Responses to representations of the built environment: the influence of emotion, attention and perspective-taking

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ABSTRACT

The main aim of this thesis is to investigate how environmental preference for the built environment, either in-situ or based on visual representations (e.g. visualisations of final architectural design), may be affected by three distinct variables. One of them is emotion, operationalised as the mood people are in at the time of the evaluation and the way people feel with regards to the environment. A second variable considers the participants' attention and how they may be influenced by task instructions. The third variable, intrinsically related to the second one, is how environmental preference may be influenced depending on the perspective taken at the time of the evaluation.

The main research questions in this thesis are:

a) How does emotion influence environmental preference?

b) What is the impact of perspective-taking on environmental preference?

c) What are the benefits of using emotional reactions to the environment as predictors of preference?

These main research questions are addressed using both quantitative and qualitative methods, mainly quantitative, underpinned by a pragmatic approach. The unit of analysis in this thesis is the person who evaluates or judges an environment or a representation of it.

Five studies are presented in this thesis. Study 1 (n=10) reports the results from interviews with practising architects in the city of Aberdeen. These results show that when designing architects take two distinct perspectives: a prescriptive inferential perspective and a self, referential perspective. These interviews are used to set the context within which this thesis operates: the presentation of design to people with no expertise in architecture and built environment disciplines. The remaining four studies directly address this thesis' main research questions.

In Study 2 (n=133), Study 3 (n=146) and Study 5 (n=64) the effects of perspective-taking on different dependent variables are experimentally tested. The dependent variables are: perceived restorativeness (Study 2), environmental preference as measured via informational variables (Study 3), and the emotional reactions people have to representations of the environment (Study 5). Results of these studies show that perspective-taking carries an interpersonal perception bias

whereby taking a perspective other than the self results in different environmental evaluation outcomes, but that this process can also be affected by formal training.

The influences of emotion on environmental preference are directly explored in Studies 4 (n=32) and 5 (n=64). The results show that mood can have an influence on environmental preference by influencing the emotional reactions people have to the environment, but that these influences vary over time.

Overall the thesis shows that perspective-taking and emotion have a range of influences on environmental preference in a built environment context, that these are important at the point at which architecture and built environment professionals design environments, and that timing of environmental evaluations in longitudinal assessments can make the difference between positive and less positive evaluations. This thesis' results are discussed in light of existing knowledge and some recommendations are made for future research and practitioners in architecture and built environment disciplines.

Keywords: emotion, perspective-taking, attention, environmental preference, environmental evaluation, environmental psychology, emotional response, mood, communication of design.

DECLARATION OF AUTHORSHIP

I Carlos Roberto Galán-Díaz declare that I am the sole author of this thesis.

I declare all verbatim extracts contained in the thesis have been identified as such and sources of information specifically acknowledged.

I certify that, where necessary, I have obtained permission from the owners of third party copyrighted material to include this material in my thesis and make it available on web pages.

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I declare that no material contained in the thesis has been used in any other submission for an academic award.

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USE OF TERMINOLOGY IN THIS THESIS

The following list defines the terms that are central to this thesis and that will be used throughout the text:

Attention: to attend to or to engage the senses with stimuli. There are two commonly accepted types of attention: (1) involuntary attention or the attention which is demanded by the relevant stimuli. (2) directed attention or the attention which requires selectivity or effort in order to attend to the stimuli. Unless otherwise specified, the use of the word attention refers to directed attention (2).

Client/end-user: is used to refer to the person or persons who in a situation (actual or hypothetical) are asked to consider or imagine using/ occupying/ inhabiting an environment that is presented to them using visual representations (e.g. Computer Generated Renders (CGR), photographs). The client/end-user uses these visuals in order to form a number of responses (e.g. preference) to the environment.

Environment: is considered as the "*objective and perceived relatively stable qualities of an individual's or group's physical and/or social surroundings*" (Clitheroe, Stokols and Zmuidzinas, 1998).

Environmental evaluation: the situation where an individual is asked to judge/evaluate something (in this case an environment or a representation of it) and communicate their response using a type of measure, e.g. preference, emotional reaction.

Inter-personal perception bias: this term refers to the particular situation where people's perceptions of an environment are compared to each other's and there are significant differences between perceptions.

Perspective-taking: a way of considering a situation and judging its relative importance, in this thesis the 'perspectives' are applied to the participants in order to measure their influence on a variety of processes.

Preference, environmental: the extent to which an individual likes an environment, this can be recorded in different ways, e.g. semantic differential form.

Self-knowledge: refers in a broad sense to the cognitions (e.g. preference, familiarity), emotions (e.g. pleasure, arousal), experiences and beliefs that a person holds about the world. It becomes relevant when describing the plausible effects of perspective-taking on environmental preference insofar as people are asked to state to what extent their experience of the perspective taken is influenced by what they know and feel (self perspective), what others may know and feel (other perspective) and the extent to which their perspective-taking is not dependent on self-knowledge (detached).

Self-serving bias: a bias that is concerned with one's own welfare and interests rather than those of other people. The use of this term does not imply that the opinion or judgement of one person is superior, better or more correct than that of another person.

CHAPTER 1. INTRODUCTION

This thesis is situated in the field of environmental psychology which is the study of the "*empirical and theoretical relationships between behaviour and experience of the person and his* [sic] *built environment*" (Proshansky, 1976, p. 303). The thesis investigates some of the processes that may have an impact on the environmental preference for final architectural design (either for similar existing examples or prospective environments). Environmental preference is concerned with what accounts for the choice of a given environment, whether in-situ or via visual representations.

The main research questions in this thesis are:

a) How does emotion influence environmental preference?
b) What is the impact of perspective-taking on environmental preference?
c) What are the benefits of using emotional reactions to the environment as predictors of preference?

An individual might evaluate final architectural design for a number of reasons (Zube, 1984) e.g. someone requires a purpose-built dwelling; someone wants to buy a property to live in and turns to housing associations to seek a new property, or researches the available housing market; an employee is being relocated to a different office as part of his or her employers' organisational strategy; or citizens are presented with city planning proposals.

Each of these scenarios has particular characteristics and implies a set of constraints. For example a bespoke building would normally imply full control of the design options and process whereas an office relocation gives the individuals little or no control over the office design as this is a decision that would normally have been made for them. Therefore, the scenarios of presentation of final design vary according to the level of involvement with, knowledge of and control over the project that the individual has at this particular point.

This thesis focuses on the scenario where the individuals have not been involved with the design process but are presented with final design scenarios to make a judgement as potential occupants or users, hereafter called client/end-user. Moreover, this client/end-user is assumed to be a layperson, i.e. with no specialised

knowledge of architecture, urban design, planning or similar disciplines. This means that the final architectural design needs to be *visualised* or *presented* in a way that the individual with no architectural training can understand it.

Chapter 2 provides an overview of the architectural design process as set out in the Plan of Work of the Royal Institute of British Architects (RIBA)[1] in order to provide the context for the presentation of final design. It also describes the various types of clients and how the communication of design is made through a variety of visual representations. This chapter reports on **Study 1**: interviews with practising architects, which consisted of in-depth interviews to explore the way architects normally present design to the client/end-user, as well as the process they use to extract design requirements from their clients.

Chapter 3, reviews the literature that this thesis draws on to address the above research questions. The review is divided into four main sections: environmental preference; emotion; attention; and perspective-taking. The first section presents a definition of environmental preference and a general overview of the scope of existing research. The second section discusses what emotional phenomena are, and reviews findings on how a particular instance of them, mood, may have an influence on environmental preference formation. The third section describes the attention mechanism, reviews some of the literature showing how attention manipulations have important consequences for environmental perception, and discusses Attention Restoration Theory (ART), a theory that proposes that preference is dependent on the potential an environment has to restore directed attention. The fourth and final section of this chapter reviews the literature on perspective-taking, a process that has been claimed to be an essential component of human interaction, and discusses how perspective-taking could be used within environmental evaluation. It is argued that perspective-taking could be used as a tool for the manipulation of self-serving bias during environmental evaluation and that taking a perspective other than the *self* has important environmental preference consequences.

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[1] Although not all buildings are designed by architects, the vast majority of their design process can be divided into the stages set by the RIBA. The particular instance of presentation of final design in this thesis always requires that the potential client/end-users make judgements based on visual representations of the proposed environment.

Chapter 4 describes the methodology used in the thesis and presents a conceptual framework that integrates the main arguments put forward by this work. The methodology section deals with the research approach taken in this thesis and discusses the rationale behind each of the studies and how they fit together to respond to the research questions. The conceptual framework on the other hand deals with the standard environmental evaluation task where an individual is presented with an environment, or a representation of it, and has to provide evaluative judgements related to it. It highlights the influences on the environmental evaluation considered worthy of research for this thesis, and introduces a slight modification that takes place in the environmental evaluation when proposed environments are evaluated: the evaluation becomes *prospective*.

Chapters 5-8 report on studies 2-5. In **Chapter 5**, **Study 2** reports on the impacts of perspective-taking on environmental perception using the Perceived Restorativeness Scales (PRS), a common measure in the ART field. As Attention Restoration works on the premise of cognitive expenditure based on perceptual input, the research question is based on what would happen in terms of perceived restorativeness if participants were asked to take two different perspectives during the evaluation of the visual stimulus, one as an architect and one as a local resident.

In **Chapter 6**, **Study 3** reports on the effects of perspective-taking on environmental preference via commonly used semantic differentials using the same stimulus and design as in study 2. Measures related to environmental preference, aesthetic perception and an item addressing potential purchase behaviour are used in contrast to the PRS measures used in the previous study. In this study a selection of architecture students are tested in order to compare their results with the rest of the sample which was composed of people with no training in architecture (non-trained or laypeople).

In **Chapter 7**, **Study 4** reports on the preference for, and emotional reactions to, a new office environment at three different times during an office relocation: prior to the move via prospective ratings (using visualisations), three and six months after the relocation (both in-situ preference ratings). The longitudinal data are discussed in light of how pre-relocation responses differ – or not – when compared to the three and six month post-occupation evaluations. Overall, this study explores how stable different measures are over time.

In **Chapter 8**, **Study 5** reports on the effects of perspective-taking on the emotional reactions to, and preference for, different office environments. It tests what happens to environmental preference and emotional reactions to the environment when people are asked to take a detached perspective, take the perspective of the other (in this case an architect) or take a self perspective. This chapter also explores a technique for measuring emotional reactions to the environment by asking participants to generate their own emotion words. The results of the group comparisons are discussed in terms of the effects that taking different perspectives have on environmental preference and how people use their self-knowledge to take different perspectives.

Studies 4 and 5 include a self-reported measure of the participants' mood (in the form of positive and negative affect) in order to analyse mood's impact on a variety of processes, namely environmental preference, emotional reactions to the environment and perceived restorativeness.

In **Chapter 9** the contributions to knowledge of this thesis are laid out followed by a general discussion of the thesis findings. The general limitations of this thesis are presented and future research generated by this work is proposed.

In Chapter 2 the architectural design process is described to provide the background for the research.

CHAPTER 2. THE ARCHITECTURE DESIGN PROCESS: AN OVERVIEW

In order to be able to discuss the presentation of final or scheme design, it is necessary to understand, at least in principle, the stages through which the design has travelled by the time it is presented to the client/end-user. In turn, it is not possible to talk about this without having a general idea of what design is and how it happens. Thus, in this chapter the parameters of what design entails and the context for design in Architecture will be set in its more abstract terms.

The very definition of the term "design" is the subject of debate in Architecture. "Design", as it is generally described, is both process and end product depending on the author defining the concept or the point of the design process to which one is referring (e.g. Lawson, 1997; van der Voordt and van Wegen, 2005). Design is a process when it goes from addressing the problem that needs to be solved to the production of the solution. It is a product when the emphasis is on the solution. This distinction is relevant given that this thesis will be investigating one of the by-products of design, or more appropriately the design process: the presentation of final design to client/end-user.

2.1 THE DESIGN PROCESS

Any architect working in the United Kingdom should adhere to the framework specified by the Royal Institute of British Architects (RIBA) known as the "Plan of Work". The Plan of Work stipulates that all architects should work in a logical and systematic way: properly recording the different stages of the design process. The suggested framework is shown in Figure 1.

	A	inception	
	B	feasibility	
	C	outline proposals	
S	**D**	scheme design	PRE-CONTRACT
T	**E**	detail design	
A	**F**	production information	
G	**G**	bills of quantities (BQ) or measurement	
E	**H**	tender action	
	J	project planning	
	K	construction on site	POST-CONTRACT
	L	completion and feedback	

Figure 1. The Plan of Work set by the RIBA from beginning to completion of a building project.

The framework contemplates the whole process of design in Architecture, from having the first meeting with a client (stage A), working out the different but tangible possibilities of the given project (stage B), the selection of the most appropriate solution (stages C and D), the production of detailed plans, local authority permission, cost estimates, different process' logistics and management of different parties involved in the process (stages E, F, G and H) to working out the whole project outline (stage J), then moving on to making it happen (stage K) and finalising and receiving feedback from client/end-user (stage L). As shown in Figure 1, the plan of work is divided between pre-contract and post-contract.

The pre-contract (stages A to J) is concerned with all the issues that must happen before a legal binding contract is set between client and architect. Once all the minutiae of the whole process up to this point have been addressed, and both parties agree on the course of action, the legal binding contract is signed off and construction can commence. The post-contract stage (K and L) will essentially be materialising the previous work and involves the biggest financial commitment on behalf of the client. Given its scope, the design process in Architecture is paramount and not to be taken lightly. It requires a wide range of skills on behalf of the architect including the ability to delegate work to appropriate parties.

It is beyond the scope and area of expertise of this thesis to go into specific details about the design process but it is important to highlight that it applies to any building project, whether it is concerned with domestic or commercial architecture. The way the process works has been outlined here so the reader can understand the context of the problem that will be discussed in this thesis: the presentation of final design to the client/end-user.

2.2 CLIENT GROUPS

According to the literature on the Design Process there are several groups of clients. The client groups in general terms are defined as follows (Tunstall, 2006):

- *Owners*: those who can make decisions (individuals, partners, shareholders, etc.)
- *Representatives*: they may make decisions but also may need to have approval from the owners
- *Committees*: these make decisions collectively

- *Users*: prospective purchasers or tenants may have some influence over certain aspects of the design and construction

From these categories it is possible to extract two abstract types of client: the client who is also end-user and the client who acts on behalf of the end-user, also identified as "*build for their own or builder occupier*" and "*build for profit or speculator*" respectively (Thompson, 1999).

In this thesis, the client group addressed are users or end-users, which implies that the input they have in the design process is minimal, if any. Hence, this thesis investigates what happens late in stage D (scheme design) which is the stage at which the client/end-user may have some input into the final design after the vast majority of the design phase has taken place, implying that most of the requirements have been specified and addressed (usually by a representative, e.g. housing developer, government, etcetera). Points to address here are such as finishes, materials, services, etc. Thus, the modifications available at this point are minor.

Once these minor alterations are agreed, the next stage (E, detail design) can start. In this stage the detailed specifications and drawings take place and the design has to be frozen, i.e. no more changes are permitted. The client must be made aware that even minor changes after this point may incur extra costs for the whole project (Thompson, 1999). From Stage F (production information) onwards the process stops being a design oriented one and turns into a construction oriented project in which good management and liaison skills on behalf of the architect are essential. Finally, at stage L, the design product is completed and evaluated yet again by client/end-user.

2.3 COMMUNICATING THE DESIGN PROCESS

In order to be realised, the design's end product and its process must be communicated to different parties from beginning to end. The fundamental method of communication in Architecture is the visual form and its main medium the drawing. If the design process is seen as a building then the drawings are its foundations: it is the drawings – both hand-drawn and computer generated – that will ultimately give life to the early ideas and the visualisations of the final product.

First of all, it is worth noting that not all drawings serve the same purpose in the design process, but all drawings work on the same principle, namely: operationalising the design idea(s). Hence, initially the drawings will help the conceptual design: the creation of the concept that the client/end-user is requesting (stage A and B, Inception and Feasibility). Later on in the process, the drawings will guide the planning, costing and construction of the project.

In stage A the drawings serve the purpose of trying out the different possibilities based on the initial consultation with the client/end-user and his/her needs, aspirations and vision. The drawings would be more indicative than descriptive and thus conceptual in nature. For stage B, the formulation of the design brief and basic options takes place. The design brief consists of the resulting options once the client/end-user requirements have been addressed.

In stage C, outline proposals, the drawing acquires greater significance. Its purpose is to show the main aspects of the building with sufficient detail and in scale so the main elements of the building could be identified in principle. The following stage, Scheme design (D), brings the scale and accuracy of the drawings to the forefront and all previous aspects are shown in the same depth of detail. Once a definite course of action is agreed, the drawings incorporate all different aspects of the design (stage E, detailed design, also described as final design). Eventually, these become the working drawings or the drawings used for the construction.

Nevertheless, although the drawings are the basis for all design, they are not the only presentation technique available to architects wishing to communicate their design. Generally speaking, the presentation methods serve a wider audience than just like-minded professionals whom would benefit from understanding the proposed design "as it would look" once it is finalised. The following formats encompass the most common ways for presenting ideas in the fields of Architecture and Design (Lawson, 1997; Thompson, 1999; Tunstall, 2006):

a) *Maps, plans, and elevations*: these represent the standard form with which architects and designers normally communicate their design with other professionals. The degree of accuracy is made to scale and all minute details are included for the area to be depicted. Although very precise and informationally rich, these formats require that the observer understands the language of the professional: knowing how to read highly abstract representations of the environment.

b) *Sketches or artistic impressions*: these formats are the first step in the ladder of realism or life-like looking images. They are, as the name suggests, only a rough or unfinished drawing/representation in the case of the former (sketch) and the way the architect/designer sees the potential outcome in a given project for the latter (artistic impression). They convey *general meaning*, that is, the minor details are left out in order to communicate overarching ideas. In the case of artistic impressions, license is taken to present innovative perspectives of the potential for a given project. Both formats may lack precise correspondence with the end product and are mainly used for the communication of developing ideas, not final design.

c) *Three Dimension (3D) drawings -Renders and Photomontage*: 3D drawings are those in which volume is incorporated in order to present the design idea the way it would look if one was there or took a photograph from this angle or looked at it from this position, etc. This representation can be photorealistic or not (e.g. Daniel and Meitner, 2001; Klein, Li, Kazhdan, Correa, Finkelstein and Funkhouser, 2000).

-Render is the common name for a Computer Generated Render (CGR)[2] which is a result of Computer Aided Design. CGRs entail the use of diverse information inputs such as drawings, plans, geographical and topological data, textures and lighting effects. Thus, technologically and technically speaking, the stimuli used will have the necessary perceptual and informational balance so that a given scenario is represented accurately.

-The Photomontage is a format that combines a realistic representation of the environment, i.e. a photograph, and a computer generated render or a 3D drawing in order to present a highly accurate example of what the design will look like (e.g. Stamps, 2000; Stokols, 1993).

d) *Scale models*: these are a scale recreation of the proposed environment in physical model form. They vary in the level of detail according to the information they need to communicate, from austere scale representations (e.g. cardboard) to making use of different materials so that a replica of the proposed design is achieved. They are aimed at showing how the whole

[2] Also known as computer generated images, visualisation, etcetera.

environment would work, and still require that the observer performs a manipulation so the perspective/proportion is understood. To ease this, a method called architectural endoscopy can be used, in which a small camera is introduced in the model thus recording and then playing back the proportions at an appropriate scale (e.g. Martens, 1995).

e) *Virtual environments*: these are computer generated representations the aim of which is to replicate the way people interact with the world: in movement (e.g. Biocca, 1992; Steuer, 1992). Just like 3D drawings, virtual environments can be photorealistic or not. Typically these representations come in the form of a walkthrough or a birds-eye view which are described as passive virtual environments. However, some virtual environments also allow the observer to become a user by controlling their movement through the representation: these are described as active (for detailed information about the differences between active and passive virtual environments see for example Bishop, Ye and Karadaglis, 2001; Conniff, Craig, Laing, Scott and Galán-Díaz, 2007; Conniff, Craig, Laing and Galán-Díaz, 2010; Gaunet, Vidal, Kemeny and Berthoz, 2001; Koh, von Wiegand, Garnett and Durlach, 1999).

The choice of any of these formats depends on the audience the architect needs to communicate with, for example amongst architects and designers they usually make use of maps, plans and elevations. With regard to presenting final design to client/end-user, architects and designers generally use 3D drawings, such as photomontage or render. The reasons why they rely on these are usually driven by time and economic constraints, given that formats such as scale-models or virtual environments are more expensive and elaborate than 3D drawings. Nonetheless, the developments in Computer-Aided Design (CAD) software continually narrow the gap between simple and complex representations (renders vs. virtual environments) and reduce the costs of implementing such elaborate representations.

2.4 THE ARCHITECT'S INFLUENCE ON THE DESIGN PROCESS

As seen in the previous section, the process of an architect designing and constructing a new building is a long and complex one that involves more than one party. There are different specialists' requirements for the design and the construction phases, pre-contract and post-contract stages. One of the few constants in the design process is the architect who would usually be involved from

beginning to end whereas the client/end-user does not always have a full hands-on approach.

In the United Kingdom, providing that the design has addressed the client's needs, the design must still be compliant with Local and National Building Regulations and Standards, Health and Safety Regulations and will ultimately have to be approved by the relevant Planning Authority. The latter will confirm whether the design is in keeping with the local development plans, planning policies and building controls to name a few. The architect's interactions with these regulating bodies are beyond the scope of this thesis and are used only as reference to indicate that with respect to his/her design, the architect is limited by factors other than architectural/personal/client/end-user preferences. As such, the architect must operate within these constraints and still come out at the end of the process with a concept that meets the approval of the client/end-user, him/herself and the relevant Authorities.

Lawson (2006) identifies four main constrictors of design, the client/end-user, the architect him/herself, the local authority and the context as a whole roughly correspond to those described above, but Lawson also attributes a degree of "strength", inherent to the constriction, described as rigidity and flexibility, see Figure 2 below.

