***

The first step is to construct a disclosure index in order to assess the voluntary disclosure level. It is demonstrated in the disclosure literature that a self-constructed disclosure index is a widely-used method of collecting data to assess the extent of information disclosure in corporate annual reports (e.g. Singhvi and Desai, 1971; Kahl and Belkaoui, 1981; Hossain, 2008). A major step in the construction of the voluntary disclosure index is the selection of information items that could be disclosed by commercial banks in their annual reports and which are relevant to the Libyan environment.

A total of 63 items of information were identified as relevant to Libyan commercial banking disclosure and those items of information were not assigned in the Banking Act 2005 or the Libyan Stock Market (LSM) Laws. These 63 items were then classified into five categories: background about the bank/ general corporate information; corporate social disclosure; financial ratios and other statistics; accounting policies and corporate governance information.

### ***9.2.2 Scoring the Voluntary Information Disclosure Items***

The scoring approach used in this study is unweighted, assumed all information items are considered equally important to all user groups of commercial bank's annual reports. An item scores one if it is disclosed and zero if it is not disclosed. The main reason for adopting this approach in the current study is to avoid the subjectivity inherent in using any weighted scoring approach. In order to measure the extent of overall voluntary disclosure for every commercial bank in the sample for each year, a scoring sheet was designed including the all voluntary disclosure index items. Then, the total voluntary disclosure score (**TVDBs**) for each of the 45 annual reports from the commercial banks in the sample, was calculated as the ratio of the actual voluntary disclosure score (**AVDBs**), which is awarded to a commercial bank, divided by the maximum voluntary disclosure score (**MVDBs**), which that particular commercial bank is expected to earn.

## ***9.3. Statistical Analysis Techniques***

Both univariate and multivariate techniques were employed in this study as statistical analysis methods. Multivariate regression model, OLS is applied to examine the association between the extent of voluntary information disclosure and commercial bank-specific attributes. The main qualitative analysis technique linked with semi-structured interviews is content analysis, which "...represents a formal approach to qualitative data analysis" (Jankowicz, 2000, p. 247). Thus, content analysis was utilised in this study to analyse the interview transcripts (qualitative data).

## 10. Conclusion and Limitations

The purpose of the present study is to empirically evaluate the extent of voluntary information disclosure in the annual financial reports of listed and unlisted Libyan commercial banks from 2007 to 2011, and also to examine the impact of the commercial bank-specific attributes (i.e. age, size, profitability, liquidity, listing status, and government ownership) on the overall extent of voluntary information disclosure. A total of 9 listed and unlisted commercial banks have been selected for this study based on their availability of annual reports for a five-year period. To measure the extent of voluntary disclosure in the commercial banks' annual reports, a self-constructed disclosure index was developed, containing a total of 63 information items relating to background about the bank/ general corporate information, corporate social disclosure, financial ratios and other statistics, accounting policies, and corporate governance information. A scoring sheet was designed to score commercial banks on their voluntary disclosure level, including all the voluntary disclosure index items. The scoring approach used in this study is unweighted. A multivariate regression model (OLS) is used to test the relationship between the levels of voluntary disclosure in the annual reports of the years of 2007-2011. However, there are some limitations of this paper that should be acknowledged. One of the limitations of this paper is in measuring the extent of voluntary disclosure, this study uses a self-constructed disclosure index, which is very sensitive and therefore the results of the present study may be affected by that choice. There is unavoidable subjectivity in the constructing of voluntary disclosure index. Despite that, self-constructed indices are one of the measures typically utilised by disclosure studies (Urquiza et al., 2009). The second limitation is related to the operationalisation of specific variables, and there was no opportunity to include some variables examined in prior studies.

## References

- Abdul Hamid, F. (2004). Corporate social disclosure by banks and finance companies: Malaysian evidence. *Corporate Ownership and Control*, 1(4), 118-130.
- Abdolmohmmadi, M. R., and McQuade (2002). *Applied research in financial reporting: text and cases*. McGraw-Hill.
- Abu-Nassar, M., and Rutherford, B. A. (1996). External users of financial reports in less developing countries the Case of Jordan. *British Accounting Review*, 28, 73-87.
- Akhtaruddin, M. (2005). Corporate mandatory disclosure practices in Bangladesh. *The International Journal of Accounting*, 40, 399-422.
- Alsaeed, K. (2006). The association between firm-specific characteristics and disclosure: The case of Saudi Arabia. *Managerial Auditing Journal*, 21(5), 476-496.
- Al-Razeen, A., and Karbhari, Y. (2004). Annual corporate information: Importance and use in Saudi Arabia. *Managerial Auditing Journal*, 19(1), 117-133.
- Allan, G. (1991). *Qualitative research* in G. Allan and C. Skinner, (eds), *handbook for research students on the social sciences*. London: Falmer Press.
- Basel Committee on Banking Supervision (1998). *Enhancing bank transparency*. Switzerland: Basel, September, No. 41.
- Barako, D. G., Hancock, P., and Izan, H. Y. (2006). Factors influencing voluntary corporate disclosure by Kenyan companies. *Journal Compilation*, 14(2), 107-125.

- Buzby, S. L. (1975). Company size, listed versus unlisted stock, and the extent of financial disclosure. *Journal of Accounting Business Research*, spring, 16-37.
- Cavana, R. Y., Delahaye, B. L., and Sekaran, U. (2001) *Applied business research: qualitative and quantitative methods*. Australia: John Wiley and Sons, Ltd.
- Chow, C. W. and Wong-Boren, A. (1987). Voluntary financial disclosure by Mexican corporations. *The Accounting Review*, 62, 533-541.
- Cooke, T. E. (1989a). Disclosure in the corporate annual reports of Swedish companies. *Accounting and Business Research*, 19(74), 113-124.
- Cooke, T. E. (1989b). Voluntary corporate disclosure by Swedish companies. *Journal of International Financial Management and Accounting*, 1(2), 171-195.
- Cooke, T. E. (1991). An assessment of voluntary disclosure in the annual reports of Japanese corporations. *International Journal of Accounting*, 26(3), 174-189.
- Collis, J., and Hussey, R. (2003). *Business research: A practice guide for undergraduate and postgraduate student*. New York: Palgrave Macmillan.
- Collis, J., and Hussey, R. (2009). *Business research: A practice guide for undergraduate and postgraduate student*. UK: Palgrave Macmillan.
- Craswell, A. T., and Taylor, S. L. (1992). Discretionary disclosure of reserves by oil and gas companies: an economic analysis. *Journal of Business, Finance and Accounting*, 19(2), 295-308.
- Creswell, J. W., and Clark, V.P. (2011). *Designing and conducting mixed methods research*. USA: SAGE.
- Denscombe, M. (2007). *The good research guide for small-scale social research projects*. England: Open University press.
- Elliott, B., and Elliott, J. (2007). *Financial accounting and reporting*. UK: Prentice Hall.
- Eriksson, P., and Kovalainen, A. (2008). *Qualitative methods in business research*. SAGE Ltd.
- Harahap, S. S. (2003). The disclosure of Islamic values – Annual report the analysis of bank Muamalat Indonesia's annual report. *Managerial Finance*, 29(7), 70-89.
- Hooi, G. (2007). The effects of culture on international banking disclosure. *Asia-Pacific Journal of Accounting and Economics*, 14, 7-25.
- Hossain, M., Tan, L. M., and Adams, M. (1994). Voluntary disclosure in an emerging capital market: Some empirical evidence from companies listed on Kuala Lumpur stock exchange. *The International Journal of Accounting*, 29, 334-351.
- Hossain, M., Perera, M. H. B., and Rahman, A. R. (1995) Voluntary disclosure in the annual reports of New Zealand companies. *Journal of International Financial Management and Accounting*, 6(1), 69-87.
- Hossain, M., and Taylor, P. J. (2007). The empirical evidence of the voluntary information disclosure in the annual reports of banking companies: the case of Bangladesh. *Corporate Ownership and Control*, 4(3), 111-125
- Hossain, M., and Reaz, M. (2007). The determinants and characteristics of voluntary disclosure by Indian banking companies. *Corporate Social Responsibility and Environmental Management* 14, 274-288.
- Hossain, M. (2008). The extent of disclosure in annual reports of banking companies: the case of India. *European Journal of Scientific Research*, 23(4), 660-681.

- Howe, K., and M., Eisenhart (1990) *Standards for qualitative (and quantitative) research: A prolegomenon. Educational Researcher*, 19(4), 2-9.
- Hussey, J., and Hussey, R. (1997). *Business Research, A practical Guide for Undergraduate and Postgraduate students*. London: Macmillan Press.
- International Accounting Standards Board (IASB, 2004). *International Financial Reporting Standards (IFRS)*. UK: IASCF.
- Inchausti, B., G. (1997). The influence of company characteristics and accounting regulation on information disclosed by Spanish firms. *The European Accounting Review*, 6(1), 45-68.
- Jankowicz, A. D. (2000). *Business research projects* (3rd ed.). London: Thomson Learning.
- Kahl, A., and Belkaoui, A. (1981). Bank annual report disclosure adequacy internationally. *Accounting and Business Research*, summer, 189-196.
- Lee, N., and Lings, I. (2008) *Doing business research, a guide to theory and practice*. Sage, Ltd.
- Mingers, J. (2001). Combining IS research methods: towards a pluralist methodology. *Information Systems Research*, 12 (3), pp. 240–259.
- McNally, G. M., Eng, L. H., and Hasseldine, C. R. (1982). Corporate financial reporting in New Zealand: an analysis of user preferences, corporate characteristics and disclosure practices for discretionary information. *Accounting and Business Research*, 13, 11-20.
- Osborne, J.W. (1990). Some basic existential-phenomenological research methodology for counsellors. *Canadian Journal of Counselling*, 24(2), pp. 79-91.
- Owusu-Ansah, S. (1998). The impact of corporate attributes on the extent of mandatory disclosure and reporting by listed companies in Zimbabwe. *The International Journal of Accounting*, 33(5), 605-631.
- Owusu-Ansah, S. (2005). Factors influencing corporate compliance with financial reporting requirements in New Zealand. *IJCM*, 15(2), 142-157.
- Raffournier, B. (1995). The determinants of voluntary financial disclosure by Swiss listed companies. *The European Accounting Review*, 4(2), 261-280.
- Saunders, M., Lewis, P., and Thornhill, A. (2003). *Research methods for business students*. England: Pearson Education Limited.
- Sekaran, U. (2003). *Research methods for business, a skill building approach*. USA: Inc.
- Silverman, D. (2006). *Interpreting qualitative data: methods for analysing talk, text, and interaction*. London: SAGE.
- Singhvi, S. S., and Desai, H. B. (1971). An empirical analysis of the quality of corporate financial disclosure. *The Accounting Review*, XLVI (1), 129-138.
- Urquiza, F. B., Navarro, M. C. A., and Trombetta, M. (2009) Disclosure indices design: does it make a difference?. *Revista de Contabilidad-Spanish Accounting Review* 12 (2), 253-278.
- Wallace, R.S.O., Naser, K., and Mora (1994). The relationship between the comprehensiveness of corporate annual reports and firm specific characteristics in Spain. *Accounting and Business Research*, 25(3), 41-53.
- Wallace, R.S.O., and Naser, K. (1995). Firm-specific determinants of comprehensiveness of mandatory disclosure in the corporate annual reports of firms on the stock exchange of Hon Kong. *Journal of Accounting and Public Policy*, 14, 311-368.

# Literature review of understanding relationship marketing and networks in the hotel industry

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## Abstract

This research attempts to integrate the concepts of relationship marketing and network organisations especially within a service marketing context and in this case the Bali Hotel industry. This research particularly explores the business-to-business networks whereas most of the research in the hotel industry is related to business-to-consumer. This paper considers how successful marketing strategy uses a network of business relationships and through the critical evaluation of relevant and appropriate academic literature, a conceptual model is proposed. The paper describes, evaluates and justifies the development of such a model which comes from an analysis and evaluation of literature in the following aspects of marketing. Firstly, the concept and philosophy of relationship marketing is considered and its key components, given that many hotel industry stakeholders are other businesses. This paper then considers the literature in business-to-business marketing which then automatically leads to a consideration of the literature of business networks. The paper concludes with a discussion about future research objectives and how they can be met. The findings of this research will contribute not only for the enhancement of the concept of business networks but also for the development of hotel industry particularly in the Republic of Indonesia.

## Keywords

Business relationships, network organisation, relationship marketing, hotel industry

## 1. Research Background

Since the late 1970s the traditional marketing mix based view of marketing has been questioned among researchers who were interested in the relational aspect of marketing (Hakansson, 1982; Gummesson, 1987; Gronroos, 1990). This growing criticism toward the transaction marketing concept comes from four sources including the Nordic, the International/Industrial Marketing and Purchasing group, the Anglo-Australian, and the North American schools of thought. The interest in business relationships and networks in marketing has also grown as business practices; for instance, firms form loose alliances to supply each other with required productive functions (Erickson and Kushner, 1999).