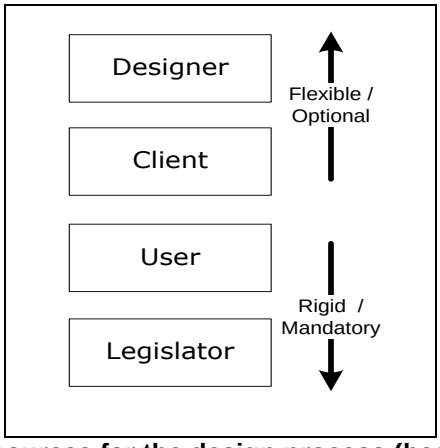

Figure 2. Constraint sources for the design process (based on Lawson, 2006).

Figure 2 exemplifies one of the different ways that design limitations could be described. In this case Lawson identifies the client/end-user as two different entities with different degrees of flexibility. It accounts for the client who is end user, and is thus part of the process, and the user who never is part of the early stages of the design. The diagram is indicative and hence open to accommodate variations on a

case-by-case basis. Overall it shows how there are two main constraints in the design process, the flexible which could be solved via design and the rigid which are clear-cut: the architects either comply or do not get approved by the relevant legislator (whichever authority this may be at a given point in the design process).

It is important to emphasise that the point at which the client/end-user evaluates the potential design product, he/she may be unaware of all these constraints and end up attributing all responsibility, wrongly, to the architect. Nevertheless, one would expect that after such a thorough process, design – in general – is at best innocuous to people and its surrounding environment. Unfortunately this is not always the case.

In order to explore these ideas further the remainder of this chapter presents the first study of this thesis: interviews with practising architects. The architects were consulted in order to establish what the norm is when presenting design to the client/layperson and to understand the process that architects go through when they explore their clients' design requirements.

2.5 STUDY 1 – INTERVIEWS WITH PRACTISING ARCHITECTS: CONTEXTUALISING THE PRESENTATION OF DESIGN TO LAYPEOPLE

The literature review summarised the design process and the visualisation formats available to architects to present final designs to various audiences. As this thesis focuses on the presentation of design to the client/end-user with no training in the built environment disciplines, i.e. non-trained or laypeople, the emphasis will be on some of the representations used by architects and designers to convey their work to them, i.e. 3D drawings.

Research findings on laypeople's understanding of final design have been consistent: people tend to have problems understanding 2D drawings and benefit from 3D visualisations with high levels of realism (e.g. Appleyard, 1976; Daniel and Meitner, 2001; Bergen, Ulbricht, Fridley, and Ganter, 1995). As a result of computing and software developments of the last three decades, visualising design in a variety of formats and degrees of realism is becoming easier and cheaper (e.g. Mahdjoubi and Wiltshire, 2001). This has resulted in presentation formats that can visually *mimic* reality to a close degree.

However, the recurrent message found in the literature appeals to the appropriate use of a range of visualisations during different stages of the design process (e.g. Appleyard, 1976; Stamps, 2000). The reason behind this is that early conceptual stages may or may not be carried through the design process, and thus visualising these stages with high degrees of realism may give the false impression of a finalised product (e.g. Bates-Brkljac, 2009).

Given that one of the aims of architecture is the delivery of a concept/vision for those who pay for the creation of the environments, the architect is required to identify the client/end-user's needs so they can be addressed. This requires the architect to *read* the client so the design concept can be abstracted and translated into a deliverable outcome. As an integral part of the design process, it would be expected that the architect has a systematic approach to such enquiry.

Environmental preference during the design process is crucial and research has shown a clear aesthetic discrepancy between laypeople and architects: architects and laypeople do not seem to like the same architectural styles or elements (e.g. Devlin and Nasar, 1989; Gifford, Hine, Muller-Clemm, and Shaw, 2002). The way this gap has been explained is that environmental preference or architectural taste may vary according to the values of a professional body or group of people. In addition, Wilson (1996) proposed that architectural preference is *socialised*: using a longitudinal study the author showed how during the architectural training the students are taught what to like and thus establish a system for judging their preferences. As a result, it was clear that the students started with a set of environmental preferences that did not hold over time.

In other words, given the same environment people *may* use different frameworks for judging their aesthetic preference. For example, Gifford et al. (2002) showed that architects and laypeople do not use architectural cues in the same way. For example, architects associated originality of the stimuli with "*greater presence of metal cladding and the lack of landscaping*" (p. 143) whereas laypeople's ratings of originality were associated with rounded and ornamented buildings.

In order to acquire a firsthand perspective on the presentation of final design, in-depth interviews were undertaken with a selection of architects with practices in the city of Aberdeen. This qualitative approach was not intended to be a representative sample of the views of practising architects but an exploration of the thought and

action process of the way the architect extracts the needs of the client/end-user and the selection of presentation formats to communicate to them the final design.

Between these two main themes a number of issues were considered, including the reasons for favouring a given visualisation format, constraints for using alternative formats and the recurrent difficulties encountered while presenting design. The architects were also asked if they designed for their own aesthetic pleasure or in order to fulfil the client/end-user's requirements, as it is believed that this is the point at which some of the architect-laypeople gaps may be created.

2.5.1 SAMPLING PROCEDURE

A list of all chartered architects in Aberdeen City registered with the Royal Institute of British Architects (RIBA) was obtained from the RIBA website. This resulted in a list of 80 chartered architects in Aberdeen city working in 59 practices.

It must be emphasised that this study is an exploration of architects' communication of final design to lay audiences and not a representative study of how final design is communicated in architecture. As a result, only ten practices out of the 59 (17%) were randomly selected from the list and the leading architect was invited for interview via letter followed by a telephone call. Whenever a practice rejected the invitation, another practice was randomly selected from the list and approached in the same way. All interviews were arranged at the architect's convenience and took place in their offices, each lasting approximately 40 minutes. All architects signed a release form prior to the interview (see Appendix 1.1).

2.5.2 INTERVIEW PROCEDURE

There were nine questions in total and all were asked unless, during the course of the interview, it was completely evident that a question was being answered as a follow up to another one. The order of the questions presented here was generally adhered to but in some cases the flow of the interviews dictated a different order. The questions were:

1. In your everyday practice, how do you communicate the design to the client/end-user? (representation format)
2. Why do you use this method?
3. What problems have you encountered while using such methods?

4. What are your constraints for using other methods?
5. In your own view what are the ideal formats for the communication of design to a layperson?
6. How often do you use the/your ideal method for communicating design?
7. In your own view, what are the main difficulties your clients have had while visualising the new design?
8. When you design, how often do you imagine being the client/user? Do you design for the layperson or considering how they will understand it?
9. How do you try to envisage what it is like being your client?

2.5.3 CODING STRUCTURE

All interviews were transcribed and the data were analysed in QSR International's NVivo 7 software (2007). An example transcription is presented in Appendix 1.2. The qualitative content analysis followed the recommendations of Kelle (2005), who suggests that qualitative coding should account for both theoretical and emerging coding. The former refers to those structures that the researcher expects to find in the data based on the theoretical paradigm substantiating the inquiry. The latter alludes to the instances whereby patterns *emerge* from the data and need to be accounted for.

As part of this qualitative approach coding was split or grouped into *nodes* that followed a hierarchical structure described as the *coding tree*, each of these nodes thus referred to relevant structures directed by theoretical nodes.

The theoretical coding tree was based around the way architects communicate design to the client/end-user and the gaps found in the communication of design literature (see section 2.3). The initial coding tree was piloted in an interview with an architect who provided critical advice (this pilot interview does not form part of this study). This advice was weighted against the literature review and discussed with the supervisory team. The result of this iterative process resulted in a theoretical coding tree, shown in Figure 3, which could accommodate the possible answers to the interview questions.

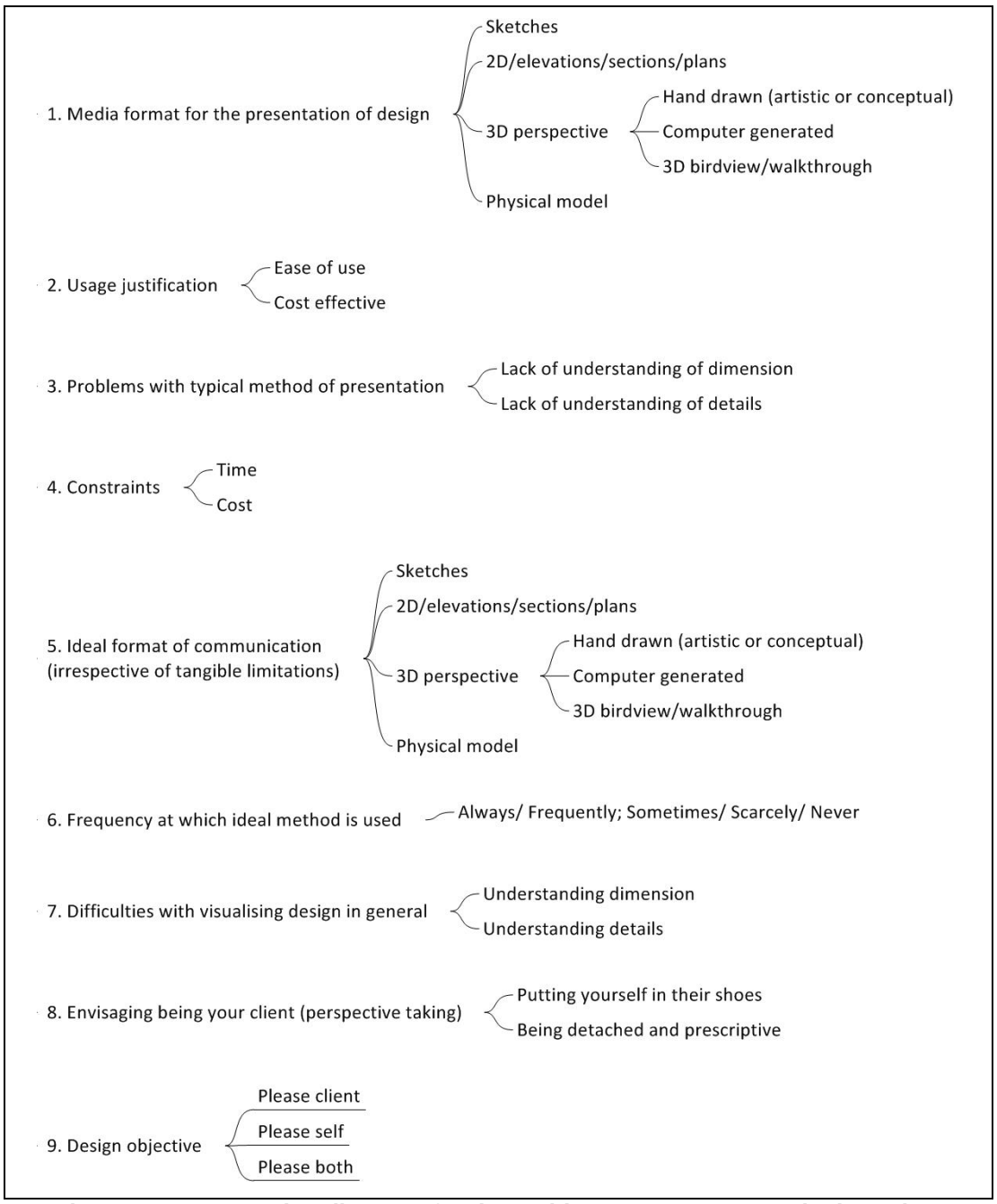

Figure 3. Suggested coding tree for the architect's responses to the interview questions.

Any issues that could not be explained by the theoretical nodes were coded as emergent nodes and later integrated into the analysis of the architects' interview responses.

2.5.4 RESULTS

The results are reported in the order that the questions were asked. The theoretical nodes are reported first, followed by the emergent nodes and a discussion as to how they complement the former.

2.5.4.1 Theoretical nodes

1. In your everyday practice, how do you communicate the design to the client/end-user? (representation format)

All interviewed architects used at least one of the media formats anticipated in the theoretical nodes to present their design to the client/end-user. However, not all architects used these formats in the same way. Eight of them used sketches, 2D drawings (elevations, sections, plans) and 3D computer generated renders (CGRs) to present design to the client/end-users on a regular basis. The only architect who does not use 2D visuals or sketches does so because he uses full visualisation in 3D; out of the two who do not use computer generated 3D, one does not like using it (i.e. prefers hand-drawn perspectives) and the other one does not require them as his clients demand 2D visuals only, exclusive of sketches, i.e. plans and elevations only. The least used media formats were physical models, hand-drawn 3D perspectives and 3D simulations. Table 1 shows a summary of the formats used by the interviewed architects. Format categories are not mutually exclusive.

	Format					
Architect id	***Sketches***	***2D elevations / sections plans***	***3D perspective hand-drawn***	***3D perspective computer generated***	***3D perspective simulation***	***Physical Model***
1	✓	✓		✓		
2	✓	✓	✓			✓
3	✓	✓	✓	✓	✓	✓
4				✓		
5	✓	✓		✓		
6	✓	✓	✓	✓		✓
7		✓				
8	✓	✓		✓		
9	✓	✓		✓		
10	✓	✓		✓	✓	

Table 1. Representation formats as used by the interviewed architects.

2. Why do you use this method?

The reasons behind the use of these visualisation methods were varied but could be categorised in the following way (categories are not mutually exclusive): *easy to use, aids the understanding of the design, cost effective, professional looking* and *inspires more creative thinking*. The first two categories mainly referred to sketches, 2D and 3D visualisations. The latter three were dependent on other factors such as

the scale of the project (small, medium or large), stage of the design process and the audience. In general, the rationale for using these methods was shaped by the skills learned as part of the architectural training and the common knowledge embedded in architectural practices: what normally works and what doesn't.

3. What problems have you encountered while using such methods?

In order to assess the effectiveness of their own formats for communication of design the architects were asked if they had encountered problems or recurring issues while presenting via those formats. Five architects had not found any problems; out of the five architects who did have problems three of them reported that the client/end-users did not understand the dimensions or the details of the design, and two of them found that people have difficulty understanding dimensions only.

This finding should be taken with caution as the architects were asked to answer this question as an *average* of their professional experience. In other words, sometimes the architect would present a design, encounter a problem and address it accordingly, thus raising concerns for false negatives regarding their answers.

4. What are your constraints for using other methods?

If architects have encountered some difficulties using their everyday methods for communicating design, why not use different ones? The architects' responses to this question showed a complex relationship between cost, time and the client.

Visualising design in sophisticated forms – 3D drawings, scale models and virtual environments – is resource intensive (both time and cost). These sophisticated visualisations were still regarded as an area of *expertise* that carries its own financial implications that the architect would not absorb as part of his or her fees. More specifically, the client and project – on a case-by-case basis – would usually dictate if the cost of visualising design would be justified; as a rule of thumb, the bigger the project, the more likely there will be a budget for high-end visualisations.

5. In your own view what are the ideal formats for the communication of design to a layperson?

It was assumed that regardless of what architects used in their everyday practice, architects would have an *ideal format* for communicating design to the layperson. This was a question detached from their business requirements as it was hypothesised that there would not be any financial or time constraints involved.

The architects reported that the ideal formats were 3D perspectives both CGR and hand-drawn, followed by the physical model, sketches, 3D simulations and 2D. However, it was clear that verbal communication was very important, for example:

> "*There is nothing that actually beats sitting down and talking to them face-to-face, verbal communication without a doubt*" (architect 1)

> "*most of it is visual in terms of drawings but a lot of it is also verbal, it's verbal it is …when I get a call from… a new prospective client I will go and meet them first of all, and find out exactly what I'm looking for…*" (architect 9)

Overall the ideal format for communicating design to the layperson was reported to be an iterative process based on a combination of visuals and communication with the client/end-user.

6. How often do you use the/your ideal method for communicating design?

There was a discrepancy between what architects described as the ideal formats and the frequency with which they actually used them. Two architects were not considered for this as they did not want to answer the question. Of the rest of the architects (n=8), four used it all of the time, two used it sometimes and two seldom used it.

The underpinning rationale for not using their ideal method for communicating design was the monetary implication of using such presentation formats, particularly the high-end physical model. Nevertheless, the architects conceded that this also depended on the strengths they possess as a practice and the way they operate, for example one practice relies on producing *working* physical models for their own understanding, and sometimes these were passed onto the client to generate discussion:

"*…It can be the crappiest model made out of cornflakes packets and you can have spent all nighters, days and days putting the presentation together, and if you just pull out the cardboard model and stick it on a table the whole meeting focuses on that and not the drawings, it's amazing. Because people can understand it …*" (architect 2)

One of the practices whose ideal format for presenting design was 3D visuals reported that as they became more skilled they started absorbing this *expertise*:

"*The sketch 3D stuff we are doing quite a lot now, we can do that in-house, few years ago we had to go external, now we can do it ourselves we use it a lot more*." (architect 4)

In general, computer generated 3D visuals seemed to be an element somehow detached from the process conducive to the final design:

"*The problem with 3D is, you can... it's not that easy then to convert into working drawings, you know. When we design, we start the design at the sketch design; we do it on the basis that we will develop that into, you know, as we go along, into a full set of working drawings. So all the detail is there to a fairly early stage, with 3D at the moment, it's almost like a standalone design package, and ok you can extract bits of information from it for 2D purposes but you still end up having to go to AutoCAD and do all the details (chuckles).*" (architect 3)

Nevertheless, another architect mentioned that using 3D computer models was not only easier and faster nowadays but also helped the design team resolve some issues with the design as they could visualise what and how things would be likely to work out on site:

"*I think it's becoming quicker to do, to create a 3D model, I think we are starting to see the benefit of it through the design process. That you can focus-in on the bits three dimensionally that are creating the problems in the design so you can address those earlier*" (architect 4)

7. In your own view, what are the main difficulties your clients have had while visualising the new design?

There was a clear consensus between all architects about the client/end-user's understanding of the visualisations, all architects (n=10) mentioned that the problem was one of dimensions or volume, that is: the translation or conversion from the visual representation to the real environment. Four of them also mentioned that the clients could not *perceive* the totality of the details of the design such as textures, materials and style of the elements. With respect to this, two of the architects mentioned that they would also use previous finished work as an aid to help clients visualise:

> "*...we can take the clients to previous buildings we've done, previous fittings. In the job I'm doing just now, we took them to two or three different things just so they can get a feel and see exactly what we can get. And I think that's a big help as well if you can take them to previous jobs you've worked on.*" (architect 5)

8. When you design, how often do you imagine being the client/user? Do you design for the layperson or considering how they will understand it?

With respect to whom the architects actually design for, results showed that all architects believe that design could serve both: they design for the client but also for themselves.

> "*...there's probably a little bit of both, no architect that is being honest doesn't say there isn't a little bit of ego and vanity into it, in somewhere. It shouldn't be all about you as the architect and your ego, it needs to be providing your clients with something.*" (architect 1)

Nevertheless, this was something that, according to two architects, is learned through experience:

> "*...you have to always think about your client and what they want, the more experience you get, the longer you are in the industry, the more you are going to realise. Maybe you start when you are newly, new graduated thinking, 80% should be you and 20% should be the client and you realise*

very quickly that it's the other way around you have to listen to what they want in the first place I think." (architect 5)

"*...Well, errr... I think to an extent it's a bit of all. I think when I first qualified I designed for my own pleasure, but you learn as you get older, and you learn to listen very carefully to your client and unless you do that you will get nowhere. Yet you hope to get out of it something for you as well, there's no question about that. But if a client wants a box, you either design a box or you say 'I'm not into designing boxes' basically, and then you walk away.*" (architect 3)

9. How do you try to envisage what it is like being your client?

The architects reported that they *read* their clients by asking them relevant questions, but some of them also reported interpreting the client's *image* as a whole (clothes, accent, aspirations, etcetera). It is important to highlight that this study only deals with the questions architects ask their clients; the architects' interpretation of their clients was not explored at length and it cannot be substantiated by the data.

The questions the architects ask their clients can be, at an abstract level, theoretically categorised as detached or personal, i.e. asking questions from a detached/prescriptive perspective or asking questions from a personal perspective. The former perspective implies that the architect suppresses his or her personal preferences in order to apply a professional judgement whereas the latter entails the positioning of the architect in the situation of his or her client and then making a judgement from that perspective[3].

Results showed that only three out of the ten architects actually try to envisage *what it is like being the client*; however, this also included the detached-prescriptive perspective that most interviewed architects took:

"*...we always go through the process of visiting the site, sitting with them going through of what they want, trying to understand why it is they are doing*

[3] By using this distinction the author wishes to convey that architects undertake two distinct ways of understanding the client/end-user, one dictated by their professional experience and education, and another one where the architect tries to take the perspective of the client/end-user. This does not imply that one perspective is better or superior than the other.

the project they are, meeting with everyone who is involved. ... Trying to see what the client has done before, find out what works for them, what doesn't. ... there are circumstances where we have to, as you say, try to put yourselves in their shoes and see what they are trying to get out of us, see what they've been doing as a client before and then give it our best." (architect 4)

The rest of the architects kept a detached perspective on the problem, or as one architect described it "with your architects' hat on", for example:

"*I would say that I don't actually place myself in their position other than a designer. And I think that this comes back to training that you are trained in many ways as an architect to look at all these things and consider all these things and consider the practicalities, ergonomically, in terms of space and use and everything else and ok, you are not actually putting yourself in their shoes you've designed it to be an efficient space and… but that's just basic design principles of being functional and various other things but I mean it depends, it really depends on the brief...*" (architect 6)

One architect made evident how the perspective-taking exercise may be dependent on the degree of familiarity with the project (thus how experienced the architect may be with a type of building):

"*… it comes through experience… you just through built-up knowledge could… instinctively know what's going to start working… so whether it's a house extension or whether it's a supermarket, or a hospital, or an airport or a hotel or whatever, of course you are using your personal experiences of those spaces to also inform that decision but then hopefully, your experiences are also informed by your training, so you are looking at space in a different way, and in a professional way… and that's your job so when you say 'I've never designed x, y or z' it doesn't actually matter, if you understand the building typology you can apply your architectural training onto that and… it takes somebody with an expertise like you… to come and analyse that and review it and you know therefore hopefully come up with a design that works for the client from the start so you are in their shoes from day one but at the same time also layering on top of that.*" (architect 2)

The responses to these questions, the theoretical nodes, adequately substantiated the initial enquiry of how architects present final design to the client/end-user. However, part of the architects' answers described other processes that merited the inclusion of emergent nodes. These will be described in the following section.