A firm cannot survive and prosper through its own individual efforts, as each firm's performance depends in important ways on the activities and performance of others such as other people, organisations and firms (March and Wilkinson, 2009; Wilkinson and Young, 2002). A firm relies on key inputs from others in the form of various products and services, including material goods, personal and professional services, information and funds; it depends on others to use, transfer, transform and combine their outputs into meaningful goods and services for other; it depends on regulators, communities and industry bodies to

protect and sustain them and their workers; it depends on competitors to challenge and inform them about new possibilities and threats (March and Wilkinson, 2009).

Moreover, specifically, in the hospitality business a firm is difficult to serve the consumer without working collaboratively with multiple firms (Crotts et al., 2011). All organisations have relationships with other entities such as suppliers, distributors, competitors, public organisations, governments, and other firms carrying out complementary activities (Achrol, 1997; Garcia-Falcon and Medina-Muno, 1999; Medina-Munos and Garcia-Falcon, 2000). Some relationships are relatively trivial, whereas others are of the utmost importance to the parties involved. For this reason, the establishment of cooperative relationships with other organisations is increasingly regarded as a crucial factor for organisational performance and survival (Child and Faulkner, 1998). This collaboration is not necessarily in formal forms such as franchising agreements or other forms of formal collaboration, but also in form of a less binding strategic collaboration that increasingly draws more attention. Chathoth and Olsen (2003) believe that for hospitality firms to be successful in the future they should consider the alliances as a competitive advantage. It relies on the nature and quality of the direct and indirect relations that a firm develops with its counterparts. The inter-organisational relationship does not necessarily lead to the establishment of a new organisation and also does not necessarily include mutual investment of capital (Sedmak et al., 2011).

Overall, therefore, it is necessary to take into account the importance of forming a successful network of business relationships particularly in the hotel industry as part of a hotel's marketing strategy.

## **2. Rationale of the Research**

### ***2.1 Government Policy***

Tourist arrival in Indonesia is ranked number four within ASEAN (Association of Southeast Asian Nations) countries behind Malaysia, Thailand, and Singapore in 2009 (ASEAN, 2011). The Indonesian government through the Ministry of Tourism and Creative Economy (formerly named Indonesia Ministry of Culture and Tourism, prior to 2011), attempts to increase the number of tourists visiting Indonesia at least to improve its ranking amongst ASEAN countries. One marketing effort to achieve this aim was by launching the new tourism slogan for 2011: "Wonderful Indonesia" for branding Indonesia more strongly (Indonesia Ministry of Culture and Tourism, 2010). This branding reflects the country's beautiful nature, unique culture, varied food, hospitable people and price competitiveness in various kinds of services. The research findings will strongly support the Indonesian government policy to increase the number of tourists. Thus, it will contribute to the Indonesian economy. This can be done by establishing, maintaining and enhancing relationships with stakeholders in an inter-organisational network successfully. For example, by having a network with its suppliers, customers, distributors, competitors, and other institutions, a hotel can increase the number of tourists staying in the hotel. This has become the main interest of this research which is how to nurture the beneficiary network for the parties involved. Ideally, results of this research should contribute not only to the development of knowledge but also for the benefits of community.

### ***2.2 Gap of Knowledge***

This research attempts to fill the gap of knowledge by integrating the concept of relationship marketing and network organisation concepts especially for the services marketing context.

The 'network' organisations originated from the industrial market context (Achrol, 1997; Hakansson and Snehota, 1989; Halinen et al., 1999; Ritter and Gemunden, 2003). The purpose of the relationship marketing concept is to have long-term and profitable relationships with customers and other stakeholders (Gronroos, 1999; Gruen, 1997; Morgan and Hunt, 1994; Seth and Parvatiyar, 1995). On the other hand, a business network is a set of connected direct and indirect relationships between firms (Hakansson and Johanson, 1992; March and Wilkinson, 2009, Olkkonen, 2001). Therefore, the researcher is interested to explore and understand how a firm (i.e. a hotel) nurtures its network of business relationships with stakeholders and how it is used as its marketing strategy in the hospitality industry. These are not easy tasks to be performed by the parties involved as they have varying objectives. In addition, Line and Runyan (2012), who reviewed 274 articles from the hospitality marketing research published in four top hospitality journals from 2008 to 2010, found the gap that business relationship marketing in the hospitality literature needed to be more extensively researched.

### ***2.3 Dearth of Research on Network of Business Relationships in a Hotel Business Context***

There is a limitation of empirical research relating to the inter-organisational relationships or network of business relationships in the hospitality and tourism industry context in which the hotel business is a part. Most of the research in this field has been conducted in a manufacturing or industrial context (Anderson and Narus, 1984; Anderson et al., 1994; Axelsson, 2010; Brennan and Turnbull, 1999; Canning and Hanmer-Lloyd, 2002; Chetty and Wilson, 2003; Cheung and Turnbull, 1998; Easton, 1992; Ford, 1980, 1998a; Hakansson and Johanson, 1992; Hakansson and Snehota, 1989; Metcalf et al., 1992; Moller and Halinen, 1999; Rice, 1992). This concept has only recently gained interest by researchers in the hospitality and tourism industry such as Chathoth and Olsen (2003), Ku et al. (2011), Lemmetyinen and Go (2009), Lemmetyinen (2009), Saloheimo (2008), and Sedmak et al. (2011). Yoo et al. (2011), who synthesised the hospitality marketing research in the top four hospitality-oriented journals from 2000 to 2009, and concluded that only 1.4% of the research was related to the business relationship management (partnership) topics. Therefore, this research project aims at enhancing the research in the hospitality industry particularly in the network of business relationships fields.

## **3. Literature Review Aim and Objective**

The literature review aims at developing a conceptual model of a hotel's network of business relationship particularly the stakeholders that a hotel has relationships. This literature review is focused on business-to-business relationship. The objective is to develop a conceptual model of a hotel's network of business relationships from the stakeholders' perspective.