2.5.4.2 Emergent nodes

Upon asking the architects how often they try to imagine being their clients and how do they try to envisage being such (questions 8 and 9), it emerged that there is a *unit* for the time it takes to understand a client in a holistic way. This unit was measured in the number of meetings required before conceptual ideas about the project were *discussed*. This was coded under a node entitled *number of meetings*.

1. *Number of meetings*

According to the architects, in projects that could be considered normal or linear, there are up to three meetings before the architect can *read* the client and move onto the conceptual design stage:

> "*...so you usually get dialogue with the domestic client that lasts 2 or 3 visits and at that point you are ready to firm up the design and you go from there.*" (architect 7)

> "*... I would say that within the first two to three meetings with a client you will know how that client's mind operates.*" (architect 8)

> "*oh, well that depends on each job... I would say virtually every time that I meet a client initially, I'm… and I've already got the idea there that's already in my head, because that's just the way that my particular mindset would work.*" (architect 2)

> "*you can do that fairly quickly, that would be not uncommon at the first meeting so you can read your client, usually.*" (architect 10)

During these initial meetings the architect spends time probing what the potentials for the project would be. They would do so in a variety of ways but most of the architects talked about paying attention to the *emotional reactions* of their clients

when talking about design scenarios, elements or styles. This was the second emergent node and was coded under the node *emotional reactions*.

2. *Emotional reactions*

This emergent node applied to the way architects appraised how their design ideas were being accepted by the client/end-user:

> "*Public in general don't understand design but what they will do is they will look at a building and if it creates the correct emotion in them they will like it but if it creates a bad feeling they will instantly dislike it irrespective of how you actually arrived at that particular solution. They are looking at the end product and if they are happy with what they see then that's fine but if they are not they will blame the architect...*" (architect 8)

> "*... you talk them through the design... and you get a gut feeling almost immediately, people either get excited about something or don't."* (architect 7)

> "*… until you are actually, you are sitting with them and you can see how they react and how their body language is when they're are talking about it or I think you can gauge that much easier...*" (architect 1)

> "*... I don't think I have a clear strategy other than as I say, you learn to listen to people, that you also learn to read how people react to what you say. And if you kind of throw something into the pot and you see their eyes lighting up you think 'ah, I've got something here!' and I'll shoot that line. If you throw something into the pot and it's just no reaction, then you think 'oh well, I'll try something else' (chuckles)*." (architect 6)

The quotes illustrate how all of the interviewed architects explicitly voiced not having a defined structure to tackle their clients' needs. However, they all demonstrated that their strategy indeed consists of using the emotional reactions from their clients as the guides for the enquiry.

2.5.5 DISCUSSION

The theoretical nodes proposed for the analysis of the interview data were adequate but they did not account for the emergence of two nodes: *number of meetings* and *emotional reactions*. The inclusion of these two emerging nodes helped explain in more detail how the process of presenting design to and understanding of the client/end-user takes place, an overview of the nodes is given in Table 2.

Theoretical nodes	Emergent nodes
1. Representation format	
2. Usage justification	
3. Problems with typical method of presentation	1. Number of meetings
4. Constraints	
5. Ideal format of communication	
6. Frequency at which ideal method is used	
7. Difficulties with visualising design in general	2. Emotional reactions
8. Envisaging being your client (Perspective-taking)	
9. Design objective	

Table 2. Theoretical and emergent nodes for the analysis of presentation of design to the client/end-user.

There was evidence that the architects try to engage with the client at a clear level of communication with respect to his/her spatial requirements and mastery of the architectural language. The most common problem that architects reported dealing with was laypeople's lack of understanding of dimensions and details of the design. These problems are addressed throughout the iterations during the design process and the architects reported taking time to familiarise themselves with the client/end-user so that they can work together towards the design goal.

The architects reported having at their disposal a range of visualisation methods, from virtually cost-free (pen and paper sketches) to very sophisticated expensive ones (virtual simulations). This confirmed the findings from the literature review (Lawson, 1997; Thompson, 1999; Tunstall, 2006), but the findings from the interviews also highlighted that verbal communication with the client is seen as a central component of the understanding of the design. (Although it should be noted that this mainly referred to the case of domestic projects, where the communication between architect and client/end-user is direct and constant.)

Even though the architects try to use a variety of visualisation formats, the frequency with which they use their ideal method is usually outwith their control due

to monetary implications dictated by the particular visualisation format. Nevertheless, as the cost of visualisation keeps reducing, and architectural education includes 3D visualisation training as a standard subject, this could change in the near future.

The architects interviewed in this study saw the design objective as a collaborative effort between client/end-user and themselves. That is, they would set out to please or fulfil the clients' requirements whilst satisfying some of their personal design preferences. Interestingly, when it comes to the efforts of the architect to understand or operationalise the client/end-users' requirements a potential problem was unearthed: the majority of the architects deal with these from a detached and prescriptive perspective influenced by their professional training, or quoting one of the architects *"…[with the] architect's hat on: What would you do in architecture here?, What's right?, What's right for the site?, What's right for the building?, What's right for the brief?"*. Thus, a tension exists between who they design for and how they do so.

This way of approaching projects is then exacerbated by the fact that, in the particular case of commercial architecture, the architect is not speaking to the end user but with an intermediary. Thus the chances of understanding the requirements from an experiential, self-referential perspective are unlikely. This may help explain why people sometimes feel alienated from the end product of commercial architecture (e.g. Gifford, et al., 2002).

With respect to the emergent nodes, the architects talked about the 'time it takes' to propose design scenarios to a client. Although this is dependent on the size of the project, it generally takes up to three meetings from the introduction of the parties. The architects also talked about having a *strategy* whereby they evaluated their design propositions based on the *emotional* reaction of their clients, i.e. a *positive* reaction from the client towards one of the concepts is pursued whereas a *negative* response indicates to them that the idea should not be pursued and alternative design scenarios explored instead.

2.6 CHAPTER SUMMARY

With respect to the focus of this work, the presentation of final design to the end-user, the interviews with the architects pointed out a major issue: unless the

client/end-user has been involved in the process from the beginning it is unlikely that the understanding of the design will be straightforward. The interviews also highlighted that it would be very unlikely for the architects to present final design to somebody who has not been involved in the process unless they are dealing with commercial architecture, as this thesis does. As explained in section 2.2, in commercial architecture the client/end-user and the architect are not in direct communication, they use a 'mediator', e.g. in the form of an Estates Department or a liaison company with expertise in the field.

The interviews showed that the majority of the architects' examples refer to the design process only with the domestic client where communication is regular and direct. Yet only a minority of people in general have the opportunity to actually be part of the design process: most people rely on intermediaries, and, as such, are being presented with design decisions outwith their control or knowledge, as these would have been taken during the design process had they been involved.

In brief, the data confirmed the representation formats for communication of design found in the literature review. There were, however, differences in the approach to using these visual formats depending on the practices and the project at hand. In general, the architects reported that verbal communication with the client/end-user is a strategy that runs in parallel to the use of visualisation formats to communicate the design, but it was stressed this refers to domestic architecture.

The architects in this study reported that they do not normally take the perspective of the client/end-user but that they apply their training knowledge in a more prescriptive/detached way. The data also showed two emergent themes, one concerning the time architects spend *understanding* the client/end-user before they start proposing design scenarios: they generally take up to three meetings. The second emergent theme described the process that architects use to *read* their client/end-user: the architects try to get an understanding of their client based on their emotional reactions to the proposed design scenarios, they know that emotion matters, yet in commercial architecture they have no access to this reaction as contact with the client/end-user is rare.

In order to explore these issues further this thesis will focus on how people relate to computer visualisations of final design in the particular scenario where they, as client/end-users, have not been involved with the process from the onset. Are

computer visualisations treated as plausible prospective scenarios or are they seen as computer generated images bearing little or no resemblance to the real world?

Another area dealt with in this thesis is the study of how effective visualisations are in predicting future responses. On the one hand, it will test the reliability of prospective preferences and emotional responses. On the other hand, it will test what the environmental preference and emotional consequences of asking people to remain detached are – the former being a process similar to that which architects carry out when they design.

Before these issues are studied, Chapter 3 provides an overview of the key concepts relevant to this thesis for the study of environmental preference, namely emotion, cognition, attention and perspective-taking.

CHAPTER 3. THE INFLUENCES ON ENVIRONMENTAL PREFERENCE

Chapter 2 showed how, at the point at which final design is evaluated, it has already been tested in a number of ways, mainly by the architect but also by criteria for the realisation of the project, for example, construction standards, health and safety regulations. As a rule of thumb, as reported in the interviews with the architects, it is expected that environments are designed to be liked, or at least acceptable to their occupants and users.

During the presentation of final design – which is one of the instances in which an environmental evaluation can take place – there are a number of factors that could explain people's preference for it.

3.1 ENVIRONMENTAL PREFERENCE AND ENVIRONMENTAL PSYCHOLOGY

The phenomenon of environmental preference has been at the core of Environmental Psychology ever since it was established as a field (e.g. Wohlwill, 1970) given that it centres itself in the relationships between people and their environment. Broadly described, environmental preference can be partly explained by how the person perceives the design elements or attributes of an environment (e.g. illumination, materials, furnishings) and partly by intrinsic factors affecting the person evaluating the environment (e.g. mood). The way this can be evaluated is via visual representations or in-situ.

There have been different emphases within environmental preference research. Kaplan (1987) noted that the experimental study of aesthetics, one aspect of preference, was dominated for over 20 years by variables based on an informational dimension, mainly guided by Berlyne's collative variables. Berlyne (1960) postulated that people do not perceive the world inferred or taken from single, isolated dimensions. For Berlyne, stimuli could be defined by their collative properties, that is, the combined result of each stimulus' properties: novelty, uncertainty, conflict and complexity.

> *Novelty* is defined as anything new in the subject's experience. It is closely related to the generally understood meaning of the word, as in something new.

Uncertainty refers to the expectation or likelihood that an event has of occurring. The less that is known about the actual outcome of an event, the more the uncertainty.

Conflict is the situation in which the expectation of an event is not the outcome. It is a discrepancy between *a priori* and *a posteriori* states.

Complexity refers to a more tangible characteristic inherent to the stimuli, more specifically: what the stimulus consists of. In other words, it is the class or classes of objects, which should be identified in order to understand the stimulus.

These concepts were developed from results of abstract stimuli experimentation and as research expanded onto more ecologically valid stimuli, for example Wohlwill's (1968) study of works of art and outdoor environments, the field reconceptualised the initial concepts to expand their scope. For example, the concept of c*omplexity* changed from one referring to the physical properties of the generated stimuli to the perceived complexity of the environment in a simple-to-complex continuum (e.g. Stamps, 2004).

Overall, the investigation of environmental preferences has a number of theoretical and practical consequences. First, knowing what people tend to like or dislike aids the development of viable built environments. Second, informational variables can be prospectively used as predictors of preference, i.e. before the proposed environment is built or occupied. Finally, environmental preference provides a window to understanding *why* some environments are approached or avoided, thus helping the understanding of the psychological process involved in the choices.

Alongside research based on informational variables there have been other lines of research that explain people's environmental preferences. These have focused on aspects that are less attribute-based and more centred on the psychological processes of the person performing the evaluation, i.e. the foci is put on the concurrent processes affecting people's environmental choices. For example, Staats and Hartig (2004) studied the social influences of visiting urban and natural environments alone or accompanied, they found that having company increased preference for the urban but not for the natural environment.

As this thesis focuses on the presentation of final design to lay audiences, whether a representation or an existing simile, some of the influences affecting preference must be accounted for. More importantly, the environmental evaluation of final design is not strictly testing for preference, as the environments are not realised yet. It is therefore testing for *prospective* preference: the responses to the proposed environments.

Most research on environmental preference studies people's responses to real environments whether in situ or through a representation, namely a photograph. Although there are clear connections between the rationale of traditional evaluations testing for environmental preference and testing for *prospective* preference there is one subtle difference: the former explores an aesthetic response at large, the latter explores the responses to a situation that can have real consequences, e.g. buying a property, moving office, finding an environment to take a stroll, etc. From an environmental evaluation point of view, this means that the evaluated environments not only have to cover an aesthetic standard but can also serve the envisaged purpose for which the environment is being designed.

Given this, the presentation of final design faces strengthened self-serving biases on behalf of the person doing the evaluation, in this case the client/end-user. This thesis argues that this can result in two different processes, one where the person evaluates the aesthetic properties of the stimulus (preference) and another where the person takes these properties into account whilst projecting him or herself into the prospects of being or functioning in such an environment.

Therefore, to what do people pay attention when evaluating an environment? In other words, when people are asked to judge an environment (existing or prospective), are they evaluating only the aesthetic properties or are they also evaluating the purpose of the environment and context from where the evaluation is starting? In the following sections this thesis will explore three constructs that are considered important in environmental preference: attention, perspective-taking and mood.

The study of emotional phenomena, or the mood people are in, and people's emotional reactions to stimuli may help clarify (a) the link between aesthetics and affect and (b) how people are influenced by their own emotions during an environmental evaluation. Section 3.2 will cover the emotional phenomena this thesis deals with as well as some of the research that substantiates this enquiry.

The second construct explored here is the attention mechanism. The person evaluating the prospective preference for an environment that is likely to have consequences on his or her life is not only assessing the aesthetic properties of the stimulus: his or her attention is also being affected by the purpose of the evaluation. Overall the field of attention deals with two main attention modes, voluntary attention (controlled by the user) and involuntary attention (demanded, perceptually, by the environment), unless otherwise specified the use of the word attention refers to directed attention. Section 3.3 describes the attention mechanism and research examples are highlighted in order to show how attention shifts induced via instructions may affect environmental preference.

In order to study the effects of attentional shifts the thesis makes use of a third construct described in section 3.4: perspective-taking. Perspective-taking is the process where people are asked to to consider a situation and judge its relative importance during a task. Previously, perspective-taking has been used in empathy and social cooperation research on the rationale that taking the perspective of the *other* reduces self-serving biases (e.g. Batson, Lishner, Carpenter, Dulin, Harjusola-Webb et al., 2003; Galinsky, Ku and Wang, 2005). In this thesis these experimental manipulations are used to test what would happen to environmental preference when participants are asked to take a perspective other than the standard *self* perspective taken in the majority of environmental preference research, e.g. a detached or other perspective (see section 3.4 for details).

3.2 EMOTION

This thesis argues that emotion may play an important role in environmental preference (also studied under aesthetics or environmental aesthetics, see Wohlwill, 1976). The potential link between emotion and environmental preference has been identified by previous researchers (this will be described in more detail in section 3.2.2). For example, Nasar (1981) found that for a sample of 'elderly public housing residents' (n=57) "*increments in affect*" (p. 310) were associated with increases in uniformity, dullness, organisation and openness. Similarly, Russell and Snodgrass (1987) suggested that research efforts should concentrate on the people-environment *emotional* relationship or the *affective* quality of environments as this influences the way people would *perceive* them.

In other words, what the research suggests is that the link between people and environments includes an emotional component. Thus, the next section will describe what emotion encompasses, how it is dealt with in this thesis and its role in environmental preference.

3.2.1 WHAT IS EMOTION?

Defining emotion perhaps represents one of the longest running and still unfinished debates in Psychology. The ongoing nature of the debate rests on the fact that when it comes to emotion research there is low agreement between different approaches on its origins and expression.

Historically, the field has been divided into those who propose that emotions have their basis in physiological phenomena and, those who propose that emotions are rooted in cognitive processes. The former believe that a necessary condition of emotions is in its physiological mechanisms (e.g. Burbridge, Larsen and Barch, 2005; Cacioppo and Gardner, 1999; Wiens, Mezzacappa and Katkin, 2000) and the latter believe that cognition is necessary to actually demonstrate that an emotion has occurred (e.g. Lazarus, 1982; Schachter and Singer, 1962).

Such division has been a response to the way emotions are studied, i.e. whether the measurement of emotion is at the physiological or the cognitive level. For example, the study of the changes in the participants' nervous system or studying participants' reports of a given emotion. More recently, consensus is growing towards accepting both (physiology and cognition) as equally important dimensions of the same complex phenomenon (e.g. Barrett, Mesquita, Ochsner and Gross, 2007; Britton, Taylor, Berridge, Mikels and Liberzon, 2006).

More importantly, the research literature on emotion is characterised by low agreement between researchers on a set of discrete terms defining emotional phenomena, raising the issue of a multitude of terms that are used somewhat interchangeably. As shown in the beginning of section 3.2, different words are used to talk about emotion, for example affect and feelings.

In order to tackle this vagueness it is necessary to distinguish what is meant by emotion (Russell and Barret, 1999). Following the main trends in the field (see Barrett, 2006; Cacioppo and Gardner, 1999; Cannon, 1927; Dewey 1894, 1895; Gendolla, 2000; Gray, 1935; Griffiths, 1990, 2004; James, 1884; Lazarus, 1982;

Reisenzein, 1983; Russell and Mehrabian, 1977; Russell and Snodgrass, 1987; Schachter and Singer, 1962; Washburn, 1927) this thesis will categorise emotional phenomena into basic or prototypical emotions, affective appraisals and mood.

3.2.1.1 Basic emotions

To date the vast majority of research on emotion has been driven by a "natural kind" view of emotion (Barrett, 2006). A natural kind is a philosophical concept which describes a collection of things that are all the same, the things may (or may not) look the same but they are equivalent in a natural way. That is: "*a natural kind is a nonarbitrary grouping of instances that occur in the world. This grouping, or category, is given by nature and is discovered, not created, by the human mind*" (Barrett, 2006, p. 2). There are two main ways of confirming natural-kind categories: they should be a cluster of observable properties and have a causal mechanism.

In the emotion literature this (natural kind) is known as basic emotions or prototypical emotions: those emotions which are claimed to be universal and discrete in their underlying physiology and behavioural expression. By universal it is meant that any basic emotion should be able to be corroborated by different people from different cultures, who speak different languages, etcetera. In turn, by discrete is meant that there are distinctive physiological and behavioural mechanisms involved in different basic emotions.

Basic or prototypical emotions are also claimed to be a biologically prescribed and automated response triggered by some event or object. It is automated because it occurs without awareness of other factors (cognition, reflexion). It is biologically prescribed because it is assumed to be hardwired at birth or to be part of a species' behavioural repertoire (e.g. Cosmides and Tooby, 2000).

In sum, basic or prototypical emotions are: universal, automated, distinctive, homologous in other animals (at least primates) and should serve some adaptative advantage (or be a by-product of the evolution process) (e.g. Ekman, 1999). As such, in their strict sense, basic or prototypical emotions fall outside the focus of this thesis.

3.2.1.2 Affective appraisals

The task of assessing how one feels or the emotional or affective quality of something is defined as an affective appraisal. It is an aspect of how someone interprets available information, they are judgements about something: it is an attribution. Affective appraisals *assume* the physiology accompanying the appraisal at the time that it is expressed or reported by the individual.

Affective appraisals have their theoretical underpinning in the concept of cognitive appraisal. A cognitive appraisal is an evaluation of the significance of something in relationship to the self, that is, how the events taking place in the world are evaluated from a personal perspective. A cognitive appraisal does not focus on the properties of the appraised event (s) but on how events are interpreted by the individual. The events can range from abstract, hypothetical examples to real-life situations and can deal with as varied topics as attitudes, emotions, goals, activities, beliefs, plans, etcetera.

The origins of the cognitive appraisal can be traced back to an experiment by Schachter and Singer in 1962 (Colman, 2006), which will be briefly explained in the following paragraphs. The Schachter and Singer (1962) theory of emotion postulates that emotions are the result of an interaction between a state of physiological arousal and cognitions derived from the situation[4]. Schachter and Singer designed a study in which participants were given injections of saline (placebo) or adrenaline solutions with either correct or incorrect information about the expected effects and then were placed in one of two situations expected to arouse either *euphoria* or *anger* through experimental confederates.

The results of this study led them to the following propositions: first, "*given a state of physiological arousal for which an individual has no immediate explanation, he [sic] will label this state and describe his [sic] feelings in terms of the cognitions available to him [sic]*" (Schachter and Singer, 1962, p. 398); second, if there is a completely appropriate explanation of a state of physiological arousal in a given situation, there will be no emotional reaction and; third, given the same cognitive

[4] The reader is reminded that this classic study takes place at a time where the study of emotion is heavily polarised between physiological and cognitive accounts. Such emphasis, as described in section 3.2.1, was eventually toned down and a complementary or unified view and study of emotions is gaining momentum again.

circumstances an individual will react emotionally or describe the feelings as emotions only to the extent that there is a state of physiological arousal.

The Schachter and Singer (1962) study could be described as a trigger for a different way of conceptualising emotion: an approach reliant on the cognitions or appraisals that people have about their emotions or feelings.

3.2.1.2.1 The three-factor model of emotions

Within this line of reasoning, Russell and Mehrabian (1977) attempted to map out a way of defining all affective or emotional states. For Russell and Mehrabian the understanding of emotions can only be achieved through the identification and description of "*those dimensions that are both necessary and sufficient to define all emotional states*" (p. 273). Their work was based on Osgood, Suci and Tannenbaum's (1957) semantic differential studies, hence it is reliant on the cognition mediating the labelling of the experienced state. In this approach it is absolutely clear that all reported emotional states are cognitively mediated, furthermore, the theory relies on the assumption that verbal reports have a physiological substratum.

The main contribution of Russell and Mehrabian's (1977) study is the proposition of a well-delimited theory of emotions based on the workings of three independent and bipolar dimensions (pleasure-displeasure, arousal-sleepiness and dominance-submissiveness). The selection of these dimensions was based on two criteria: (a) independency of scores: changes in one factor do not correlate or cause the other and (b) bipolarity of constructs insofar that each of the dimensions (pleasure-displeasure, arousal-sleepiness and dominance-submissiveness) can be described in continuums representing clear opposite states, ranging from the most overpowering ecstasy, alertness and feelings of total control to the worst pain, sleepiness and feelings of total lack of control.

In order to test their ideas, Russell and Mehrabian (1977) used two separate but convergent studies. In the first study 200 participants were induced to two different emotional situations via written instructions. Participants had to read the description of a situation (one at the time, from a pool of 200 situations), and then report their emotional experience using a variety of related but distinct scales. With this experiment they put to test whether there were interrelationships between emotional state descriptors amongst different scales.

The results of their first study showed that the verbal reports of emotion states can be highly reliable and that there was a considerable overlap even between scales supposed to measure different things. Furthermore the results confirmed that the three factors not only have good explanatory power but also are especially important in distinguishing between certain emotions. For example, emotions such as anger, hostility, fear, and tension share low pleasure and moderate to high arousal. The only way to tell them apart is by the dominance-submissiveness scores; the former two are described by feelings of dominance whereas the latter are characterised by feelings of loss of control.

In order to study emotion as a clearer phenomenon, without the induction of emotion-eliciting situations, Russell and Mehrabian asked participants to define emotion-denoting terms using the three factor structure in semantic differential-type format[5]. In this second study 300 participants were asked to rate as many terms as possible, within a fixed amount of time, from a set of 151 terms on the three factors using a 9-point semantic differential-type scale. Participants were instructed to describe "*what it is like when you feel _X_*" for each emotion on the list selected at random. In order to provide reliable data at least 29 people rated the same 20 terms.

The results from the second study confirmed some of the findings from the first study. Eighteen scales from study one were successfully described via the three factor structure on study two, these were: happiness, aroused, vigorous, angry, fearful, depressed, interested, elated, concentrating, egotistical, enjoyment, disgusted, hostile, contemptuous, sceptical, shy, guilty and sad. Nineteen of the remainder 24 scales from study one were only partially replicated in study two given that the equations followed the same direction but did not attain significance in all three factors. Finally, five of the 42 scales were discrepant in between studies, these emotion states were: friendly, affectionate, aggression, anxious and distress.

These three dimensions have also been used to study the affective appraisals of environments. For example, in a series of studies Russell and colleagues (Russell

[5] The semantic differential measures people's reactions to stimuli by asking them to rate their responses on scales whose end-points are bipolar. For example, happiness or feeling happy is operationalised by asking people to rate the extent to which (from completely to not at all) a person feels happy or by asking people to rate how they feel on a scale ranging from sad to happy.

and Pratt, 1980; Russell, Ward and Pratt, 1981; Russell and Lanius, 1984) showed that, just like in the emotion states, the affective appraisal of environments can be defined by three bipolar dimensions: pleasure, arousal and dominance. These dimensions are operationalised around the semantic differential evidence but have also been replicated using a pictorial form of measurement (see the Self Assessment Manikin (SAM) (Lang, 1980, in Lang, Bradley and Cuthbert, 2005) see section 3.2.3 for further details).

In sum, this theory proposes that all emotions could be adequately described using three dimensions: pleasure, arousal and dominance. The theory also considers that a person is in some emotional state at all times (assuming the physiology of the emotion through its verbal expression), where an emotional state is described as "*a region within a three-dimensional space*" (Russell and Mehrabian, 1977, p. 274). More importantly, the three dimensions used to describe emotion can also be used to appraise the ability that other stimuli (e.g. environments) have to alter emotion.

3.2.1.2.2 Lazarus' theory of emotion

Lazarus (1982) noted that emotion and cognition are not only related but that any behavioural response is cognitively motivated. He establishes a causal link between cognition and emotion: "*cognitive activity is a necessary as well as sufficient condition of emotion*" (p. 1). Lazarus stretches the concept as described by Russell and Mehrabian to the point at which the cognitive act can induce emotion. Lazarus defines his theoretical position as a variant of the theories of emotion based on the concept of cognitive appraisal. The concept deals specifically with the mediation of emotions through cognition. In this sense, any emotional response is mediated by a cognitive evaluation of the situation at stake in that specific time and space.

The theory works on the basis that the organism can recognise information in the stimulus, process and respond to it (appraisal). This postulation would appear to leave little or no room for novel stimuli (in which previous or no knowledge/experience has been acquired); however, Lazarus explains that complete information is not necessary to emotionally react to meaning, incomplete information can trigger reactions and this, in fact, is how most ordinary transactions occur. Therefore, this theoretical position allows for meaning derived from incomplete information as well as from *clearly articulated* and thorough processes.

It is clear that appraisal theories enter the domain of meaning, it would not be possible to study cognitive appraisals of emotions otherwise, as the same set of stimuli in different contexts may lead to different appraisals. Thus, Lazarus explicitly accepts and starts from the fact that "*humans are meaning-oriented, meaning-creating creatures who constantly evaluate events from the perspective of their well-being and react emotionally to some of these evaluations*" (pp 2). This proposition holds true since it will rarely be the case that, evolutionary and biologically speaking (e.g. Bereczkei, 2000; Cosmides and Tooby, 2000) a typical healthy organism pursues its own doom.

In brief, Lazarus' theory of emotion postulates that cognition is different to rationality, reflection and awareness, and also that humans and their environment are always intrinsically related. On the one hand, by saying that cognition is not rationality, reflection and awareness Lazarus means that for cognition to exist it is not necessary that the person is fully aware or conscious of the possible outcomes of his/her response (or lack of) and that this process does not have to be a thorough and lengthy one. On the other hand, his proposed view is aligned with Environmental Psychology as to how environment and people are always related (Gifford, 2007; Proshansky, 1976; Uzzell and Räthzel, 2009; Wohlwill, 1970).

Up to this point basic or prototypical emotions and affective appraisals have been described. In spite of their conceptual differences both terms share the peculiarity of being a *snapshot* in time with respect to the emotional phenomena under scrutiny. Basic or prototypical emotions deal with complex causal mechanisms whereas affective appraisals focus on how people make sense of the information available to them at a particular time. Thus, how are pervasive or long-lasting emotions described?

3.2.1.3 Mood

While basic or prototypical emotions and affective appraisals are relatively straightforward, moods on the other hand present the challenge of having an undefined aetiology, i.e. they are a state of being and they have "no object or a quasi object" (Russell, 2003, p. 147). The term mood, also referred to as affect (Watson and Tellegen, 1985), affective state (Russell, 1980), core affect (Russell and Barrett, 1999) and commonly referred to as feeling, is reserved for those emotional phenomena that are less specific (do not necessarily follow universal

expression like the basic or prototypical emotions) and as such cannot be easily appraised.

Mood is also characterised by its pervasiveness and, since it is a state of being, the individual is always considered to be in some mood, for example: I feel happy, sad, tense, excited. The way moods have been studied has primarily relied on self-report using adjective lists, these lists either have scale properties or are being tested for their factor structure. Part of the mood research literature centres on the structure that mood or affect can take, for example Russell (1980) argued for a "*circumplex model of affect*" where affective concepts fall into a circle at every 45º rotation of the axis, thus facing its affective opposite, see Figure 4.

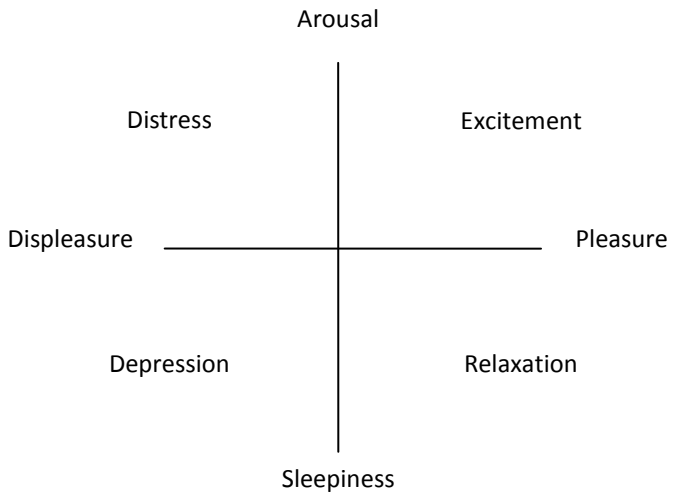

Figure 4. The circumplex model of affect.

In terms of parsimony, the circumplex can be further explained in terms of both pleasure and activity dimensions, in other words, affect can be explained in terms of two bipolar dimensions (Russell, 1999). This is consistent with other theorists in the field, for example Sjoberg, Svensson, and Persson (1979) argued for a two-dimensional description of mood based on a pleasure and activity dimensions and Watson, Clark, and Tellegen (1988) pointed out that the most dominant dimensions that consistently emerge from studies of self-rated mood states and multidimensional scaling of facial expressions or mood terms is that of a two factor model of emotion states: positive affect and negative affect.

In Watson et al.'s (1988) terms, Positive Affect (PA) "*reflects the extent to which a person feels enthusiastic, active, and alert. High PA is a state of high energy, full concentration, and pleasurable engagement, whereas low PA is characterized by*

sadness and lethargy" (p. 1063). In contrast, Negative Affect (NA) "*is a general dimension of subjective distress and unpleasurable engagement that subsumes a variety of aversive mood states…*" (p. 1063). High NA indicates a state of distress whereas low NA reflects a state of calmness and serenity.

It is important to point out that even though moods are pervasive states of being, they are not so much that they can be considered personal dispositions or traits[6] (e.g. Lazarus, 1991; Russell and Snodgrass, 1987). Nevertheless, these two factors do relate to trait dimensions of positive and negative emotionality: moods are not traits but they can have trait-like properties (e.g. Tellegen, 1985 in Watson et al., 1988; Watson and Clark, 1984). Thus, the value in considering moods resides in the wide impact they may have in cognitive processes, behaviour and well-being in general (e.g. Gendolla, 2000; Knez, 1995; Stokols, 2001).

Furthermore, research findings from the field of Personality show that Positive and Negative Affect relate to what is described as General Activation Systems of Affect (Watson, Wiese, Vaidya and Tellegen, 1999). These constructs are believed to be the underpinning mechanisms of broader bio-behavioural systems.

In behavioural terms, the Positive Activation System is in charge of those behaviours directed at the attainment of pleasure or reward, whereas the Negative Activation System is in charge of those behaviours in charge of keeping the organism out of trouble (see Carver and White (1994) and their Behavioural Inhibition System (BIS) and Behavioural Activation System (BAS) scales for a similar proposition based on motivational systems).

Having described what is meant by emotion, the next section reviews the literature on using emotional phenomena in the study of environmental preference.

3.2.2 EMOTION AND THE PROCESS OF ENVIRONMENTAL PREFERENCE

Section 3.2.1 has emphasised the characteristics of emotional phenomena. Whether they have an object or not, emotions have been consistently shown to have a ubiquitous nature: they permeate all instances of life experience. Evidence is

[6] A trait can be defined as a more or less consistent pattern of behaviour that distinguishes a person (e.g. Colman, 2006; Lazarus, 1991)

slowly growing as to what emotional phenomena can explain with respect to environmental preferences. What evidence has been produced for the links between emotions and environmental preference?

In a review on the relationships between emotion and environment, Russell and Snodgrass (1987) discuss how the study of emotion within Environmental Psychology had largely been overlooked and as a result of this the field was still uncharted. The way they see emotion and environment could be plotted along a timeline in which it is possible to study the relationship before arriving at the environment, while in the environment and after experiencing the environment. In other words, the division accounts for expectations about the environment, how the expectations are or are not fulfilled and the possible after-effects as the result of the interaction with such environment in emotional terms.

Broadly, what Russell and Snodgrass (1987) argue is that expectations about an environment, their fulfilment (or lack of) and the experience in itself have an emotional component. Moreover, this emotional component can influence the person either before it happens, as it is happening or have a lasting effect. Above all, it is this emotional or affective quality that defines our relationships with the environment. The article by Russell and Snodgrass sets a milestone in the study of emotion and environment by setting the theoretical importance and boundaries of such studies but also gathering information from other areas that supported this perspective.

One of the few studies prior to Russell and Snodgrass' (1987) explicit call for more emotion-environment studies was done by Gifford in 1980. He showed that people in a more pleasant pre-experimental mood rated colour photographs of "*everyday public building interiors*" (p. 386) as more pleasant during the experiment. Another related example is that of Csikszentmihalyi and Rochberg-Halton (1981, as cited in Russell and Snodgrass, 1987, p. 264) who carried out extensive interviews with 351 residents of Chicago "on meaning of things" that people had in their homes; the most interesting finding was a recurring theme in which meaningful objects (things) were those linked to emotional phenomena. Such findings strongly suggest that the emotional qualities of an environment should not be overlooked during environmental preference.

The findings within the informational variants of environmental preference indicate that environments which tend to be preferred, besides having balanced

combinations of information such as arousal, complexity, mystery, legibility, etcetera, are also clean environments, have a degree of ornamentation, are uncluttered, have an open view, good illumination, etcetera (e.g. Kaplan, 1977; Kaplan, Kaplan and Brown, 1989; Lyons, 1983; Nasar, 1983). Given these, then it is plausible to theorise that preferred environments do not demand too much attention, are easy to understand and easy to move about in, in other words, such environments tend to promote well-being in a general overarching way.

Given the properties of preferred environments it would be safe to assume that people's favourite environments will possess a similar structure to that shown across different studies on environmental preference. To this effect Korpela (1989) put to test the hypothesis that favourite places[7] are potentially used as regulators of psychic states; he found that indeed, the physical environment (favourite places) are connected to psychic self-regulation, this is, favourite places allow the individual to de-stress and re-gain coherence through experiences of freedom of expression, feelings of pleasure, familiarity and belongingness.

In 2003 Korpela studied the properties of people's favourite and unpleasant places while screening for mood. Favourite places were coded into distinctive categories from the data generated. These were: natural places, built recreation areas, residential places and other places (mainly commercial). The results showed that people with high negative mood (stress, loneliness, anxiety, etcetera) were more likely to choose natural favourite places than any other place; whereas people with low negative mood (good enthusiastic mood, need to go out, need for exercise, etcetera) were more likely to choose residential places first, natural places second and other places third (ranked according to percentages). Overall, people with high negative mood in comparison with other people seem to be able to recognise physical environments that help them improve their mood.

Mealey and Theis (1995) showed how pre-experimental moods correlated with landscape preference for different landscapes depending on the content of the images shown. In their study, participants were asked to report their mood prior to a

[7] The author wishes to acknowledge that there are conceptual differences amongst the terms environment and place. The former tends to be limited to the physical properties of the environment and the latter is normally related to the experience of the combination of behaviours, meanings and physical properties (Canter, 1977). The occasional shifts in terminology reflect the origin of the sources consulted and not the author's subscription to a theoretical perspective.

choice experiment with the aim of selecting the photographs they 'liked best'. They found that: positive mood correlated with scenes whose content was rated as high in prospect and negative mood correlated with scenes whose content was rated as high in refuge[8]. The results from this experiment add to the body of evidence that not only can informational variables account for environmental preference but other variables may be equally explanatory, i.e. emotional phenomena.

However, in contrast to the previous findings, Regan and Horn (2005) found that mood only partially moderated preferences for natural environments. That is, theoretical perspectives on the restorative properties of natural environments suggest that distressed moods would be associated with a preference for nature (as nature has been claimed to have restorative properties that may significantly reduce stress, see Kaplan, 1973; Hartig, Mang and Evans, 1991) but this was not the case in their study. Their results showed that contrary to the expectations, relaxed mood produced a greater percentage of nature preferences than stressed mood.

The evidence presented here shows how emotional phenomena could have a significant impact on preference. Research on environmental preference serves different purposes depending on the context in which it is used. For example in the fields of Planning and Design it helps both designers and decision-makers make educated guesses as to what is relevant for a new development or a refurbishment of an existing area. In the context of environmental psychology it is important to understand how people relate affectively to a given environment.

Furthermore, from a behavioural perspective emotions by and large (as explained in section 3.2.1) serve a clear purpose which ultimately aids the organism to preserve its well-being. In evolutionary terms, they serve the function of survival. For example, if a person visits an environment which poses significant detriment to his/her well-being more often than not a response will act on this and seek a betterment of the situation (whatever this may be), but ultimately this will depend on the affective appraisal at the time.

[8] Prospect is the characteristic of a view that allows for an overall grand view of the landscape. Refuge is defined as the having a place to hide: being able to see without being seen. Both concepts were defined by Appleton (1975) in his book The Experience of Landscape.

3.2.3 SECTION SUMMARY

This section has described emotional phenomena, its major subdivisions and the basic assumptions of the field. It also described some of the work that has taken place in environmental psychology with respect to emotion, namely the interactions between mood and preference and the affective appraisals of environments. Evidence show that the mood people are in at the time of environmental evaluation can have consequences for their environmental preference and there are theoretical reasons to believe that this is also related to the affective appraisal of such environments.

As stated in section 3.2.1, this thesis will only deal with emotional phenomena in the form of affective appraisals and mood. These will be measured in the following way:

- *Affective appraisals*. These will also be referred to as emotional reactions to the environment and are considered to be the first subjective responses participants have upon seeing the stimuli. They will be presented to participants in the form of semantic differentials in a format similar to "please imagine you are in this environment, how does this environment make you feel?" (see Pedersen, 1978; Russell and Pratt, 1980; Russell, Ward and Pratt, 1981; Kaplan and Kaplan, 1989; Bradley and Lang, 1994; Imamoglu, 2000; Lang, 1980, in Lang et al., 2005; Lang et al., 2005; Craig, Conniff and Galan-Diaz, 2008).

  In Study 5, chapter 7, the appraisals will be measured using the Self Assessment Manikin (SAM) (Lang, 1980, in Lang et al., 2005). SAM is a graphic instrument that includes three 9-point-pictorial scales of feeling: pleasure, arousal and control, see Figure 5. SAM is claimed to be an equivalent and simplified measure of the semantic differentials normally used to measure the affective dimensions dealt with in this thesis (see Bradley and Lang, 1994). SAM has been used as a core measure in the International Affective Picture System (IAPS)[9] and has followed a set of

[9] The IAPS is a large and comprehensive set of diverse "emotionally evocative color photographs" (Bradley and Lang, 2007, p. 29) which has been rated by men and women using the same standardised measures and procedure. The photographs, which capture a wide range of human experiences, have been used in studies of emotion as they provide standard and replicable static affective cues (i.e. cues that do not change).

standardised instructions (see Lang et al., 2005) during which the end points of the scales are anchored using adjectives to help participants gain full understanding of the rating tasks.

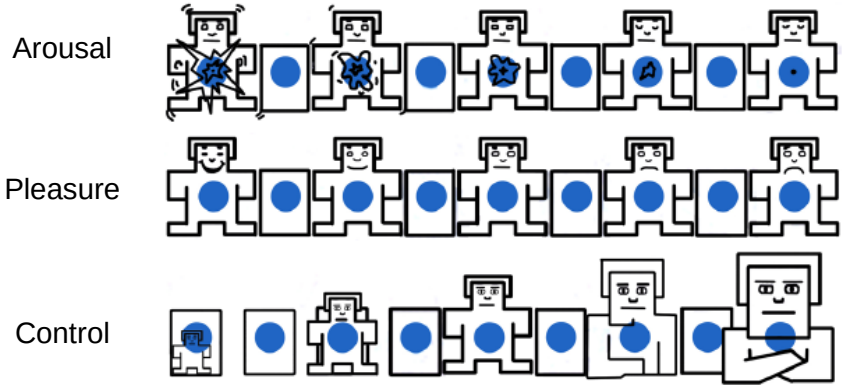

Figure 5. The Self Assessment Manikin (SAM) scales.

The pleasure dimension ranges from pleasant (happy, contented, hopeful, satisfied) to unpleasant (annoyed, unsatisfied, despairing, melancholic, bored). The arousal or activity dimension refers to the experienced level of activation or excitation; it ranges from being aroused (excited, stimulated, jittery, wide-awake) to being not aroused (sleepy, calm, relaxed, dull, sluggish). Finally, the dominance or control dimension relates to the degree of control that the participants' experience, this fluctuates from being in control (dominant, important, influential, controlling) to being controlled (submissive, influenced, controlled, guided).

Participants have to answer each of the scales, for analysis purposes these are coded "*such that 9 represents a high rating on each dimension (i.e. high pleasure, high arousal, high dominance), and 1 represents a low rating on each dimension (i.e. low pleasure, low arousal, low dominance)*" (Lang et al., 2005, p. 1).

– *Mood*. The self-report participants make prior to the study as measured via the Positive Affect and Negative Affect Schedule, PANAS (Watson et al., 1988). The PANAS is a tool that has extensively been used within psychological research and has proven to be a valid and reliable way of assessing participants' mood states (e.g. Crawford and Henry, 2004; Drake and Myers, 2006; Melvin and Molloy, 2000; Suhr and Tsanadis, 2007).

It consists of two 10-item mood scales, one for positive affect (enthusiastic, interested, determined, excited, inspired, alert, active, strong, proud,

attentive) and one for negative affect (scared, afraid, upset, distressed, jittery, nervous, ashamed, guilty, irritable, hostile). The former mainly reflects the extent to which a person feels enthusiastic, active and alert: i.e. pleasurable engagement. The latter is a general dimension of subjective distress and unpleasurable engagement that includes a variety of negative mood states. The participants have to record their answer according to each individual mood, feeling or emotion with one of five responses, ranging from very slightly=1 to extremely=5.

The PANAS structure allows the experimenter to manipulate the 'time scope' that the assessment is referring to (general, last year, past few weeks, past few days, today, moment or current). For the purposes of this thesis the time scope will be set to moment or current (how people feel right at the time prior to each of the experimental tasks), see appendices 4 and 5 for examples of the answering layouts.

Affective appraisals, in the form of emotional reactions to the environmental scenes, will try to capture the first-hand reactions to the environment whereas mood self-reports (taken prior to each of the experimental sessions) will explore the influence they may have on environmental preference and emotional reactions to the environment. Taken together, it is proposed that emotional phenomena (affective appraisals and moods) can be used as predictors of environmental preference.

The next section reviews the literature on the attention mechanism and how this thesis will operationalise it.