## **4. Literature Review**

### ***4.1. Relationship Marketing***

#### **4.1.1. Relationship Marketing Definition**

There is no universal definition of relationship marketing that is accepted by researchers and marketers (Evans and Laskin, 1994, Harker, 1999, O'Malley and Tynan, 2003). The numerous definitions are derived from different research perspectives and variously emphasise different ideas (O'Malley and Tynan, 2003). Harker (1999) attempts to review 26 random definitions of relationship marketing with the purpose of constructing a general

definition. The definition by Gummesson (1994, p. 5) which defines relationship marketing is as “relationships, networks and interaction” is applied in this research. The reason is because it covers the fundamental issue of this research. However, despite various definitions of relationship marketing, authors have basic issues that are agreed generally (Gronroos, 1999; O’Malley and Tynan, 2003). They are: (i) relationship marketing refers to value relationships between economic partners, service providers and customers at various levels of the marketing channel and the broader business environment; (ii) relationship marketing is mutually beneficial for the parties involved in relationship; (iii) relationship marketing is about fulfilment of promises; (iv) trust is essential to the process of relationship development.

#### 4.1.2. Relationship Marketing Models

Relationship marketing models are proposed by some authors; for example, Morgan and Hunt (1994), Gummesson (2002), Payne et al. (2005), and Hollensen (2003). Those four relationship marketing models have similarities in terms of their relational exchange or partnerships with customers, intermediaries, suppliers, competitors and employees (Egan, 2003). Despite their similarities, Morgan and Hunt’s relationship model is the most comprehensive in capturing the relationships of stakeholders. They introduce the ten discrete relationships of stakeholders in four groups of partnerships which are supplier partnerships (goods supplier, services suppliers), lateral partnerships (competitors, nonprofits organisations, government), buyer partnerships (ultimate customers, intermediate customers) and internal partnerships (business units, employees, functional departments) (1994, p.21).

#### 4.1.3. Relationship Marketing Components

There is no generic set of dimensions to represent a successful relationship in a variety of industries as Liang et al. (2009, p. 129) refer to “ongoing debate regarding the specific dimensions of the customer relationship orientation construct”. However, there are common dimensions that are accepted among researchers as components of a successful relationship in any context. These dimensions are trust, satisfaction and commitment. Trust is one of the key components in the long term buyer and seller relationships (Morgan and Hunt, 1994; Berry, 1995; Donney and Cannon, 1997; Wong and Sohal, 2002; Liang and Wang, 2006; Baron et al., 2010; Vesel and Zabkar, 2010) and is included in most relationship models (Wilson, 2000). The long-term relationship cannot be built, enhanced and maintained if there is no trust between the parties involved. Commitment is an essential ingredient for a successful long-term relationship (Morgan and Hunt, 1994; Gundlach et al, 1995; Baron et al., 2010). Commitment is recognised as a key element to attain a valuable outcome such as future intention to switch/stay in the relationship (Bansal et al., 2004; Kim et al., 2005), profitability (Anderson and Weitz, 1992), strongly correlated directly and indirectly with customer loyalty (Bowen and Shoemaker, 1998; Hennig-Thurau et al., 2002), and directly influencing positive word-of-mouth behaviour (Bowen and Shoemaker, 1998). Customer satisfaction is one of the most important components in influencing a customer’s decision to stay or leave the relationship (Lemon et al., 2002). It is seen as the key dimension of building, establishing and maintaining a relationship between a customer and a firm (Gruen, 1997; Hennig-Thurau and Klee, 1997; Hennig-Thurau and Hansen, 2000; Shamdasani and Balakrishnan, 2000; Kim and Cha, 2002; Liang et al., 2009; Baron et al., 2010), leads to customer retention and loyalty (Knox, 1998; Hennig-Thurau et al., 2002) and greatly affects attitudes toward purchasing products or services (Oliver, 1980; Choi and Chu, 2001).



## ***4.2. Business-to-business Marketing***

Business-to-business marketing is a general terminology for marketing goods and services to organisations (Brennan et al., 2007). The business-to-business marketing expression is also referred to as “business marketing” (Brennan et al., 2007, p. 3). Business-to-business marketing is different to business-to-consumer marketing (Cooke, 1986; Jackson and Cooper, 1988; Fill and Fill, 2005; Hutt and Spech, 2007; Brennan et al, 2007). This can be explained by comparing their definition. Fern and Brown (1984, p. 69) define business-to-consumer markets as marketing products or services to the individual consumer which uses them without further processing. Whilst Dwyer and Tanner (2007, p. 4) define business-to-business markets as marketing products or services to business, government bodies, and institutions for incorporation, consumption, use or resale.

Business-to-business marketing involves selling products or services to agents, suppliers, manufacturers and wholesalers. On the other hand, business-to-consumer marketing involves selling products or services to consumers that could be from wholesaler directly to consumer (end user) or the other selling alternative is through retailer to consumer (end user). End users might be individuals or households (Hut and Spech, 2007). The selling from retailer to consumer could also be regarded as business-to-business marketing if the buyer is a firm or organisation that utilises products or service for performing business. For example, cars are bought by an organisation such as Fleet Buyers for undertaking fleet business (Hut and Spech, 2007).

## ***4.3. Network Approach***

In the increasingly complex and turbulent markets, successful firms are no longer huge and vertically integrated firms (Archrol, 1997). In fact they are increasingly leaner and specialised firms that are part of a large network alliances and partnerships with other firms (Archrol, 1997; Tikkanen, 1998). These are the manifestations of the network approach (IMP) which is regarded as the theoretical extension of the interaction approach (Olkkonen, 2001). The interaction approach studies dyadic long-term exchange processes and relationships formation between firms, while the network approach aims “at making sense of what happens in complicated business markets in which organisations are engaged in complex business relationships” (Olkkonen et al., 2000, p. 404). Therefore, the network approach aims to provide understanding and descriptions of industrial markets as complex networks of inter-organisational relationships (Olkkonen, 2001).

### **4.3.1 Network Components**

There are three network components, they are actors, activities and resources. The actors are those who perform activities and/or control resources (Hakansson and Johanson, 1992). The actors can be individuals, groups of individuals, parts of firms, firms, and groups of firms (Hakansson and Johanson; 1992; Tikkanen, 1998). Actors utilise certain resources to change other resources in various way in the activities. The resources are the means that are used by actors when they undertake the activities (Hakansson and Johanson, 1992; de Burca, 1995). All resources are controlled by single actors or several actors that join together.

### **4.3.2 Network Models**

Some conceptual models in the literature have been developed to make the analysing of industrial networks possible (Olkkonen, 2001) and Moller and Hallinen’s model has been chosen as the most appropriate for this research (Moller and Hallinen, 1999). Their model

illustrates a network consisting of vertical and horizontal relationships of a focal firm which are derived from the driving forces of the network's external environment. The focal firm's vertical relationships are the partnerships with its different levels of suppliers and customers, whilst the horizontal relationships are established with competitors, competitor alliances, research institutions and governmental agencies. The vertical and horizontal relationships are interrelated forming intricate networks of firms shown by arrows that connect vertical and horizontal actors.

#### 4.3.3 Network as Relationships

Business networks will not exist if there are no relationships among firms (Easton, 1992). The characteristic of a network as stated by de Burca (1995) is a set of connected exchange relationships between actors controlling business activities. Connection is emphasised because networks emerge and develop as a consequence of interactions. Business activities are coordinated by firms through interactions in a network (Ford, 1998a, 1998b). The interactions involve products or services exchange, information exchange, financial exchange and social exchange (interpersonal relationships of the firms' members) (Metcalf et al., 1992; Brennan et al. 2007). Through these interactions, they influence and adapt when performing joint activities (Hallen et al. 1991; Johansson and Mattsson, 1987). The interactions over a period of time lead to business relationships in a network in which actors, activities and resources are interconnected and embedded together (Hakansson and Johansson, 1992; Ford and Mouzas, 2010). Relationships comprise five elements which are mutual orientation, the dependence that each firm has, the bonds of various kinds and strengths, the investments of each firm, and atmosphere (Easton, 1992). These elements are interrelated and shape the firms' relationships. Thus, strongly bonding firms' relationships define networks (Easton, 1992).

#### 4.4. *Hotel's Stakeholders*

From the relationship and network models that include stakeholders relationships, it can be summarised that the main stakeholders of a firm can be grouped into customers (end-customers and intermediate customers), suppliers, competitors and complementors. Since this research explores the network of business relationships which focuses on the business-to-business network, the customers are the intermediaries. With this regard, each grouping will be discussed in the next sections.

##### 4.4.1 Intermediaries

Intermediaries in the hotel industry are those companies who advise, influence, and make bookings for customers (Bowie and Buttle, 2004). They include travel agents (online and offline), tour operators (online and offline), conference placement agencies, event organisers, and incentive agencies. Intermediaries are important links in the distribution channel from the customers to the hotels.

##### 4.4.2 Suppliers

The hospitality company's performance is dependent upon its suppliers (Bowie and Buttle, 2004; Harrison and Enz, 2005). Building strong partnerships with key suppliers facilitates competitive advantage because they provide knowledge, technical assistance, and joint

problem solving (Harrison and Enz, 2005; Ritter et al., 2004). Suppliers can be funding suppliers such as bank and other financial sources. It can be also suppliers for products or services such as employment agencies, educational institutions, professional services and commercial enterprises such as material suppliers, transportation firms, food and beverages, cleaning and maintenance, furniture, technology and guest amenities (Harrison and Enz, 2005).

#### 4.4.3 Competitors

There are different kinds of competitors. They are direct competitors, indirect competitors, and competitors offering substitute product (Bowie and Buttle, 2004). Direct competitors are businesses offering a similar product or service, which is aimed at the same customer group. In the hotel industry it can be other hotels and hotel consortia. Indirect competitors include all those companies and non-profit organisations that are competing for consumers' disposable income such as choosing between buying a new car or going on an exotic holiday. Competitors offering substitute products are businesses that provide potential consumers with alternative choices. The competition in the hospitality industry has become more intense in recent years. The actions and reactions of competitors has changed the market structure, influenced consumer behaviour, and altered market demand (Bowie and Buttle, 2004).

#### 4.4.4 Complementors

Firms develop relationships with many other types of firms in order to increase their value of product (Ritter et al., 2004). This can be local government authorities (who enforce health and safety, hygiene and planning regulations), other businesses and people who live in the neighborhood, community (educational institution, social and voluntary institutions), leisure (sporting and tourism attractions), the local media, research institutions, tourism associations, labour associations and activist groups (Bowie and Buttle, 2004; Harrison and Enz, 2005).

### ***4.5. External Factors that Influence Relationships***

This section describes the external factors that force a hotel to establish a network of business relationships. These are political, economic, sociocultural, technological, and environmental (Bowie and Buttle, 2004; Harrison, 2003; Harrison and Enz, 2005).

#### 4.5.1 Political

The political direction of a country determines the consumer's and commercial organisation's actions (Bowie and Buttle, 2004). The political environment includes legal/regulatory environment, and covers any legislation that influence the market place such as planning regulation, licensing laws, government taxes, and regulation of marketing communications (such as regulation concerning advertising, direct mail, and the use of databases for marketing purposes).

#### 4.5.2 Economic

The economic environment includes all those activities that influence the wealth and income of the population such as the state of the economy, the structure of employment, the level of unemployment, the rate of inflation, and the exchange rate (Bowie and Buttle, 2004). The changing demand of hospitality markets are significantly influenced by these factors because they influence business confidence, consumers' disposable income, and consumer

confidence. When business and consumer confidence is high, hospitality markets thrive, when business and consumer confidence low, hospitality markets decline (Bowie and Buttle, 2004).

#### 4.5.3 Sociocultural

The sociocultural environment influences consumers' purchase and consumption behavior (Bowie and Buttle, 2004). The sociocultural environment is a mix of geography, climate, history, religion, demographic, and ethnic that make-up a country. Cultural differences provide hospitality industry with the greatest challenges particularly when developing global brands. Demographic changes also have significant impact on market demand in hospitality industry. For example, the increasing number of single people is changing the demand characteristic for eating out.