3.3 THE ROLE OF ATTENTION

Section 3.2 established why emotion is relevant for the study of environmental preference and how this thesis operationalises this concept. In this section the focus will be on the attention mechanism. Within the conceptualisation of environmental preference taken in this thesis it is believed that any two environments will be understood in a similar way insofar as a series of conditions are met (e.g. personal, social and environmental requirements).

Orienting the attention of the participants (also known as framing) at the moment of the evaluation of the stimulus could have important consequences for the perception of it, and thus impact on preference for the depicted environment. The issue of framing within environmental psychology has been little discussed in the literature. That is, researchers have taken for granted that whenever a participant is prompted to "imagine that you are in this place and..." he or she does so matter-of-factly. This tension was first noted by Scott and Canter in 1997 but subsequent research with respect to this has not been found in the environmental psychology literature.

In their study Scott and Canter asked participants to sort 20 photographs of places they already knew in both a free sort and a directed sort. The former, a photograph sort, instructed participants to look at the photographs so they could sort them into similar groupings. Photographs could only belong to one group. The latter, a place experience sort, instructed participants to "*spend a few moments thinking about the places [they had just seen] in the photographs... imagine being there, and to think about how they would feel...see, hear, smell, taste, and touch...*" (p. 267) and then repeat the sorting procedure, ascribing each photograph to one group only.

Scott and Canter's results showed that participants reached different conceptualisations depending on the given instructions. When participants were asked to sort photographs into groupings their responses were based on the content of the scenes whereas the free sort instructions showed that participants grouped the photographs based on the experiences they had with each of the environments represented in the photographs. Their main contribution draws researchers to the importance of setting the context for the experimental manipulation as well as cautioning them about the inferences that could be made from experimental data.

What Scott and Canter (1997) talked about is what the study of attention has been dealing with at its core. There are several issues that must be considered, for example what features of the environment draw people's attention first (saliency), why these features are attracting the attention (congruency or evolutionary relevance) and why this feature is relevant for this person but not for another (self-knowledge). Thus, attention is not only involuntary but can also be under volitional control: some stimuli demand attention but there are others to which the person decides to devote attention. This is what is described as the *selective* aspect of attention: the organism only attends to *some* stimuli (e.g. Kahneman, 1973).

According to Kahneman (1973), Berlyne's (1960) work on the collative variables (see section 3.1) represents a "*comprehensive treatment of the intensive aspect of attention*" (p. 3). By 'intensive', Kahneman is referring to amount and intensity or in Berlyne's words *arousal;* thus, for Berlyne the stimulus which is more arousing tends to attract the attention of the person. However, Kahneman asserts "*Berlyne was mainly concerned with involuntary attention. The collative properties that he studied control an involuntary selective process and they elicit an involuntary surge of arousal.*" (p. 3). Indeed, Berlyne was interested in knowing what accounted for the preference for a given stimulus and found that arousal (in the form of the collative variables) explained the majority of it.

Furthermore, Kahneman adds, "*A cognitive psychology, however, is not congenial to studies of involuntary behaviour. Perhaps as a result, the line of investigation which Berlyne opened has not been followed very actively. In contrast, the study of voluntary selective attention has become one of the central topics of experimental psychology. In voluntary attention the subject attends to stimuli because they are relevant to a task that he has chosen to perform, not because of their arousing quality*" (pp. 3-4).

This separation is one of the issues that this thesis will tackle. The environmental evaluation task is both an involuntary and a voluntary attention task: the participant chooses to take part but is not partaking in it as a tabula rasa, he or she is being influenced by the task at hand, the properties of the stimuli and contextual factors.

Thus it follows, as illustrated by Scott and Canter (1997), that the participants' attention is *key* in their understanding/ evaluation of the stimuli. Furthermore, the instructions that people are asked to follow whilst performing the evaluation may also affect the preference for the scene. Unfortunately Scott and Canter's study cannot answer this, as they did not ask participants for a preference rating.

3.3.1 THE ATTENTION MECHANISM

Is behaviour attention dependent? This is a question that has been discussed at length in Psychology (e.g. Kahneman, 1973). For example, Kahneman suggested that with respect to Behaviourists and Gestalt theorists "*The concept of attention is unpopular because it is most applicable where simple rules break down*" (p. 1), whereas in other fields, such as post-behaviouristic psychology, attention is a tool

that helps explain behaviours when stimulus considerations on their own are not sufficient. Therefore, behaviour is dependent on attention to the extent of the relevance of the stimuli for the observer; although this may be idiosyncratic, there is an assumption in which two situations can still generate similar responses amongst different people, for example parks in two different cities.

It must be emphasised that this thesis is not trying to use attentional mechanisms as the explanation for all behaviours in general; it is appealing for the careful consideration of the impact that manipulating attention could have on the experience of environments, either pragmatically or experimentally. In other words, attention may function as a pre-experiential filter and therefore modify the perception of the experience; in terms of human information processing, attention works at the higher level and may modify the rest of the process. Figure 6 has been developed to show how a task may filter the attention of the person and this in turn can affect preference.

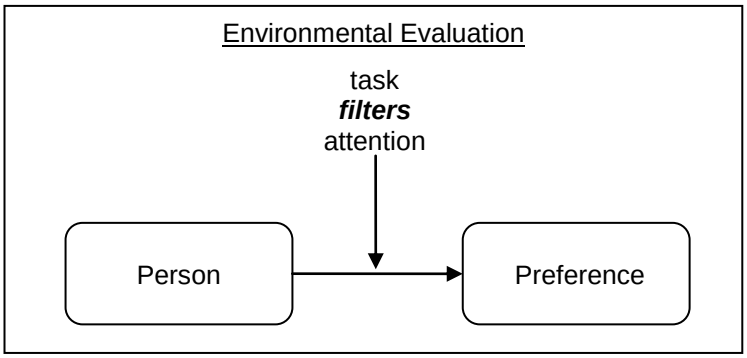

Figure 6. The influence of attention (a task) on behaviour.

Using this conceptual model of the influence on attention makes Scott and Canter's (1997) findings evident, that regardless of personal differences, people were able to focus on two different types of evaluation according to the instructions given for the tasks: the physical-tangible properties and the constructed, evocative, interpreted properties elicited by that image. This conceptual model is supported by convergent evidence from different fields of psychology.

For example, Balcetis and Dunning (2006) argued perception is not only a bottom-up process that the person passively accepts but one that is malleable from

a top-down process[10] and that this is shown through people "*seeing what they want to see*". In their study, Balcetis and Dunning start from the premise that perception is selective, often biased and malleable. They also suggest that visual perceptual sensitivity may be influenced by biological drives or desires, for example wishful thinking, and argue that the relationship between motivation and perception should be revisited and firmly established.

In order to test the motivational influences on perception, Balcetis and Dunning used five different studies with a variety of measurements in terms of their directedness (e.g. lexical decision tasks, perception of ambiguous figures, eye tracking). Overall their results suggest that peoples' *hopes* for a given outcome biased their perceptual set, that is, people only see what would lead to their desired outcomes. In other words, they don't see what they wish to avoid and only see what they want to approach; but this, the authors suggest, is open to refutation.

The motivational influences on perception were also studied by Changizi and Hall (2001). These researchers tested the idea that certain biological states may shape the perceptual system. Changizi and Hall used thirst as a modulator of visual stimuli and tested whether participants in a state of dehydration would be biased towards perceiving transparency in a series of ambiguous figures. Their results showed that dehydrated participants reported seeing more transparencies, assumed to be indicative of the presence of water, than those who were not dehydrated.

There is also confirming evidence from the field of visual perception where a top-down influence can be seen in the process. The research in this field tries to explain the complex process of visual perception via controlled observations of the visual system, normally using eye-tracking equipment to map-out where saccades[11] occur. In this field there is a focus on interactions between attention and memory, in other words what is recalled, identified and recognised in a scene, an inherent process of preference evaluations.

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[10] In perception or information processing a bottom-up process is driven by the stimuli perceived by the individual (external inputs) for example: environmental factors; a top-down process is driven by the person's internal inputs, for example: his or her expectations, prior knowledge, preferences, requirements, goals, etc.

[11] A saccade is the eye movement that occurs between gaze fixations, thus the saccades help researchers study patterns of visual recognition.

Silva, Groeger, and Bradshaw (2006) showed that specific knowledge about the viewed scenes (familiarity) can be conducive to the recollection of attributes that have not actually been paid attention to (fixation). Above all, their results showed that object recognition was dependent on task instructions, that is, instructions filtered the participants' attention to look for specific objects.

Underwood, Foulsham, van Loon, Humphreys, and Bloyce (2006) showed that a top-down override can be established via the purpose of the inspection of a scene (either exploration or an object search, which could be comparable to the picture or place study by Scott and Canter (1995) discussed in section 3.3). Furthermore, Underwood, Templeman, Lamming, and Foulsham (2007) demonstrated that early attraction of attention happens when the *gist* of the scene is violated by an object which is incongruent. The gist of a scene is also known as the scene semantics: the overall theme or meaning of the scene that is almost instantly recognised (Oliva, 2005). Thus their study strongly suggests that the attention is filtered via a cognitive override whereby possible scenarios are computed according to the scene semantics first.

In brief, research from other fields of Psychology has demonstrated that attention could be filtered through a top-down process, i.e. a cognitive override in the form of a task instruction or individual drives. With respect to Environmental Psychology, recent research has focused on some of these processes in order to explain environmental preference: the field of restorative environments and psychological restoration. The next section will describe the main findings of Attention Restoration Theory (ART).

3.3.2 ATTENTION RESTORATION THEORY (ART)

One of the established fields within environmental psychology looking at one of these attention top-down processes is that of Attention Restoration Theory. ART (Kaplan and Kaplan, 1989; Kaplan, 1995) works on the premise of cognitive expenditure: in order to function humans need to use their attentional resources, particularly those under volitional control (known as directed attention). These resources are limited and if they are constantly called upon they can become fatigued. Thus, when a Directed Attention Fatigue (DAF) state is reached it is necessary to recover the 'depleted' attention so optimal functioning can be re-established or restored.

In the Kaplans' terms (Kaplan and Kaplan, 1989; Kaplan, 1995), and following the writings of James (1892), there are two types of attention. A voluntary one; also referred to as *directed attention,* and an involuntary one, also known as *fascination*. The former is the attentional mechanism that requires *effort* or *selectivity* in order to be used. The latter is attention that is *effortless* or requires little effort *demanded* from the person because it is relevant, interesting or arousing (the core of Berlyne's theory of the collative properties), see Table 3 for the main differences between them:

directed attention	***involuntary attention (fascination)***
under control (mostly)	involuntary (mostly)
requires effort	from effortless to some effort
prone to fatigue	fatigue free
uses inhibitory process to maintain focus	attends to stimuli as it is relevant

Table 3. Main differences between directed attention and fascination.

3.3.2.1 Directed Attention

This attention type assumes selectivity, that is, the individual is able to discriminate: "*It is essential to select appropriately from among the knowledge, the possible percepts, and the potential actions*" (Kaplan, 1995, p. 171) and inhibit responses to some stimuli so focus on the *chosen* stimulus can be sustained. It is this ongoing regulatory process that makes the directed attention mechanism susceptible to fatigue.

For the Kaplans, this mechanism is fundamental to human effectiveness, as diminished attention can have serious well-being consequences, accidents being the most extreme example. Furthermore, being able to use directed attention is also a fundamental mechanism for social functioning as people who cannot draw on it are prone to irritability and in such conditions "*people are far less likely to be willing to help one another*" (Kaplan, 1995, p. 172).

3.3.2.2 Involuntary Attention or Fascination

The most important property of involuntary attention (fascination hereafter) is that it requires some effort or is effortless and thus highly likely to lead the organism to rest the 'directed attention' proper (see Kaplan and Kaplan, 1989). According to

Kaplan (1995) fascination can be located along a soft-hard continuum whereby soft fascination is effortless and hard fascination requires some effort.

Soft fascination, normally found in nature, is effortless because it demands attention in a moderate fashion and it seems to be strongly linked to an aesthetic component (it is pleasurable) and allows a 'reflective mode'[12], e.g. going for a walk in the forest. Hard fascination on the other hand requires directed attention (some effort) and could be so powerful that "*one cannot at the same time think of anything else*" (Kaplan and Kaplan, 1989, p. 192), thus even if it is enjoyable it can still create a state where people cannot achieve a 'reflective mode', e.g. engaging in sports or entertainment. Above all, fascination can be found in both processes and content, in other words: life experience and the environment, consequently the transactions between the two (people-environment).

3.3.3 THE RESTORATIVE EXPERIENCE OR RESTORATIVE ENVIRONMENT

One way to recover from directed attention fatigue is via 'restorative experiences' which may take place in 'restorative environments', or those experiences and environments that do not actively demand directed attention for a person to understand them, and therefore allow for 'restoration' of the depleted attention. Restoration is the process whereby a person can go back to an optimal state in terms of attention resources. The *need to restore* can be seen as one of the implicit underlying mechanisms accounting for environmental preference (e.g. Purcell, Peron, and Berto, 2001); thus, environments that allow effortless engagement tend to be preferred.

However, there is a faulty assumption whereby fascination is equated with restoration; fascination is **not** the only component of a restorative experience: "*fascination is a necessary, but not sufficient basis for recovering directed attention*" (Kaplan, 1995, p. 172). For an experience to be restorative the following conditions should be met:

> "*being away: being distinct, either physically or conceptually, from the everyday environment;*
> *fascination: containing patterns that hold one's attention effortlessly;*

[12] By reflective the Kaplans mean serious thought or consideration

extent: having scope and coherence that allow one to remain engaged; and compatibility: fitting with and supporting what one wants or is inclined to do." (p. 482, Kaplan, 2001).

The way these four conditions are met will indicate the extent to which an experience is restorative. The benefits of restorative experiences are a function of both environment and time. In other words, the quality of the environment and the duration of the restorative experience will determine which level of restoration can be reached (for a full discussion of this see Kaplan and Kaplan, 1989).

Research on restorative experiences or environments shows again a similar pattern found in the other studies described earlier on in section 3.3.1: some top-down processes can filter attention and alter behaviour, in this case seeking environments that allow restoration. Restorative environments have also been shown to be linked to environmental preference (e.g. Han, 2007; Hartig and Staats, 2006; van den Berg, Hartig and Staats, 2007), and as such restoration has been suggested as a key factor in human health (Hartig, 2008).

3.3.4 SECTION SUMMARY

This section has described the attention mechanism and illustrated some of its influences on behaviour, regardless of how aware the individual is of the process. In broad terms the field focuses on two distinct processes, that of directed attention or the attention process that requires *discrimination* by the individual, and that of involuntary attention or the attention process that is demanded by the stimuli in the perceptual field because it is fascinating, interesting or biologically relevant. The constant use of directed attention is conducive to fatigue or the depletion of attention, one way of recovering from directed attention fatigue is by resting the attentional resources through experiences that allow effortless engagement.

Seen through an attention *lens*, any environmental evaluation could be seen as a dual process: one where the individual is requested to use directed attention in the form of 'please do the following task' and another one where the individual's involuntary attention may be affected by the characteristics of the presented stimulus but also by his or her personal constraints at the time of the evaluation – inclusive of emotions.

The reduction of self-serving biases is desirable as this has been shown to have significant impacts on social functioning. For example Galinsky et al. (2005) showed how perspective-taking manipulations promote self-other overlap and this in turn can facilitate social coordination (see section 3.4 for an overview of this study). In the case of environmental psychology, and environmental preference research in particular, these processes could help people evaluate environments from a *different* perspective that may open up a different understanding of the environment.

The next section describes perspective-taking, which is the theoretical construct that this thesis uses to study both the architects' understanding of the client and the communication of final design to the end-user.

3.4 PERSPECTIVE-TAKING

This thesis proposes that perspective-taking could be used to aid the evaluation of design. Perspective-taking has largely been unexplored in the field of environmental psychology until recently, where it has been used to help explain phenomena such as pro-environmental behaviour (e.g. Berenguer, 2007) or behaviours aimed towards the upkeep and improvement of the environment in general.

According to the Collins English Dictionary (1989) perspective is "*...a way of regarding situations, facts, etc., and judging their relative importance*" (p. 1145). It is this "relative importance" that this work is concerned with, as it has been shown that attention mechanisms could be directed through a cognitive override or a top-down process.

It is further proposed that perspective-taking could be a powerful mechanism for attention framing as, regardless of the task, the person taking part in an experiment would normally be asked to focus on the likely consequences of the task on his/her self. However, in environmental preference tasks this is not always desirable as these may constrict the understanding of the stimuli due to self-serving biases (e.g. an office relocation which divides the staff between those who like the proposed design and those who do not).

Perspective-taking is a process intrinsically related to empathy. The following section describes both empathy and perspective-taking.

3.4.1 EMPATHY OR PERSPECTIVE-TAKING?

The concept of empathy was introduced to the English Language in 1909 by Edward Bradford Titchener as a translation from the German word Einfühlung (Colman, 2006; Duan and Hill, 1986). The concept of empathy deals with "*the capacity to understand and enter into another person's feelings and emotions or to experience something from the other person's point of view*" (Colman, 2006, p. 248).

There are several definitions of empathy, but what they have in common is that they claim there is an *affective component* central to the process. For example, Dymond (1949) defined it as "*the imaginative transposing of oneself into the thinking, feeling and acting of another, and so structuring the world as he does*" (p. 127). Wispe (1986) defined it as "*the attempt by one self-aware self to understand the subjective experiences of another self*" (p. 314) or that of Batson, Fultz, and Schoenrade (1987) defined as feeling vicarious emotion or, feeling the same emotion that some other is feeling.

As research on the area progressed, the concept was refined to define what forms empathy can take and how it happens, for example Davis (1980) suggested that empathy is a multidimensional construct composed of four dimensions: *fantasy, perspective-taking, empathic concern* and *personal distress*. Fantasy is the dimension that measures the ability people have of putting themselves in the perspective of fictitious people. Perspective-taking is the ability to put the self in the shoes of the other (the cognitive element). Empathic concern is the ability to react emotionally to others' experiences, and personal distress is the extent to which people can experience the same feelings others experience.

One aspect common amongst researchers is that empathy involves situating the self onto the other whilst focusing on the emotional content of the experience. Based on the discussion about emotion, in section 3.2.1, it becomes obvious that this position is untenable unless its cognitive counterpart is considered, this is what has been described as "perspective-taking".

Also known as *mental* perspective-taking or cognitive empathy (e.g. Smith, 2006), this is: the cognitions performed during attempts to empathise or mentally *placing* the self in the other's situation (Batson et al., 2003; Batson, Early, and Salvarani, 1997; Smith, 2006).

The way perspective-taking happens, or empathy for that matter, may involve several processes that fall into categories whose names are dependent on the field that studies them. Perspective-taking, at its core, happens through the activation of existing or expected patterns of responses that are considered to be appropriate given the situation. More importantly, such series of responses may or may not be under volitional control and as such they can be explicit or automatic.

According to Davis, Soderlund, Cole, Gadol, Kute, Myers, et al. (2004) there are at least three possible accounts of perspective-taking: (1) "primitive"-non-cognitive perspective-taking (2) perspective-taking that uses existing self-knowledge in a different way when trying to infer someone else's state and, (3) perspective-taking that uses information about the self in order to understand others.

In the first case, the authors refer to automatic processes such as those that happen in socialised behaviours like facial expressions. The evidence for this is found in studies of social mimicry in which people who were asked to *image* the others' facial expression reported experiencing parallel emotions. That is, without asking people to take the perspective of the other, mimicking facial expressions generated similar affective experiences.

The second case, using existing self-knowledge in a different way, refers to the use of self-knowledge with respect to others, that is, the existing self-knowledge is used to derive plausible guesses about the others' personal states. By self-knowledge this works refers, in a broad sense, to the cognitions, emotions and beliefs that a person holds about the world. For example, Nickerson (1999) defines the knowledge that a person holds of his or herself as knowledge that includes "beliefs, opinions, suppositions, attitudes, and related states of mind." (p. 737).

The third case refers to the use of self-knowledge whilst positioning in the others' perspective, in other words, the perspective taker does not only infer the other but situates the self in the others' perspective and from there works out what it would be to *be* that other. The main difference between these last two mechanisms is that in the former the perspective-taking is inferential (how the other experiences) whereas in the latter it is referential (how the self would be experienced in the others' perspective).

The processes through which perspective-taking occurs, particularly the second and third cases, can have important emotional and behavioural consequences such

as pro-social behaviour. For example, Batson et al. (1997) asked 30 participants to adopt one of three conditions (a *self* perspective, an *other* perspective and a *objective/detached*[13] perspective, 10 participants per condition) while listening to a recording of a woman in a distressing situation. After listening to the tape, participants were asked to answer questions about their emotional reactions to the woman's need (responses to this questions were used to create an index of empathy and distress), some questions about how they experienced these emotions, three questions about the effectiveness of perspective-taking and other general questions about the woman's story, e.g. how big they perceived her needs to be, how interesting the story was, etc.

Batson et al. (1997) found that people in the other condition, who imagined how the woman felt, reported higher scores of empathy than those in the objective/ detached condition whereas people imagining how they would feel in the woman's perspective (self perspective) not only reported higher scores of empathy but also of personal distress. Hence the authors concluded that imagining how the other may feel produced empathy and imagining how the self would feel not only produced empathy but also personal distress, which can lead to egotistic motivation to "escape or relieve your own negative emotional state" (p. 757).

Perspective-taking has not only been found to be conducive to pro-social behaviour as described in Batson et al. (1997). Galinsky et al. (2005) proposed that by taking perspectives the mental representations of the self and the other overlap, and this allows perspective takers to coordinate their behaviour and bond with others. Galinsky et al.'s findings are based on stereotype and prejudice research. In one study they asked participants to listen to a tape of a typical day in the life of an assistant professor, "a stereotypically analytical person" (p. 116), and asked participants to take one of three perspectives: self, other or objective/detached.

After listening to the tape, participants were asked to help with a supposedly unrelated task, a set of analytical questions adapted from the "Law School Admissions Test". The researchers reported that those participants that took the self or the other perspectives performed better at the task than those who were

[13] The literature on perspective-taking uses the words 'detached and objective' to describe those perspectives where participants are asked to not focus on how they themselves feel. In this sense the adjective 'objective' is taken as a synonym of 'detachment' and does not imply a positivistic sense of ultimate truth. In this thesis the term 'detached' is used to refer to this perspective unless specified otherwise.

requested to remain detached. Based on these results they concluded that "*Becoming smarter after taking the perspective of a professor facilitated interaction with such a person...*" (p. 116).

In short, Galinsky et al. (2005) proposed that the inclusion of the self in the other and the inclusion of the other in the self, the crucial mechanism that takes place during perspective-taking, can help reduce prejudice and facilitate social coordination.

3.4.2 PERSPECTIVE-TAKING RESEARCH AND ENVIRONMENTAL PSYCHOLOGY

As described in the previous section, perspective-taking has been an explanatory tool in the study of social processes, for example: helping behaviour (altruism), moral actions, stereotypes and prejudice. Perspective-taking is a crucial mechanism that allows a "*greater overlap between the mental representations of the self and mental representations the other*" (Galinsky et al., 2005, pp. 110), in other words, what people know about themselves is ascribed to or seen in the other to a greater extent when perspective-taking takes place.

The field has used different paradigms to manipulate perspective-taking, for example asking participants to write about the typical day in the life of a person shown to them in a photograph (e.g. Galinsky and Moskowitz, 2000), via visual images (e.g. Sevillano, Aragones and Schultz, 2007) and instructing participants to take a specific perspective during visual or listening tasks (e.g. Vescio, Sechrist and Paolucci, 2003; Oswald, 1996).

All paradigms have the objectives of getting participants to a) take their own perspective (self), b) take the perspective of the target (other) or c) remain detached during the task (detached). In the self perspective, participants are instructed to pay attention to how they themselves feel, e.g. "*As you watch the interview, please imagine how you yourself would feel if you were the person in the tape. Concentrate on the way you would feel if these events were happening to you. Imagine as clearly and vividly as possible everything that you would experience. In short, imagine that you are actually the person in the videotape*" (Davis et al., 1996, p. 1628).

In order to take the perspective of the other, participants are instructed to put themselves in the position of the other: "*Next, a series of photographs will be presented, upon seeing them: Try to take the perspective of the subjects that appear*

in the pictures, imagining how they are feeling about what is happening. Think about the reactions of the subjects and visualize clearly and vividly how they feel. Try to imagine how the subjects in the pictures feel. While you view them, picture to yourself just how they feel. Try not to concern yourself with attending to all the information presented, just imagine how the subjects feel in that situation." (Sevillano et al., 2007, p. 702).

In contrast to these self and other perspectives, the detached perspective instructs participants to remain impartial and uninvolved, for example Batson et al. (1997) gave participants the following instruction: "*While you are listening to this broadcast, try to be as objective as possible about what has happened to the person interviewed and how it has affected his or her life. To remain objective, do not let yourself get caught up in imagining what this person has been through and how he or she feels as a result. Just try to remain objective and detached." (p. 4).*

It is in the operationalisation of how to measure perspective-taking that the field becomes of critical importance for experimental Environmental Psychology research. If the perspective-taking research is juxtaposed to the most common scenario of Environmental Psychology research, then it becomes clear that Environmental Psychology has researched person-environment phenomena with respect to the self. Most importantly, in doing so Environmental Psychology has utilised a rich and effective array of experimental manipulations that allows it to make inferences about perceptions or behaviours with respect to the environment, current or prospective. However, there has been little formal discussion of the implementation of such manipulations.

By borrowing from the field of perspective-taking, Environmental Psychology could thus expand its explanatory power via the implementation of alternative experimental instructions. First of all, the field could be enriched if it can be experimentally shown that people appraise an environment differently if the consequences are for themselves or for another. This has been the case in discrepancies between groups such as that of architect/user and not in my back yard (NIMBY) behaviours (e.g. Burningham, 2000; Devine-Wright, 2009). Moreover, the field could use perspective-taking to facilitate understanding and strengthening of social bonds between polarised groups or populations that converge apropos the new environment.

Second, and more important for the purposes of this thesis, can people reduce their self-knowledge references and appraise an environment in a detached way? How do people behave in a *detached* way? This entails a deeper, moral justification which will not be dealt with in this thesis, but in practical terms translates as: can people *suspend* their personal preferences and knowledge to evaluate the environment?

During the interviews with the architects (see Chapter 2) it was shown how they, as a group, are believed to have two particular skills with regards to perspective-taking. On the one hand, they have the skill of looking at the environment in a detached way but anchored in his/her extensive experience in building typologies and functionalities. On the other hand, they also have the skill of extracting what the end-user will ideally need or like and communicate it accordingly via the end-product. The term detached in this thesis is used to denote the situation where a person is asked to take a perspective whilst trying to avoid using self-knowledge references. Therefore, perspective-taking could be a tool in the teaching of professionals so better understanding of the user/environment can be achieved and groups' differences narrowed.

Finally, how do people infer actual preferences, whether personal or for others? The former implies a comparison between the prospective preference (before occupation of the environment) and the in-situ preference (once occupation of the environment has taken place). The latter involves a comparison between the preference scores from people focusing on the self and people focusing on the other or taking a detached perspective.

3.4.3 SECTION SUMMARY

This section has presented the construct of perspective-taking or trying to take a perspective other than the self: the perspective of the *other* or remaining detached. It described how perspective-taking has been studied and showed that perspective-taking is similar to empathy because they both deal with emotional content. The differences between concepts suggest that they are author dependent. As a result of these similarities, perspective-taking in this thesis is seen as a concept that includes both cognitive and emotional content.

The overarching goal of perspective-taking is its usefulness to social cooperation through the reduction of self/other differences. Perspective-taking is ideal for

studying environmental preference because it can help in at least two distinct ways at either side of the design process: helping the architect/designer understand the client before design starts, and helping people reduce their self-serving biases during the evaluation of design. Moreover, not only is there interest in studying self-serving biases but also in exploring if people can suppress or reduce them, i.e. be detached.

In order to study the influences that emotion, attention and perspective-taking may have on environmental evaluations this thesis presents four studies besides the interviews with the architects in Study 1. The following chapter deals with the methodology used in this thesis and presents a conceptual framework used to describe the salient influences environmental evaluations.

CHAPTER 4. METHOD AND APPROACH

In chapter 1 the underpinning research questions of this thesis were stated followed by an overview of how the different chapters are structured. Each of the five study chapters include a summary methods section; this chapter discusses in detail the overall research approach, a conceptual framework of how the influences on environmental evaluation are considered and discusses the merits and limitations of each of the data gathering approaches used in this thesis.

4.1 THE RESEARCH APPROACH

The topic of this thesis sits in the field of Environmental Psychology, which is concerned with the "*empirical and theoretical relationships between behaviour and experience of the person and his* [sic] *built environment*" (Proshansky, 1976, p. 303). The unit of analysis for Environmental Psychology is sometimes referred to as *"person in environment"* (Wapner, 1981, p. 223) and includes the person, their environment and their relationships or transactions. In this thesis, the unit of analysis is the individual person who evaluates or judges an environment or a representation of it.

This thesis approaches its research problem with both quantitative and qualitative approaches, mainly quantitative, underpinned by a pragmatic philosophy which distinguishes itself from both purely quantitative approaches (based on a philosophy of positivism) and purely qualitative approaches (based on a philosophy of interpretivism or constructivism) (Denscombe, 2007).

In taking this approach, the author acknowledges the historical tensions that exist between the two major social science paradigms or approaches, namely positivism/ empiricism and constructivism/ phenomenology (Gray, 2004; Guba and Lincoln, 1994; Tashakkori and Teddlie, 1998). In comparison to these two major social science paradigms or approaches, pragmatism can be characterised by the following:

- Knowledge is based on practical outcomes and 'what works', whereby the main criterion for judging knowledge is its perceived usefulness when applied to a practical problem: it is tested empirically.

- There is no single, best 'scientific' method that can lead the way to indisputable knowledge. In particular, there is scepticism about the distinction between quantitative and qualitative research.
- Traditional dualisms in the field of philosophy and science are regarded as not helpful. Pragmatism attempts to find a middle ground between philosophical dogmatisms and scepticism, and to find a workable solution.
- Pragmatism recognises both the natural or physical world and the emergent social and psychological world.
- It endorses eclecticism and pluralism, for example observation, experience and experiments can be useful in understanding people and the world.
- It recognises human inquiry and experimental or scientific inquiry as analogous.

  Adapted from Creswell, 2007, p. 23; Descombe, 2007, p. 117; Johnson and Onwuegbuzie, 2004, p. 18; Snape and Spencer, 2003; Tashakkori and Teddlie, 1998, p. 5.

In a recent study Bryman (2006) analysed 232 social science articles in order to examine how quantitative and qualitative research is integrated in practice and the rationales that are provided for so doing. Bryman (2006) found that 57.3% of his sample articles were based on a combination of survey instrument and qualitative interviews and that there were 16 distinct rationales for the combination of research approaches. In this thesis, as categorised by Bryman's (2006) extensive list for the combination of approaches, the selection of a qualitative approach alongside the mainly quantitative body of work was undertaken in order to *contextualise the research problem, to enhance the research findings and to gain a diversity of views*.

After the initial overview of the thesis in chapter 1, the first part of chapter 2 presented a literature review that outlined the architecture design process and how the RIBA has set a Plan of Work which expects architects to adhere to. The Plan of Work considers all of the stages that a design process goes through from the onset of a project to the finalisation of end-product: the building. In doing so, the Plan of Work describes the different types of clients that an architect may encounter and also deals with the available methods used for communicating the design to those involved.

4.2 EMOTION, ATTENTION AND PERSPECTIVE-TAKING: A CONCEPTUAL FRAMEWORK

Having described the methodological approach in this thesis, this section will describe the conceptual framework for the articulation of the constructs dealt with in this thesis. Chapter 3 discussed how within environmental preference research more effort should be spent on investigating the impacts of emotion during an environmental evaluation. It also discussed that the attention mechanism is central to the process of environmental evaluation (in terms of attention framing and orienting of attention) and may have important consequences on environmental preference. Finally, the section on perspective-taking described how it is operationalised and argued for its usefulness within environmental preference research.

Any environmental evaluation consists of a person doing the evaluation, an environment that is being evaluated and an outcome of the evaluation or environmental preference: the stated preference is one of the instances where person and environment converge. The evaluation can be carried out in the environment (in-situ) or on a representation of an environment, e.g. a photograph or a CGR.

In-situ and photographic-based evaluations are straightforward: there is a direct correspondence between the environment and the observer. Within the environmental preference literature, photographic representations of environments are regarded as a proxy for the real environment: responses to photographs are similar to the in-situ responses (e.g. Coeterier, 1983; Stamps, 1990). Nevertheless, when it comes to representations of new environments this direct correspondence is thwarted as the new environment is not tangible but tentative. Because of this, the evaluation becomes prospective, thus prospective preference deals with how much people may like a future environment.

As described in section 2.3, there are different types of visualisations and these affect how easily the observer relates to them. The architect's preferred method for presentation of final design to the end user is through verbal communications and visualisation formats, particularly the 3D render. Chapter 1 also highlighted that the scenario this thesis deals with is that of commercial architecture – where the end user is not involved from the beginning of the design process and is thus not fully

aware of the reasons behind each design decision. As a result of these circumstances, the evaluation of final design invariably deals with prospective reactions to or prospective preference for the represented environment: the evaluation of future environments as opposed to the commonplace evaluation of real or representations of real environments.

Chapter 3 argued that further research is needed in order to understand the interactions between emotion, attention and environmental preference, particularly at the moment people evaluate and commit their views on a future environment they may occupy. As such this thesis will consider that during presentations of final design the participants may be susceptible to the influence of mood, attention shifts (such as those produced by the instructions for the evaluation) and self-serving biases. It also proposes that one way of softening these influences could be via perspective-taking manipulations; these are done by prompting people to focus on somebody other than themselves or by asking them to be detached.

This thesis assumes that focusing on the self will provide *firsthand* information about the plausible consequences of making a choice. This is a process that all people perform. Conversely, focusing on the other or being detached may enable people to reduce reliance on self-knowledge and consider their evaluations from a different perspective. It is hypothesised in this thesis that performing this focus shift may translate into a different perceptual experience when dealing with environmental preference, i.e. the environment could be processed with a reduction of self-knowledge bias.

This thesis proposes a conceptual framework, illustrated in Figure 7, for studying the problem of environmental evaluation that can be applied to both evaluations of representations of the environment (e.g. CGRs) and actual environments (inclusive of photographs). It is suggested that the stated preference for an environment can be affected by variables affecting the person (e.g. mood) and by variables which are part of the context in which the evaluation takes place (e.g. taking a perspective). It also highlights that stated preference can be prospective or in situ.

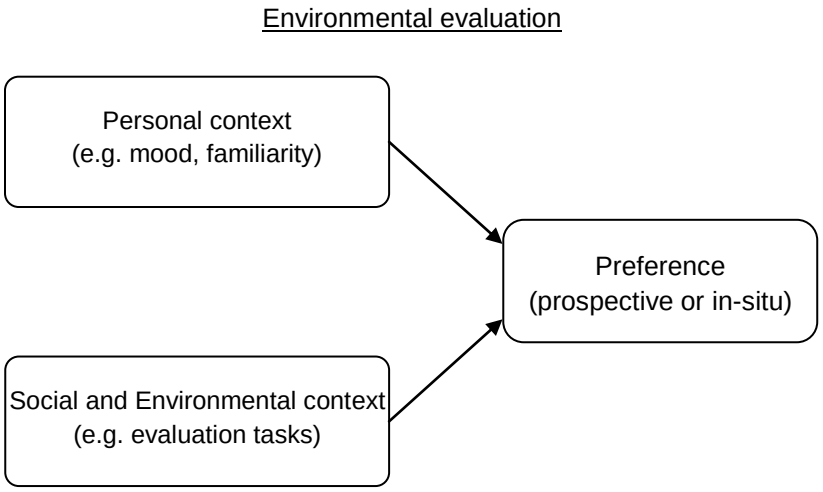

Figure 7. The conceptual framework for environmental evaluation.

The evaluation of the consequences of being in an environment could be seen as a process that occurs at both parts of the architect/end-user dyad at different stages of the design process. The end-user evaluates the consequences of being in the environment during the evaluation of final design. The architect evaluates what the user is likely to prefer whilst designing an environment. It is here where the preference differences between experts and laypeople may reside: the preference evaluation or judgement is not being made from the same perspective (e.g. Gifford, et al., 2002).

Finally, this thesis will also test if affective appraisals in the form of emotional reactions to the environment (i.e. how the environment makes the individual feel) are important components of environmental preference. As described in the interviews with the architects, and discussed in section 3.2, it would make theoretical sense that preference is closely related to environments that tend to produce positive experiences in emotional terms: if the individual prospectively feels good or has a positive reaction, the environment should tend to be preferred.

4.3 PERSPECTIVE-TAKING AND THE POLITICS OF EXPERTISE

The perspectives manipulated in Studies 2, 3 and 5 ask participants to take different perspectives during the evaluation of the stimulus, as described in section 3.4.2, these perspectives are: from a self-perspective, from the perspective of the *other* (in the form of an architect) and from a detached perspective. Because there may be social implications of asking participants to take an 'expert' perspective, the following paragraphs clarify what is mean by 'expert' in this thesis.

The research literature concerned with the differences between experts and non-experts (laypeople) normally focuses on the explanation and understanding of these differences, and it is area dependent. For example, differences between experts and laypeople have been studied in as varied fields as information problem solving (Brand-Gruwel, Wopereis and Vermetten, 2005), the perception of nanotechnology hazards (Siegrist, Keller, Kastenholz, Frey and Wick, 2007), risk perception (Slovic, 1987; Sjober, 1998) and climate change (Sundblad, Biel and Garling, 2009).

In the context of this thesis, an architect is an expert in so far that they have had formal education, training and experience in their field and, as a result of these, hold specialist knowledge which is socially recognised as such (Bromme, Rambow, and Nuckles, 2001). The author of this thesis acknowledges that some approaches in the research literature have theorised expertise as instruments or parts of power and political systems (e.g. Turner, 2001; Collins and Evans, 2002), but this is not considered in this thesis. This approach is similar to those in the literature studying trained and non-trained people's environmental evaluations (Bromme et al., 2001; Brown and Gifford, 2001; Purcell and Nasar, 1992; Valadez, 1984; Wilson, 1996)

With regards to environmental psychology, and environmental preference in particular, this thesis has made clear that architects and people without architectural training tend to differ in their environmental evaluations. This is one of the reasons why the studies in this thesis will use the architect as a perspective to be taken by participants. Moreover, not only it is interesting to know how experts and laypeople differ but also to investigate if laypeople will show similar trends if asked to put themselves in the perspective of the expert. In the words of Bromme et al. (2001): "*This will not only broaden the existing empirical evidence on biases in laypersons' knowledge estimations (which is already of interest in itself), but also provide a basis for comparing experts and laypersons on knowledge estimation.*" (p. 319)

As a result of this caveat, this thesis approaches the issue of expertise in two ways, one involves asking participants to take the perspective of the architect/ designer whilst doing the experimental tasks (such is the case in studies 2, 3 and 5) in order to explore its impact on a number of measures. The other one involves the inclusion of students of architecture (Study 3), in order to use this data as a benchmark against which laypeople's results can be compared. This has been a strategy widely used in the literature (e.g. Akalin, Yildirim, Wilson, and Kilicoglu, 2009; Imamoglu, 2000; Kirk, Skov, Christensen, and Nygaard, 2009; Purcell and Nasar, 1992; Valadez, 1984)

Using students of architecture as a proxy for architects relies on the assumption that education and training shapes preference. As well as evidence from the socialisation of architecture whereby students' architectural preferences are influenced by their education (Wilson,1996), other studies have shown similar findings. For example, Drottz-Sjoberg and Sjoberg (1991) found that 18 yr old students' perceptions of nuclear risks were associated with the students' chosen academic specialisation even before professional and graduate education. In another study Erdogan, Akalin, Yildirim, and Erdogan (2010) showed that first year architecture students differ from last year architecture students (which they call pre-architects) in their evaluations of different architectural styles.

In order to standardise this effect (years of formal training and experience in a particular knowledge domain) the sample of architecture students in Study 3 consists of students with at least four years of formal training in architecture. Importantly, this thesis does not claim that they are architects and addresses them accordingly.

In summary, when participants are asked to take the perspective of an architect it is with the objective of studying its effect on a variety of measures and assumes that this effect is related to the participants' self-knowledge of an architect. The effect of this perspective is also checked using architecture students with at least four years of formal training and experience in Study 3.

4.4 THE DATA GATHERING APPROACHES

The following section will describe the data gathering approaches used in this thesis, namely interviews, experiments and a case study.

4.4.1 INTERVIEWS

The second part of Chapter 2 presented the first study of the thesis: interviews with a selection of practising architects in the city of Aberdeen. Study 1 was carried out in order to contextualise the presentation of design to laypeople. It could have been possible to use a survey to study architect's opinions about these issues. For example, Bromme and Riklef (1995) used an open-ended postal survey to study how experiences shape the architect's knowledge of occupants' needs and

behaviour in a sample of novice and experienced architects. However, face-to-face interviews were chosen as a method because they are particularly well suited to answering 'how' and 'why', thus allowing the researcher to understand the topic of interest based on the perspectives of the participants in their social setting (Snape and Spencer, 2003).

The interviews followed a semi-structured format (Creswell, 2007; Berg, 2001) that was based on the literature review on the presentation of design. Thus, the interviews not only allowed contextualisation of the research but enhancement of its findings (Bryman, 2006).

Section 2.5.3 pointed out that the interviews were audio recorded, transcribed and later analysed using QSR International's Nvivo software (2007). The data were content analysed following the recommendations of Kelle (2005) for qualitative coding in order to account for both theoretical and emergent themes. This afforded the data analysis strategy sufficient flexibility for any unexpected yet interesting data to be included in the results, for example in section 2.5.4.2 two emergent themes are presented and discussed.

Once the contextualisation of the presentation of design to laypeople is investigated, through the interviews with selected practising architects, the thesis moves on to tackle its research questions using a variety of research strategies, i.e. three experiments (studies 2, 3 and 5) and one longitudinal case study (study 4).

4.4.2 EXPERIMENTS

Studies 2, 3 and 5 have in common their experimental nature: they are empirical inquiries under controlled conditions designed to examine the properties of, or the relationships between, selected variables (Bechhofer and Paterson, 2000; Breakwell, 2004; Denscombe, 2007; Kirk, 2003). All studies are carefully designed to achieve the control required to allow the author an investigation into the variables of interest.

Studies 2 and 3 (Chapters 5 and 6) set out to test the effects of perspective-taking on perceived environmental restorativeness using the Perceived Restorativeness Scale (see *Measures*, under section 5.1) and environmental preference using the informational variables approach (see *Measures*, under section 6.1), respectively. Although it is recognised that a range of visual stimuli is used in order to account for

environmental differences, the studies make use of an actual CGR of a mainstream block of flats used to visualise design for the client/end-user. This was done in order to replicate the exposure that actual client/end-users may have to final design in a real world situation. This was in keeping with the trends in the research literature on the presentation of final design to non-trained people described in section 2.3.

In Study 2, a sample of students, who are not enrolled in architecture and built environment disciplines, is used in order to control for the effects formal training may have on their perspective-taking tasks. In Study 3, however, this plausible confounding variable is incorporated into the study design by selecting two samples of students, one with no training in architecture and built environment disciplines and one consisting of students of architecture with at least four years of education.

The rationale for this decision is underpinned by the perspective-tasks requested from the participants, this is shared amongst Studies 2, 3 and 5. In Studies 2 and 3 (studies with within-subjects and repeated measures design) participants are requested to take two perspectives during the experimental tasks, one after the other; in contrast, Study 5, a between-subjects with repeated-measures design, randomly assigned participants to one of three perspective-taking instructions.