#### 4.5.4 Technological

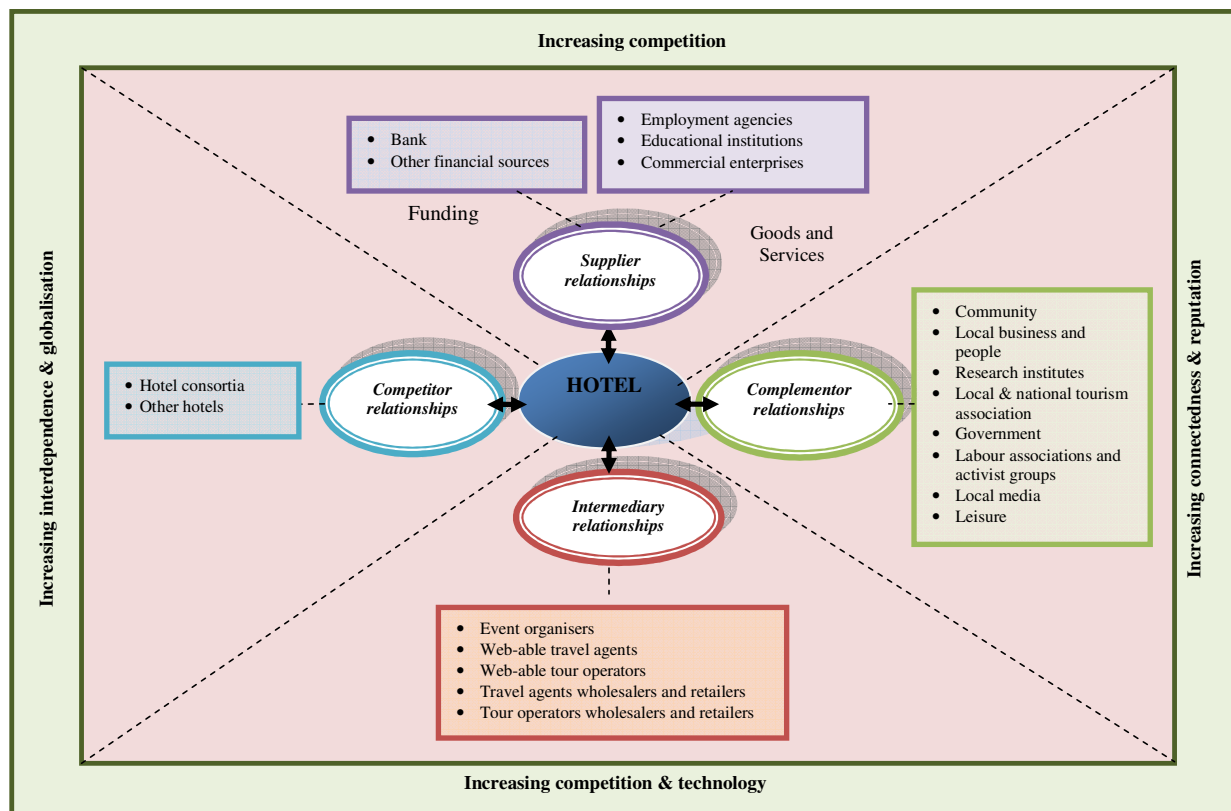
The innovation and development of information communication technology (ICT) in the late 1990s influenced the hospitality industry significantly (Bowie and Buttle, 2004). The improvement in the technological environment includes the growing sophistication of computerized reservation services, the development of global distribution networks, increasing consumer and commercial use of the internet, and the development of in-hotel computerized systems (Bowie and Buttle, 2004; Harrison, 2003).

#### 4.5.5 Environmental

Environmental factors become more important in all parts of the world as people become more concern toward the impact of tourists on the planet (Bowie and Buttle, 2004). Mass tourism is seen as impinging on natural habitats, using up scarce resources, generating air and noise pollution, and creating waste disposal problems. The concept of the green hotel has become more popular in order to accomodate the environmental conservation issues.

### **5. Result: Conceptual Model of Hotel's Network of Business Relationships**

Based on the literature review, a model that combines the relationship marketing model by Morgan and Hunt (1994) and the network model by Moller and Hallinen (1999) is developed. This model consists of the hotels' possible stakeholders networks (vertical and horizontal networks). The stakeholders are grouped into supplier relationships, intermediary relationships, competitor relationships, and complementor relationships. Suppliers could be funding firms and/or goods and services provider. The external factors that influence a firm to develop a relationship are also included.



**Fig. 1. Conceptual Model of Hotel's Network of Business Relationships**

Source: Adapted from Morgan and Hunt (1994, p.21), Moller and Hallinen (1999, p. 415)

## 6. Conclusion

This literature review produces a conceptual model of hotel's network of business relationships from stakeholders' perspective in the business-to-business context. It consists of vertical relationships (supplier and intermediary relationships) and horizontal relationships (competitor and complementor relationships). The external factors that influence the establishment of the hotel's network of business relationships are the increasing competition for supplier relationships, increasing interdependence and globalisation for competitor relationships, increasing competition and technology for intermediary relationships, and increasing connectedness and reputation for complementor relationships.

## 7. Recommendation

This conceptual model is recommended to be confirmed further in the field research whether it is reflected in the real conditions of the Bali hotel industry.

## References

- Achrol, R.S. (1997). Changes in theory of interorganizational relations in marketing: toward a network paradigm. *Journal of the Academy of Marketing Science*, 25 (1), pp. 56-71
- Anderson, J.C., Hakansson, H. and Johanson, J. (1994). Dyadic business relationships within a business network context. *Journal of Marketing*, 58 (4), pp. 1-15
- Anderson, J.C. and Narus, J.A. (1984). A model of distributor's perspective of distributor-manufacturer working partnerships. *Journal of Marketing*, 48 (4), pp. 62-74

- Anderson, E. and Weitz, B. (1989). Determinants of continuity in conventional industrial channel dyads. *Marketing Science*, 8 (4), pp. 310-323
- ASEAN (2011). Tourism Statistics. Available at [www.aseansec.org/22122.htm](http://www.aseansec.org/22122.htm) Retrieved on 10 March 2011
- Axelsson, B. (2010). Business relationships and Networks: Reflections on the IMP tradition. *The IMP Journal*, 4 (1), pp. 3-29
- Bansal, H.S., Irving, P.G. and Taylor, S. F. (2004). A three-component model of customer commitment to service providers. *Journal of the Academy of Marketing Science*, 32 (3), pp. 234-250
- Baron, S., Conway, T. and Warnaby, G. (2010). *Relationship Marketing: A Consumer Experience Approach*. London: SAGE Publications Ltd.
- Berry, L.L. (1995). Relationship marketing of services: Growing interest, emerging perspective. *Journal of the Academy of Marketing Science*, 23 (4), pp. 236-245
- Brennan, R., Canning, L. and McDowell, R. (2007). *Business-to-Business Marketing*. London: SAGE Publications Ltd.
- Bowen, J.T. and Shoemaker, S. (1998). Loyalty: A strategic commitment. *Cornell Hotel and Restaurant Administration Quarterly*, 39 (1), pp. 12-25
- Bowie D. and Buttle, F. (2004). *Hospitality Marketing: An Introduction*. London: Elsevier Butterworth Heinemann
- Brennan, R. and Turnbull, P.W. (1999). Adaptive behavior in buyer-supplier relationships. *Industrial Marketing Management*, 28 (5), pp. 481-495
- Canning, L. and Hanmer-Lloyd, S. (2002). Modelling the adaptation process in interactive business relationships. *Journal of Business & Industrial Marketing*, 17 (7), pp. 615-636
- Chathoth, P.K. and Olsen, M.D. (2003). Strategic alliances: A hospitality industry perspective. *International Journal of Hospitality Management*, 22 (4), pp. 419-434
- Cheung, M.Y.S. and Turnbull, P.W. (1998). A review of the nature and development of inter-organisational relationships: a network perspective. in *Network Dynamics in International Marketing*, Peter Naude and Peter W. Turnbull. Oxford: Elsevier Science Ltd., pp. 42-6
- Chetty, S.K. and Wilson, H.I.M. (2003). Collaborating with competitors to acquire resources. *International Business Review*, 12 (1), pp. 61-81
- Child, J. and Faulkner D. (1998). *Strategies of Co-operation: Managing Alliances, Networks, and Joint Ventures*. Oxford: Oxford University Press
- Choi, T.Y. and Chu, R. (2001). Determinants of hotel guests' satisfaction and repeat patronage in the Hong Kong hotel industry. *International Journal of Hospitality Management*, 20 (3), pp. 277-297
- Cooke, E.F. (1986). What is business and industrial marketing? *The Journal of Business and Industrial Marketing*, 1 (1), pp. 9-17
- Crotts, J.C. and Coppage, C.M.A. (2001). Trust-commitment model of buyer-supplier relationships. *Journal of Hospitality & Tourism Research*, 25, pp 195-208
- De Burca, S. (1995). Services management in the business-to-business sector: From networks to relationship marketing. in *Understanding Services Management*, William J. Glynn and James G. Barnes, pp. 393-419. Chichester: John Wiley & Sons Ltd.
- Doney, P.M. and Cannon, J.P. (1997). An examination of the nature of trust in buyer-seller relationships. *Journal of Marketing*, 61 (2), pp. 35-51
- Dwyer, F.R. and Tanner Jr., J.F. (2002). *Business Marketing: Connecting Strategy, Relationships, and Learning*. London: McGraw-Hill
- Easton, G. (1992). Industrial networks: A review. in *Understanding Business Markets, Third Edition*, David Ford. Croatia: Thomson Learning, pp. 123-144
- Egan, J. (2003). Back to the future: Divergence in relationship marketing research. *Marketing Theory*, 3 (1), pp. 145-157

- Erickson, G.S. and Kushner, R.J. (1999). Public event networks: an application of marketing theory to sporting events. *European Journal of Marketing*, 33 (3), pp. 348-365
- Evans, J.R. and Laskin, R.L. (1994). The relationship marketing process: A conceptualization and application. *Industrial Marketing Management*, 23 (5), pp. 439-452
- Fern, E.F. and Brown, J.R. (1984). The industrial/consumer marketing dichotomy: a case of insufficient justification. *Journal of Marketing*, 48 (2), pp. 68-77
- Fill, C. and Fill, K.E. (2005). *Business to Business Marketing*. London: Prentice Hall
- Ford, D. (1980). The development of buyer-seller relationships in industrial markets. *European Journal of Marketing*, 14 (5/6), pp. 339-353
- Ford, D. (1998a). Two decades of interaction, relationships and networks. in *Network Dynamics in International Marketing*, Peter Naude and Peter W. Turnbull. Oxford: Elsevier Science Ltd., pp. 3-15
- Ford, D. (1998b) *Managing Business Relationships*. Chichester: John Wiley & Sons
- Ford, D. and Mouzas, S. (2010). Networking under uncertainty: concepts and research agenda. *Industrial Marketing Management*, 39 (6), pp. 956-962
- Garcia-Falcon, J.M. and Medina-Munoz, D. (1999). The relationship between hotel companies and travel agencies: an empirical assessment of the United States market. *The Service Industries Journal*, 19 (4), pp. 102-122
- Gronroos, C. (1990). The marketing strategy continuum: towards a marketing concept for the 1990s. *Management Decision*, 29 (1), pp. 7-13
- Gronroos, C. (1999, November). Relationship marketing: Challenges for the organization. *Journal of Business Research*, 46 (3), pp. 327-335
- Gruen, T.W. (1997). The outcome set of relationship marketing in consumer market. *International Business Review*, 4 (4), pp. 447-469
- Gummesson, E. (1987). The new marketing-developing long-term interactive relationships. *Long Range Planning*, 20 (4), pp. 10-20
- Gummesson, E. (1994). Making relationship marketing operational. *International Journal of Service Industry Management*, 5 (5), pp. 5-20
- Gummesson, E. (2002). *Total Relationships Marketing: Rethinking Marketing Management*. Oxford: Butterworth-Heinemann
- Gundlach, G.T., Achrol, R.S. and Mentzer, J.T. (1995). The structure of commitment in exchange. *Journal of Marketing*, 59 (1), pp. 78-92
- Hakansson, H. and Johanson, J. (1992). A model of industrial networks. in *Industrial Network: A New View of Reality*, Bjorn Axelsson and Geoffrey Easton. London: Routledge
- Hakansson, H. and Snehota, I. (1989). No business is an island: The network concept of business strategy. *Scandinavia Journal Management*, 5 (3), pp. 187-200
- Halinen, A., Salmi, A. and Havila, V. (1999). From dyadic change to changing business networks: An analytical framework. *Journal of Management Studies*, 36 (6), pp. 779-795
- Hallen, L., Johanson, J. and Seyed-Mohamed, N. (1991). Interfirm adaptation in business relationships. *Journal of Marketing*, 55 (2), pp. 29-37
- Harrison, J.S. (April, 2003). Strategic analysis for the hospitality industry. *Cornell Hotel and Restaurant Administration Quarterly*, 44 (2), pp. 139-152
- Harisson, J.S. and Enz, C.A. (2005). *Hospitality Strategic Management: Concept and Cases*. New Jersey: John Wiley & Sons
- Harker, M.J. (1999). Relationship marketing defined? An examination of current relationship marketing definitions. *Marketing Intelligence and Planning*, 17 (1), pp. 13-20
- Hennig-Thurau, T., Gwinner, K.P. and Gremler, D.D. (2002). Understanding relationship marketing outcomes. *Journal of Service Research*, 4 (3), pp. 230-247