The first two experimental studies, Studies 2 and 3, thus have a limitation with regards to the use of a within-subjects design, similarly Study 5 is also limited by its between-subjects nature. The limitation of these studies resides on not having absolute certainty over what actually accounts for any significant differences within or between groups (Kirk, 2003; Field, 2005). This is addressed by prioritising the ecological validity of perspective-taking in all of the studies. In Studies 2 and 3 participants are requested to take a perspective congruent with their self-knowledge, i.e. being a resident of an exemplar of residential accommodation; in Study 5 the ecological validity of the perspective-taking manipulation with regards to office environments is achieved by recruiting office-workers.

The exploratory nature of Study 2, the first experimental manipulation of perspective-taking, allows the researcher to isolate perspective-taking effects whilst taking care of some considerations such as counterbalancing the presentation of perspectives, controlling for the effect of education on the sample, etcetera. By Study 3, the ecological validity gains weight and still using a within-subjects design the experimental design adds a layer of control by sampling participants with and without experience and training in the architecture and built environment disciplines.

By Study 5, the experimental design is changed in order to improve its ecological validity, i.e. the design moves from within-subjects to between-subjects (three perspectives) with eight repeated-measures. The use of visuals is also re-considered and environmental sampling is incorporated into the study, however, in contrast to Studies 2 and 3, this study does not use a CGR of a residential block of flats but a selection of office environments. In keeping with the rationale of Studies 2 and 3, Study 5 uses a range of photographs that have actually been used as part of a professional interior design company's portfolio to present design options to its clientele. The study raises its external validity by the choice of visuals and selecting participants with relevant office-working experience.

Another advantage of Study 5 is that it is not constrained by scientific or positivistic reductionism commonly associated with psychometric testing and includes open-ended questions so participants, instead of using a set of scales to describe how they feel when imagining being in the environments presented to them (in keeping with each of the perspective-taking conditions), can write down their own emotions (see Seitz, Lord and Taylor, 2007). The inclusion of this qualitative component is done in order to test for the correspondence between scale-dependent results and freely generated emotion words.

4.4.3 CASE STUDY

During the course of the PhD study, The Robert Gordon University decided to launch a 'new campus' masterplan strategy, whereby approximately 100 members of staff were to be relocated to new premises, presenting a unique opportunity to study the presentation of final-design to client/end-users in a real world setting. After careful consideration of this possibility with the thesis supervisory team, the author contacted the Director of the Estates Department, the Deputy Director for the Campus Development and the Head of Space Management (Estates Department specialists hereafter, the people in charge of the delivery of the masterplan) in order to secure access to the process.

The conversations with the Estates Department specialists were successful and access to the relocation process was granted for a longitudinal study of the relocated population, resulting in a case study where the staff views were surveyed prior to the relocation, using the actual visual representations used by the Estates Department specialists to communicate to them the design of the new work

environment, and three and six months after having been relocated (this will be described in detail in Chapter 7).

Having access to a real world sample posited new challenges for the research project, such as what is the *best* way of reaching all members of staff whilst maintaining disruption to a minimum? What are the *key* components that each of the time measurements should encompass? Are these *key* components maintained throughout the measurements? To what extent the researcher has freedom of choice over these matters?

These questions were resolved between the author (supported by the thesis supervisory team and findings from the literature) and the Estates Department specialists over an iterative discussion process. The results of this discussion were condensed into a survey (described in section 8.1) which was electronically distributed to all staff involved prior to the relocation and three and six months after occupation of the premises.

The survey sought staff's perceptions of different environmental dimensions of their new work environment as well as psychological dimensions of concern for this thesis, i.e. the mood at the time of the evaluation and staff's emotional reactions to their environment (either prospectively or in situ). Thus the survey has a mixture of theory and discovery driven properties (Denscombe, 2007; Gray, 2004).

Quantitative research approaches to case studies, such as this, are commonly used as a research strategy (details of this type of case studies, a post-occupancy evaluation, will be described in the introduction to Chapter 7). For example, Yin (2003) states *"...case studies can include and even be limited to quantitative evidence.*" (p. 14), and in defining the characteristics of a case study Mills, Durepos, and Wiebe (2010) state that *"Case study can involve any combination of methodologies or methods..."* (p. xxxiii). Notwithstanding, the author acknowledges that case studies have been traditionally associated with qualitative research (e.g. Lewis, 2003; Denzin and Lincoln, 2005).

There are some limitations to this case study, the general ones are discussed in this section and its specific limitations will be covered in section 7.3. One of the overarching limitations of this case study is similar to general case studies limitations (e.g. Denscombe, 2007; Aaltio and Heilmann, 2010) and has to do with the terms on which the case study is secured and approached. In this case, the

Estates Department specialists, although well meaning and flexible to the researcher's request, maintained a hard line on what the study should encompass, namely: it could only study the physical environment and its perception by the end users, social processes were requested not to be touched upon as this would move beyond the environmental evaluation. Thus, what the beginning of this section refers to as the negotiation process entailed the discussion of the relevant psychological phenomena dealt with in this thesis (mood and emotional reactions) that needed to be included in the surveys.

Practical factors also had an impact on the survey's structure, namely minimal disruption of staff's time, accessibility to staff and the lack of financial resources (the cost of this study is absorbed by the researcher). These limitations, in conjunction with the scope imposed by the Estates Department specialists, translate into having to reach a compromise between depth and breadth of the study's scope (Gray, 2004).

Just as in the other studies, this case study ensures that appropriate ethical and confidentiality measures are in place (these are described in section 8.1) so the sensitive nature of the resulting data is only available to the researcher and that only anonymised data is ever used for the dissemination of results. Fortunately, the results do not contain any extreme cases or outliers that would have merited appropriate follow-up mechanisms.

It is important to acknowledge that Studies 2 and 3 deal with a visualisation of a residential block of flats whereas Studies 4 and 5 use visuals of work-environments. The change of focus between residential to non-residential architecture is dictated by the opportunity afforded by this case study, this change is justified in terms of the ecological validity afforded by the present case study where the relationships between mood, emotional reactions and preference can be explored in a naturally occurring setting and over time.

The case study also allows the researcher to gain some insight into how to best achieve ecological validity in the final study, i.e. the relevance of participants' prior self-knowledge of the research stimuli. In the final study, this is kept at the forefront and in order to be as ecologically sound as possible office workers are sampled. They are, by definition, well acquainted with the stimuli material.

4.5 SUMMARY

This chapter has presented the methodology underpinning this thesis and described the rationale for each of the studies. The methodological approach underlines the pragmatic nature of this thesis and takes advantage of this by mixing some qualitative approaches (interviews with architects, Study 1, and the freely generated words task in Study 5) in a mainly quantitative research approach. It also explained what this thesis means when dealing with the architect (expert) perspective that participants are requested to take during the environmental evaluation and recognises that other interpretations are tenable but they fall outside the focus of this work.

The conceptual framework for analysing the evaluation of final design in this thesis allows the study of variables affecting the person whilst controlling for the stimuli. With regards to the personal constraints affecting preference, the model explores the effect of mood and attention shifts. The former is explored by asking participants to report their current mood (described in section 3.2.3) prior to the evaluation whereas the latter is achieved by manipulating the perspective participants are asked to take to perform the evaluation (described in section 3.4.3).

The concept of preference is operationalised in two different ways. The first utilises the informational variables approach (described in section 3.1) and the second explores affective appraisals in the form of emotional reactions to the stimuli (described section 3.2.3) in order to compare the benefits that each of the measurement approaches add to the study of preference.

The following chapters present four studies that address these issues. **Study 2** focuses on perceived environmental restorativeness and tests if this varies according to the perspective taken during the evaluation. **Study 3** tests the effects of perspective-taking on prospective preference using the traditional informational variables approach. In **Study 4** a case study of an office relocation explores the stability of preference and emotional reactions' ratings before and after a relocation. Finally in **Study 5** the effect of perspective-taking on the emotional reactions to and preference for different office environments is explored. An underlying factor of **Studies 4** and **5** is the evaluation of current mood prior to the evaluation. **Studies 2** and **3** explore participants responses to a CGR of a block of residential flats whereas **Studies 4** and **5** use office environments as their stimuli, the shift from

residential or domestic to non-residential stimuli is discussed in section 4.4 and the introduction to **Study 4**.

CHAPTER 5. STUDY 2 – PERSPECTIVE-TAKING AND PROSPECTIVE RESTORATIVENESS[14]

In chapter 3 the role of attention was described in general terms followed by one of the approaches used in environmental preference research, namely Attention Restoration Theory. As described in section 3.3.2, restoration works on the premise of cognitive expenditure as the by-product of person-environment transactions. Transactions that draw heavily on cognitive resources – reducing the individual to a state of directed attention fatigue (DAF) – will be likely to cause detriments to well-being; conversely, transactions that allow pleasant engagement will tend to foster well-being.

There has been a considerable amount of research stemming from Attention Restoration Theory (ART, Kaplan and Kaplan, 1989) which has studied the characteristics of restorative environments and experiences. The research in this area has mainly looked at the psychological characteristics that make experiences 'restorative' (e.g. Kaplan and Kaplan, 1989; Herzog, Black, Fountaine and Knotts, 1997) and at the restorative properties of different environments (e.g. Hartig, Book, Garvill, Olsson and Garling, 1996; Korpela and Hartig, 1996) using a variety of presentation formats (e.g. slides, video and in-situ).

Given that it has been shown that there are links between preference and restoration (e.g. Han, 2007; Hartig and Staats, 2006; van den Berg et al., 2007), the principles of psychological restoration could be used as a tool for architects, designers, developers and planners to test the strengths of final-design proposals with the public. As described in section 2.1, this is the design process stage where change comes at low cost and decisions can be made without commitment, making it the ideal stage for this.

Restoration principles could be used at all levels of the design process (architect/end-user dyad) but here their use at the macro-level of the process (planner-public) is highlighted: where there is less direct interaction between the

[14] Some parts of this study were presented at the Young Researchers' Workshop, 20th Conference of the International Association for People-Environment Studies, "Urban Diversities, Biosphere and Well-Being", 27th July-28th July 2008, Rome, Italy.

parties and restoration and visualisation could meet for the betterment of developments. Decision-making often includes specialist teams in charge of visualising the proposed options and conducting public consultations with city residents, i.e. beyond the stakeholders' level (e.g. Conniff et al., 2007; Schroth, Lange and Schmid, 2005), and it is at this stage where perceived restorativeness can be incorporated.

The way prospective restorativeness of new environments can be tested is via the same visualisation techniques used by architects to present final-design scenarios to the end user, which are on a par with current restoration and preference testing formats (e.g. slides, video). With regards to environmental simulation the literature is extensive (e.g. Appleyard, 1976; Bosselmann and Gilson, 1993; Marans and Stokols, 1993) and, as described in section 2.3, it has covered the different visualisation formats that architects use to present design.

Research findings regard static representations as valid representations of reality (e.g. Hull and Stewart, 1992; Stamps, 1990) whereas computer generated simulations (the architect's preferred method for communicating design) have shown different degrees of correspondence with their real counterparts depending on the degree of photorealism. The trend suggests that the more photorealistic the representation the closer the responses are to responses to real environments (e.g. Bergen et al., 1995; Daniel and Meitner, 2001). In this study this will be tested by asking participants to do a free-memory-recall-task in order to content analyse how they perceive the CGR.

As explored in the interviews with the architects (see section 2.5.4) the demand for visualisations and the advent of computing technology has resulted in photorealistic representations of final design at steadily decreasing costs and time (e.g. Bouchlaghem, Shang, Whyte and Gana, 2005) and they now form part of the design cycle process. The general assumption amongst architects is similar to that found in the research literature: the Computer Generated Render (CGR) is a good format for inferring responses to the end product as long as it is photorealistic.

As discussed in Study 1 and the conceptual framework (section 4.6), evaluating the consequences of being in an environment could be seen as one of the processes that go into the evaluation of any design. Nevertheless, just as with preference judgments, when it comes to perceived restorativeness there may be a discrepancy between what is restorative for the architect and the end user.

This study will test if perceived restorativeness varies as a function of the perspective taken at the time of the evaluation, i.e. evaluating the environment taking the perspective of an architect or a local resident, the latter being used as a proxy for the layperson. It is assumed that by asking participants to take the perspective of the local resident their self-knowledge of residential environments will be brought to their attention, whereas by asking them to take the perspective of the architect will focus their self-knowledge of what architects do when they evaluate design. As discussed in section 4.5, these perspectives are used in this thesis in order to study the influence that training has on environmental evaluation but this thesis acknowledges that some approaches have looked at the relationships between expert and non-expert perspectives in terms of power and political systems.

In the study described in the following pages participants are first asked to describe with words a CGR of a mainstream residential block of flats and then to evaluate it using the perceived restorativeness scales (PRS), from the perspective of a local resident or an architect in order to explore a) if perspective-taking has an effect on perceived restorativeness as measured through the PRS b) the extent to which participants take each of the perspectives (from completely to not at all), expecting that the perspective that is congruent with the participant's self knowledge (i.e. local resident) is taken to a greater extent that one that is incongruent with their self-knowledge (i.e. architect) and, c) how the participants relate to the CGR as shown through their descriptions of the image.

5.1 METHOD

The wording of the measures, layout of the testing booklet and experimental procedure were piloted and refined into the present setup.

Participants: 133 students from Aberdeen University took part in return for course credits. Participants were students of social and biological sciences with no formal training in architecture and built environment disciplines. There were 97 women (72%) and 36 men (28%). Participants' ages ranged between 17 and 54 years of age with a mean of 20 years.

Design: the study used a within-subjects design with two conditions manipulating the perspective taken at the time of the evaluation. The order of the two conditions was randomly presented.

Perspective-taking instructions: as the design suggest, there were two perspective-taking manipulations in this study. The selection of the perspectives corresponded to one of the most common comparisons used in the literature (described in section 4.4): experts vs. laypeople. The two perspectives were manipulated via the following written instructions that participants read prior to the experimental tasks:

Version A: the perspective of an architect:

> I would like you to imagine that there has been a design competition for a building and that you are the architect who will be judging it as part of an expert's panel set by the council. You are being asked to use your expertise as an architect to evaluate the qualities of the building based on this image.

Version B: the perspective of a local resident:

> I would like you to imagine that there has been a design competition for a building and that you are the local resident who will be judging it as part of a user group set by the council. You are being asked to use your knowledge as a local resident to evaluate the qualities of the building based on this image.

Apparatus: all participants were seated facing the front of a small classroom with only artificial lighting. When the stimulus was presented, the lights were turned off and the image was projected onto a wall screen. All seating positions afforded a clear and sharp view of the stimulus.

Stimulus: a photorealistic CGR of a mainstream residential block of flats was selected amongst a number of images donated to the author by a professional visualisation company[15]. These images were part of their visualisation archive, meaning that the selected visualisation was actually used to advertise to the

[15] The images were donated by Digitnm, a visualisation and 3d animation company based in Inverurie, Scotland.

client/end-user the environment represented in them. The CGR depicted the block of flats in midday sunlight, without litter or graffiti, portrayed a balance between urban and natural elements and clearly showed that the environment was lived in, see Figure 8.

Figure 8. Stimulus used for the evaluation of restorativeness based on perspective-taking.

Measures: the evaluation of restorativeness of the environment was made via the Perceived Restorativeness Scales (PRS) (Hartig, Kaiser and Bowler, 1997). These scales consist of 26 items with a seven point scale with a response range from not at all (1) to completely (7). Upon inspection of the visual stimuli the participants had to record the extent to which they agree or disagree with each of the statements (items), see Appendix 2.

As described in section 3.3.2, the PRS consists of five subscales that build on the restorative experience conditions: being away (BA) or psychologically distancing from usual routines and from having particular purposes; fascination (FA) or effortless attention as demanded by environmental attributes; coherence (COH) or the ease with which a person can understand a scene; compatibility (COM) or the match between personal inclinations and the environment; and legibility (LEG) or the inferred understanding of the environment.

The way participants processed the CGR was measured through a free-memory-recall task. All participants were given the following question after being presented with the stimulus on the wall screen:

"Thinking about the place you just saw, how would you describe it? Please use as many words as you can think of."

The results of this task were firstly processed using word frequency analysis, a simple count of occurrences for any given word, and then content analysed in order to generate aggregated categories where appropriate, i.e. whenever a synonymy was encountered such descriptors were added to a new but shared category (e.g. Robson, 2002; Scott, 2006), with the ultimate aim of exploring how the CGR was understood by the participants.

The manipulation of the perspective was checked using a single semantic differential that measured the extent to which the participant reported putting him or herself in the instructed perspective: "I put myself in the perspective of the architect/local resident" (see Batson et al., 1997; Galinsky et al., 2005; Sevillano et al., 2007). The responses were recorded on a 7 point scale going from 'not at all' to 'completely'. The full testing booklet can be seen in Appendix 2.

Procedure: participants were greeted and seated in the small classroom. They were all given a testing booklet (with either version A or B first randomly allocated) whose first page was a written consent form in which they learned the general tasks to be completed during the experiment. After signing the consent form, participants were asked to complete the general questions. After this was completed, participants were shown the stimulus projected on the wall screen for 30 seconds followed by some time to carry out the free-memory-recall task. When all participants had finished the recall task the first evaluation started and the stimulus was projected again until completion of the PRS ratings and the perspective-taking item. This was repeated one more time in the same way for the second evaluation. At the end of the second evaluation participants were debriefed and dismissed.

5.2 RESULTS

The data was firstly checked for the effects of gender or age, t-tests demonstrated that there were no significant effects of gender or age on the PRS data, $p>.05$. A second step before exploring the research questions consisted of running reliability analysis on the internal consistency of each of the PRS subscales for each of the perspective-taking conditions. Results showed good internal consistency for all but the coherence and legibility subscales, see Table 4 for the subscales' Cronbach's α

in each of the conditions. This is in keeping with earlier studies which have also found low reliabilities for these subscales (e.g. Ivarsson and Hagerhall, 2008).

	Cronbach's α	
	Architect condition	**L. res. condition**
Being away	.867	.890
Fascination	.885	.884
Compatibility	.860	.866
Coherence	.587	.625
Legibility	.698	.584

Table 4. Internal consistencies for each of the PRS subscales in each of the perspective-taking conditions.

Perspective-taking and environmental evaluation

Comparisons between the scores of the five subscales of the PRS scales according to the perspective taken were made using t-tests; Table 5 shows the mean and standard error for the subscales in each of the perspective-taking conditions. Results showed that perspective-taking had a significant effect on two of the five PRS subscales. Coherence (t (132)= 4.30, p<.05, r= .35) and Legibility (t (132)= 2.63, p<.05, r= .22) scores in the architect task (version A) were significantly larger than in the local resident task (version B), e.g. more coherence and more legibility.

	Perspective-taking	
	Architect M (SD)	**Local resident M (SD)**
Being away	4.04 (1.31)	4.19 (1.36)
Fascination	4.34 (1.21)	4.28 (1.17)
Compatibility	3.83 (1.35)	3.98 (1.30)
*Coherence**	5.39 (0.82)	5.10 (0.87)
*Legibility**	4.87 (1.09)	4.66 (0.97)

**differences significant at p < 0.05*

Table 5. Descriptive statistics for the PRS subscales for each of the perspective-taking conditions.

Extent to which participants took each perspective

The item checking the extent to which participants took a perspective showed that there was a significant difference (t (132)= 6.63, p<.05) between taking the

perspective of the architect (*M*= 4.78, *SE*= 0.13) and taking the perspective of the local resident (*M*= 5.61, *SE*= 0.11), i.e. participants reported taking the perspective of the local resident to a greater extent than the perspective of the architect, see Figure 9.

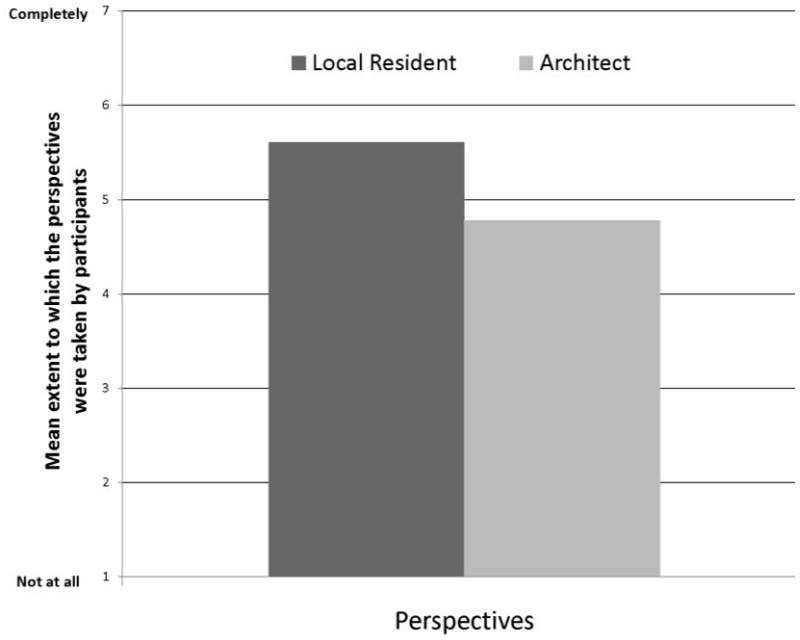

Figure 9. The mean extent to which participants took each of the manipulated perspectives.

General understanding of the environment

The word frequency analysis, which is a count of occurrences for any given word, indicated a general overview of how the image was perceived. Participants generated 1062 words in total with an average of 8 words (*M*=7.98) per participant. Table 6 shows the 20 most frequently used descriptors for the image (Galán-Díaz, 2005), frequency is the number of participants (N=133) using the same descriptor. However, the word frequency ranking may not be representative of the data: (a) the data in such form only accounts for 50% of the total output of descriptors and (b) these data does not consider synonymy (the cases in which the same idea is conveyed using different words.

	Descriptors	Frequency
1	MODERN	70
2	CLEAN	68
3	NEW	44
4	EXPENSIVE	41
5	BRIGHT	37
6	NICE	30
7	QUIET	26
8	PEACEFUL	25
9	TIDY	24
10	GREEN	22
11	SUNNY	20
12	PLEASANT	19
13	SAFE	19
14	FRIENDLY	18
15	POSH	14
16	WELCOMING	13
17	CALM	12
18	COLOURFUL	12
19	HOMELY	11
20	BIG	10
	Total	**535**

Table 6. The 20 most frequently used descriptors of the image used as stimulus for the experiment.