- Hennig-Thurau, T. and Hansen, U. (2000). Relationship marketing - some reflections on the state-of-the-art of the relational concept. in *Gaining Competitive Advantage Through Customer Satisfaction and Customer Retention*. Thorsten Hennig-Thurau. Berlin: Springer-Verlag
- Hennig-Thurau, T. and Klee, A. (1997). The impact of customer satisfaction and relationship quality on customer retention: A critical reassessment and model development. *Psychology & Marketing*, 14 (8), pp. 737-764
- Hollensen, S. (2003). *Marketing Management: A Relationship Approach*. Essex: Prentice Hall
- Hutt, M.D. and Spech, T.W. (2007). *Business Marketing Management: B2B*, Ninth Edition. Mason: Thomson
- Indonesia Ministry of Cultural and Tourism (2010). *Pulau Bali Terima Penghargaan dari Majalah Wisata Terkemuka Travel and Leisure*. Available at [www.budpar.go.id](http://www.budpar.go.id) Retrieved 4 April 2011
- Jackson, R.W. and Cooper, P.D. (1988). Unique aspects of marketing industrial services. *Industrial Marketing Management*, 17 (2), pp. 111-118
- Johansson J. and Mattsson, L. (1987). Interorganizational relations in industrial systems: a network approach compared with the transaction-cost approach. *International Studies of Management & Organization*, 17 (1), pp. 34-48
- Ku, E.C.S., Wu, W., and Lin, A. (2011). Strategic alignment leverage between hotels and companies: The buyer-supplier relationship perspective. *International Journal of Hospitality Management*, 30, pp. 735-745
- Kim, W.G. and Cha, Y. (2002). Antecedents and consequences of relationship quality in hotel industry. *International Journal of Hospitality Management*, 21 (4), pp. 321-338
- Kim, W.G., Leong, J.K. and Lee, Y.K. (2005). Effect of service orientation on job satisfaction, organizational commitment, and intention of leaving in a casual dining chain restaurant. *International Journal of Hospitality Management*, 24 (2), pp. 171-193
- Knox, S. (1998) Loyalty based segmentation and the customer development process. *European Management Journal*, 16 (6), pp. 729-737
- Lemon, K.N., White, T.B. and Winer, R.S. (2002). Dynamic customer relationship management: Incorporating future considerations into the service retention decision. *Journal of Marketing*, 66 (1), pp. 1-14
- Liang, C.J., Wang, W.H. and Farquhar, J.D. (2009). The influence of customer perceptions on financial performance in financial services. *International Journal of Marketing*, 27 (2), pp. 129-149
- Line, N.D. and Runyan, R.C. (2012). Hospitality marketing research: Recent trends and future directions. *International Journal of Hospitality Management*, 31, pp. 477-488
- March R. and Wilkinson, I. (2009). Conceptual tools for evaluating tourism partnerships. *Tourism Management*, 30, pp 455-462
- Medina-Munoz, D. and Garcia-Falcon, J.M. (2000). Successful relationships between hotels and agencies. *Annals of Tourism Research*, 27 (3), pp. 737-762
- Metcalf, L.E., Frear, C.R. and Krishnan, R. (1992). Buyer-seller relationships: an application of the IMP interaction model. *European Journal of Marketing*, 26 (2), pp. 27-46
- Moller, K. and Halinen, A. (1999). Relationship marketing theory: Its roots and direction. *Journal of Marketing Management*, 16 (1-3), pp. 29-54
- Morgan, R.M. and Hunt, S.D. (1994). The commitment-trust theory of relationship marketing. *Journal of Marketing*, 58 (3), pp. 20-38
- Oliver, R.L. (1980). A cognitive model of the antecedents and consequences of satisfaction decisions. *Journal of Marketing Research*, 17 (4), pp. 460-469
- Olkkonen, R. (2001) Case study: The network approach to international sport sponsorship arrangement. *Journal of Business & Industrial Marketing*, 16 (4), pp. 309-329



- Ritter, T. and Gemunden, H.G. (2003). Interorganizational relationships and networks: an overview. *Journal of Business Research*, 56, pp. 691-697
- Olkkonen, R., Tikkanen, H. and Alajoutsijarvi (2000). The role of communication in business relationships and networks. *Management Decision*, 38 (6), pp. 403-409
- O'Malley, L. and Tynan, C. (2003). Relationship marketing. in *The Marketing Book, 5th edition*, Michael J. Baker. Oxford: Butterworth-Heinemann
- Payne, A., Ballantyne, D. and Christopher, M. (2005). A stakeholder approach to relationship marketing strategy: The development and use of the "six markets" model. *European Journal of Marketing*, 39 (7/8), pp. 855-871
- Rice, G. (1992). Using the interaction approach to understand international trade shows. *International Marketing Review*, 9 (4), pp. 32-45
- Ritter, T., Wilkinson, I.F. and Johnston, W.J. (2004). Managing in complex business networks. *Industrial Marketing Management*, 33 (3), pp. 175-183
- Sedmak, G., Planinc, T., and Planinc, S. (2011). Unexploited potentials of Networking in the hospitality business-Slovenia's case. *Tourism and Hospitality Management*, 17 (2), pp. 187-200
- Shamdasani, P.R. and Balakrishnan, A.A. (2000). Determinants of relationship quality and loyalty in personalized services. *Asia Pacific Journal of Management*, 17 (3), pp. 399-422
- Sheth, J. N. and Parvatiyar, A. (1995). The evolution of relationship marketing. *International Business Review*, 4 (4), pp. 397-418
- Tikkanen, H. (1998). The network approach in analyzing international marketing and purchasing operations: a case study of a European SME's focal net 1992-95. *Journal of Business & Industrial Marketing*, 13 (2), pp. 109-131
- Vesel, P. and Zabkar, V. (2010) Comprehension of relationship quality in the retail environment. *Managing Service Quality*, 20 (3), pp. 213-235
- Wilkinson, I. and Young, L. (2002). On cooperating firms, relations and networks. *Journal of Business Research*, 55, pp. 123-132
- Wilson, D.F. (2000) Why divide consumer and organizational buyer behaviour. *European Journal of Marketing*, 34 (7), pp. 780-796
- Wong, A. and Sohal, A. (2002). An examination of the relationship between trust, commitment and relationship quality. *International Journal of Retail & Distribution Management*, 30 (1), pp. 34-50
- Yoo, M., Lee, S., and Bai, B. (2011). Hospitality marketing research from 2000 to 2009: Topics, methods, and trends. *International Journal of Contemporary Hospitality Management*, 23 (4), pp. 517-532