In order to account for these limitations the data was content analysed and aggregated categories were generated where appropriate, i.e. whenever a synonymy was encountered such descriptors were added to a new but shared category. The new categories then accounted for 75% of the total output of descriptors for the CGR. Table 7 shows these categories, the frequencies express the number of participants who contributed to the category subtotal.

	Descriptors	Frequency
1	**WELL-KEPT** (e.g. tidy, neat, well-kept, neat, clean, well maintained, pristine)	115
2	**NICE** (e.g. nice environment, aesthetically pleasing, pretty, attractive)	97
3	**QUIET** (e.g. quiet, calm, serene, peaceful, laid back, relaxing, tranquil)	88
4	**COLOURFUL** (e.g. sunny, bright, colourful, light, shiny)	81
5	**MODERN** (e.g. contemporary, sophisticated, modern)	75
6	**EXPENSIVE** (e.g. expensive-looking, rich, affluent, luxurious, wealthy, expensive)	69
7	**NEW**	48
8	**INVITING** (e.g. welcoming, friendly, inviting)	48
9	**FANCY** (e.g. posh, fancy, fashionable, pretentious, stylish, upmarket)	40
10	**GREEN** (e.g. grassy, greenery, garden, vegetated, green)	35
11	**WARM** (e.g. cosy, homely, warm)	29
12	**SAFE** (e.g. secure, safe)	26
13	**SPACIOUS** (e.g. big, open, spacious)	25
14	**FLATS** (e.g. apartments, housing, flats)	14
	Total	790

Table 7. Resulting categories based on content analysis of original descriptors of the experimental stimulus.

The clustered data clearly described the image shown to the participants, categories one to six (well-kept, nice, quiet, colourful, modern) included descriptors used by at least 50% of the participants at any given point. Categories seven to 10 were used by at least 25% of them and, categories 11-14 account for 10% to 25% of the participants.

5.3 DISCUSSION

Results showed that prospective restorativeness significantly differed according to the perspective-taken at the moment of the evaluation in two of the PRS subscale scores. When participants took the perspective of the architect their results showed increased scores of Coherence and Legibility relative to those found when they took the local resident perspective.

In other words, asking people to reduce their self-serving biases by asking them to take the perspective of an architect (as opposed to the perspective of the local

resident) resulted in an increase of the scores used to measure the perceptual understanding of the environment (shown by PRS' Coherence and Legibility subscales). BA, FA and COM scores did not vary as a function of perspective-taking, suggesting that these subscales appeal to the properties of the environment that would be perceived regardless of the perspective.

These results must be taken with caution, given that the internal reliability of the COH and LEG subscales were below the conventionally allowed threshold of 0.7 and this may be related to the fact that those were the scales where the statistics significally differed. As such, this study should not be taken as conclusive but supportive evidence of the perspective-taking effects on prospective perceived restorativeness.

The extent to which participants reported taking a perspective showed that participants put themselves in the local resident perspective to a greater extent than the perspective of the architect. This confirmed the expected direction of this test: the local resident perspective was more congruent with the participants' self-knowledge, being local residents of an exemplar of residential architecture, than with the likelihood of putting themselves in the perspective of the architect evaluating the stimulus as part of an experts panel.

The descriptors of the photorealistic CRG showed that participants clearly perceived it to be a new block of flats and that they related to it without problems. Interestingly, some of the participants' descriptors of the building indicated that the CGR conveyed meanings that went beyond the physical properties, e.g. 'expensive', 'fancy'.

One of the limitations of this study was that participants were not given specific instructions with regards to the characteristics of the local resident or architect perspective they were asked to take. This was based on the rationale that taking the perspective of *any* local resident or architect would prompt participants to dwell on or reduce their reliance on self-knowledge, respectively. It was expected that the former was congruent with participants' self-knowledge, i.e. they were local residents, whereas the latter was assumed to be incongruent, i.e. they were not architects.

The study is also limited because it did not test perceived restorativeness for different scene types, commonly referred to as environmental sampling, and did not

ask participants to state their preference for the environment according to each of the perspectives. Finally, through this study research design it was not possible to test for the influence of formal training in Architecture and Built Environment on perceived restorativeness.

5.4 CHAPTER SUMMARY

In general, results indicated that prospective environmental restorativeness, as measured with the PRS, can be affected by the perspective-taken at the time of the evaluation. More specifically, the significant effects of perspective-taking were found on the Coherence and Legibility scores, perceptual components of perceived environmental restorativeness, sub-scales which routinely report mixed levels of internal reliability (e.g. Ivarsson and Hagerhall, 2008) and that are considered acceptable in so far that psychometric testing is not the primary goal of the study. For the purposes of this study, the results are taken as evidence towards the effects that perspective-taking can have on perceived restorativeness.

The study also found that participants reported taking the perspective of a local resident to a greater extent than the perspective of the architect; this is explained through the participants' assumed self-knowledge as this would influence how they took perspective (Nickerson, Baddeley, and Freeman, 1987), i.e. being a local resident is congruent with most people's self-knowledge whereas being in the perspective of an architect is not (it is incongruent).

By using an example of visualisations already used in the evaluation of final design this study showed that perceived environmental restorativeness can be assessed without further modifications of the visualisations already used by architects and designers. Participants were able to recall and describe the environment depicted in the CGR and did not question its validity, e.g. there was no indication of people challenging its 'realness' or feasibility. These results confirm the claims by architects and the literature reviewed in section 2.3 on the validity of photorealistic CGRs for the presentation of design, but also show that CGRs do communicate meanings that go beyond the physical properties of an environment, e.g. 'fancy'.

Nevertheless, those visualising final design will invariably present it as immaculate and this is likely to increase the prospective restorativeness of the

environment by default (ideal versus real), i.e. they will not invest time and money in visualising weathering and usage effects. This flexibility with regards to the level of customisation of the visualisation of final design could also be used for better restorative experiences, i.e. maximum environmental stylisation. However, maximum stylisation of the representations is disputable as it can come at the expense of virtual to real transfer-effects, i.e. the representation no longer corresponds to a feasible future environment.

The following chapter presents a replication of this study using informational variable measurements commonly used in environmental preference research (via semantic differentials). Study 3 includes a sample of architecture students (with at least four years of formal training) that are compared against a sample of students with no training in these disciplines in order to check for differences between the perspective-taking effects and actual differences between the groups.

CHAPTER 6. STUDY 3 – PERSPECTIVE-TAKING AND PROSPECTIVE PREFERENCE

Study 2 tested the effects that perspective-taking has on perceived environmental restorativeness. Perceived environmental restorativeness builds on variables described as informational and is closely linked to how demanding, in cognitive terms, an environment is on the attentional or perceptual mechanisms (described in section 3.3.2).

This study builds on the results of Study 2 by including a discrete measure of environmental preference and a comparison group in order to check what, if any, the effects of different perspectives are on the evaluation of the environment. Moreover, whilst reflecting on these results it became apparent that the previous evaluation did not include a measure through which likely behaviour with respect to the environment could be inferred.

Building on these results, this study focuses on the relationship between perspective-taking and preference using the informational variables approach (described in section 3.1) using the same experimental design and stimulus as Study 2 under section 5.1. The measures this time tap into aspects of perception of aesthetics and exposure or familiarity to the stimulus, these have been reported as predictors of preference in previous research (e.g. Imamoglu, 2000; Kaplan et al., 1989). The questionnaire also includes a measure of behaviour intention that addresses the prospectiveness of the experimental situation.

It is expected that participants will rate the environment according to the perspective-taking assigned in each task. More specifically, it is hypothesised that taking a perspective would have an impact on how the environment is evaluated in the following way: taking the perspective of the architect should result in an increase in familiarity and a drop in beauty, pleasantness, simplicity, ornamentation, arousal, purchase behaviour and novelty of these flats with respect to existing developments. This is shown in Table 8, a plus (+) and a minus (-) sign indicates that higher and lower values are expected.

Item	Perspective	
	Local resident	*Architect*
Beautiful-ugly	+	-
Pleasant-unpleasant	+	-
Simple-complex	+	-
Plain-ornate	+	-
Familiar-unfamiliar	-	+
Exciting-boring	+	-
Like-dislike	+	-
Comparison to existing developments	+	-
Purchase behaviour	+	-

Table 8. The semantic differentials used to assess environmental perception, preference and behaviour intention.

The assumption that architects, and therefore taking the perspective of one, will be more likely to be negatively biased towards the stimulus is based on the rationale that architects will see a block of mainstream flats as *ordinary* whereas the inverse would be true for the perspective of the local resident. Indeed, research findings have shown that familiarity plays a significant part in preference choices (Pedersen, 1978; Kaplan and Kaplan, 1989; Imamoglu, 2000) and, more importantly, that the relationship between familiarity and preference may not be linear but that of an inverted-U relationship (Craig, Conniff and Galan-Diaz, 2008).

In other words, liking an environment is a function of how familiar or novel it is for the person across time: familiarity with an environment will be associated with increased preference and extreme levels of familiarity, i.e. boredom, will be associated with lower preference (familiarity breeds contempt). It is expected that the stimulus will be familiar but exciting enough to be liked when the local resident perspective is taken and overtly familiar or boring when in the perspective of the architect: less liked.

The effects of perspective-taking for familiarity and preference scores will be checked by comparing one group of participants with architectural training in the perspective of the architect (their congruent perspective due to their training) against a sample of participants with no training in the perspective of the local resident (the congruent perspective for this group); the same pattern of results as in the perspective-taken scenario within groups are expected.

6.1 METHOD

Participants: in line with the rationale explained in the previous section, regarding the differences between training and no training on environmental preference, a total sample of 146 people were gathered. 121 were students with no training in the built environment disciplines (81 women, 67%, and 40 men, 33%). The remaining 25 (14 men and 11 women) were students with at least 4 years of formal architectural training.

Design: the study used a within-subjects design with two conditions manipulating the perspective taken at the time of the evaluation. Version A prompted the participants to take the perspective of an architect and Version B prompted the participants to take the perspective of a local resident. See section 5.1 for the exact wording of the instructions.

Apparatus: all participants were seated facing the front of a small classroom with only artificial lighting. The stimulus was presented projected onto a wall screen. All seating positions afforded a clear and sharp view of the stimulus.

Stimulus: the same stimulus as in the previous study: a residential block of flats in CGR format.

Measures: Nine 9-point semantic differential scales, out of which seven were chosen to explore the following environmental attributes: *beauty* (beautiful-ugly), *pleasantness* (pleasant-unpleasant), *complexity* (simple-complex), *ornamentation* (plain-ornate), *familiarity* (familiar-unfamiliar), *arousal* (exciting-boring) and *preference* (like-dislike) (see Pedersen, 1978; Kaplan and Kaplan, 1989; Imamoglu, 2000; Craig, Conniff and Galan-Diaz, 2008)

Of the remaining two items one explored the comparison of the proposed block of flats with trends in recent local developments (*comparison*) – a further measure of familiarity: “to what degree do you feel that the proposed design is worse or better than other developments being built in and around Aberdeen City in the recent years?” The scale points ranged from much worse to much better. The last item dealt with purchase behaviour intention (*purchase*) with the following question: “Imagine that money is not an issue, will you purchase a flat in such a place?” The

response scale ranged from definitely to not at all, (a response sheet can be seen in Appendix 3)

Procedure: participants were seated in a medium sized classroom. They were all given a testing booklet (with either version A or B first randomly allocated) whose first page was a written consent form in which they learned the general tasks to be completed during the experiment. After signing the consent form, participants were asked to complete some general questions. After this was completed, the lights were turned off and the stimulus was projected until completion of the nine semantic differential scales. This procedure was followed for each of the perspective-taking tasks. At the end of the second evaluation participants were debriefed and dismissed.

6.2 RESULTS

The first analysis was conducted on the main sample participants' data. The only significant differences as the result of perspective-taking were found in the familiarity scale: when participants took the perspective of the architect they rated the environment as significantly more familiar (M= 3.93, SE= 0.196) than when they took the perspective of the local resident, M= 4.42, SE= 0.212, t (98)= -2.31, p=.023, r= 0.23. Figure 10 shows the scores' means for each perspective, lower scores mean more beauty, pleasantness, simplicity, ornamentation, familiarity, arousal, preference, more inclined to purchase such a property and that the proposed design is much worse than other developments.

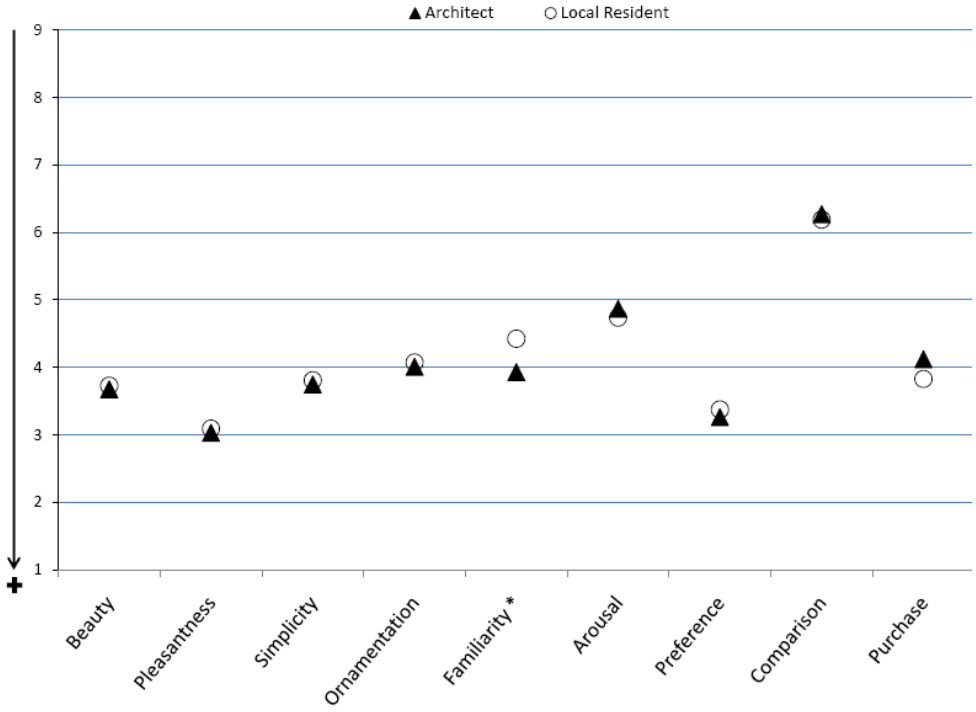

Figure 10. Overall means for the items measuring perception of aesthetics, preference and behaviour intention according to the perspective taken.

The second analysis was concerned with the comparison between the responses of the participants *with architectural training* taking the perspective of the architect and the participants with *no training* taking the perspective of the local resident. The nine measures were compared with training or no training as the independent variable using independent samples t-tests, one for each of the item comparisons.

Results showed that there were significant differences (*p<0.05) in five of the measures; participants with architectural training (n=25) taking the perspective of the architect (a congruent perspective due to their formal training) saw the environment as significantly less beautiful, less pleasant, more familiar, less preferred and were less inclined to purchase such a property than the participants with no architectural training (n=121) taking the perspective of the local resident (a congruent perspective for the non-trained participants), see Figure 11.

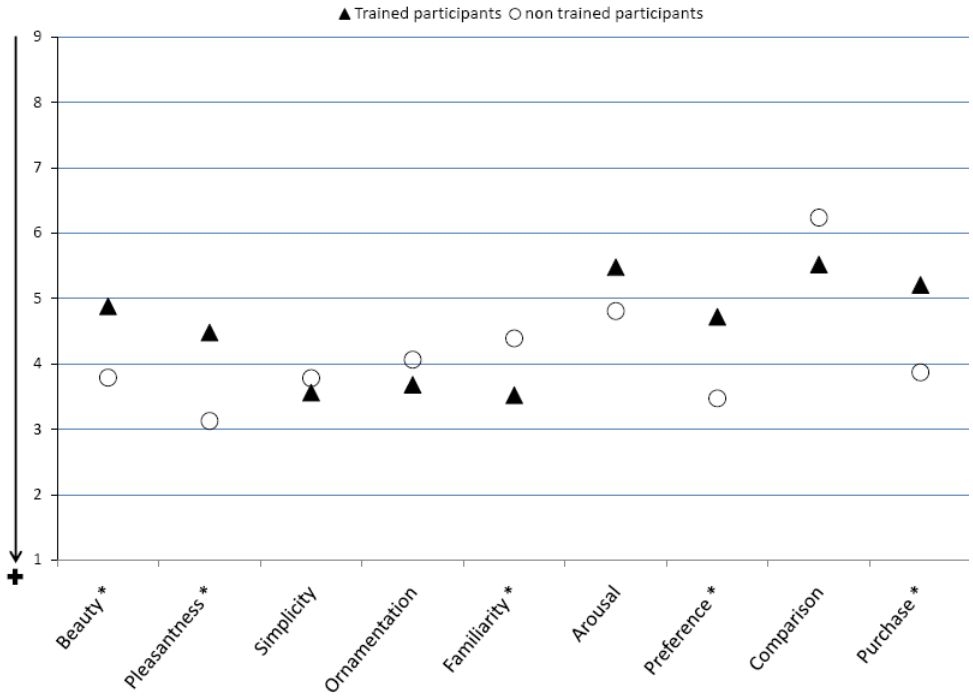

Figure 11. Scores for each of the measures when comparing people with architectural training versus people with no training.

The third analysis was concerned with how closely the trained and non-trained participants resembled each others' scores when taking the perspectives. The first comparison showed that non-trained participants' scores taking the perspective of the architect were only similar to the trained participants taking the architect perspective in the following measures: *complexity*, *ornamentation*, *familiarity* and *arousal* measures. The second comparison showed that trained participants' scores taking the local resident perspective were the same as the scores of non-trained participants taking the local resident perspective in all of the measures. Table 9 shows the means and significance values, significant differences mean no agreement of scores.

	Architect perspective			**Local resident perspective**		
	Non-trained (n=107)	*Trained (n=25)*	*Sig. (2-tailed)*	*Trained (n=25)*	*Non-trained (n=109)*	*Sig. (2-tailed)*
Preference	3.27	4.72	**.001**	4.21	3.47	.105
Purchase	4.05	5.20	**.028**	4.67	3.87	.155
Comparison	6.28	5.52	**.037**	5.93	6.24	.277
Beauty	3.69	4.88	**.001**	4.33	3.79	.154
Pleasantness	3.03	4.48	**.000**	3.83	3.12	.084
Complexity	3.77	3.56	.560	4.21	3.47	.890
Ornamentation	4.02	3.68	.351	3.83	3.78	.642
Familiarity	3.93	3.52	.306	3.92	4.39	.236
Arousal	4.86	5.48	.188	4.75	4.80	.904

Table 9. Trained vs. non-trained group comparisons in each of the perspective-taking tasks.

Finally, the relationship between preference and the rest of the items was explored via Pearson moment correlations. The results showed that there were significant correlations between *preference* and *purchase behaviour intention*, *comparison to recent developments*, *beauty*, *pleasantness* and *arousal* in both non-trained and trained participants, as shown in Table 10.

	Non-trained participants		**Trained participants**	
	Architect (n=107)	*Local resident (n=107)*	*Architect (n=25)*	*Local resident (n=24)*
Purchase	.650**	.704**	.825**	.703**
Comparison	-.594**	-.450**	-.769**	-.423*
Beauty	.834**	.772**	.934**	.941**
Pleasantness	.837**	.869**	.925**	.915**
Complexity	.089	.077	.328	.354
Ornamentation	-.213*	-.090	-.059	.244
Familiarity	.134	.065	.219	.528**
Arousal	.718**	.729**	.778**	.737**
*correlations significant at ** p < 0.01 * p < 0.05 (2-tailed)*				

Table 10. Correlations between preference and the remaining eight items for both trained and non-trained participants in each of the perspective-taking conditions.

Moreover, some of the scores in the incongruent perspective groups were inconsistent with their counterpart in the congruent perspective group. Namely, the scores of non-trained participants taking the perspective of the architect showed a medium negative correlation between *ornamentation* and *preference* and, the trained participants' scores taking the perspective of the local resident showed a large correlation between *familiarity* and *preference*.

6.3 DISCUSSION

The study tested if taking a perspective would have an effect on the evaluation of the same environment. The measures were selected based on common environmental preference predictors (*beauty, pleasantness, complexity, ornamentation, familiarity and arousal*) but also included two further measures, a purchase behaviour intention (*purchase*) and a comparative item (*comparison*) or the extent to which the presented stimulus was seen as better or worse than recent developments.

The results of the first analysis, using the sample of non-trained participants, showed that taking a perspective produced significant differences in the perception of *familiarity*: taking the perspective of an architect resulted in increased scores of familiarity with the stimulus. This result was in line with the general expectations about the effects of taking a perspective. However, the rest of perspective-taking effects expectations were not met, taking the perspective of the architect was expected to result in a drop in *beauty*, *pleasantness*, *simplicity*, *ornamentation*, *arousal*, *purchase behaviour* and *novelty*.

The second analysis focused on group comparisons between trained and non-trained participants in order to explore differences as the result of training instead of perspective-taking effects. This showed that there were significant differences between groups in the following scales: *beauty*, *pleasantness*, *familiarity*, *preference* and *purchase behaviour intention*. Thus, based on training differences, trained participants perceived the stimulus as less beautiful, less pleasant, more familiar, preferred it less and reported being less inclined to purchase it than the participants with no training. These results were in line with the results expected for the perspective-taking effects. The implications of the item on *purchase behaviour intention*, although statistically significant, should be further explored and taken as only an 'intention': as there are issues of ecological validity whereby samples of students cannot be taken as representative of the home buying population.

The third analysis tested how similar the scores of each group taking their incongruent perspective were when compared between them. Results showed that non-trained participants' scores when taking the perspective of the architect were similar to the scores of the trained participants taking the perspective of the architect in only half of the measures of the trained group, whereas the trained participants' scores taking the perspective of the local resident were all the same as those of the non-trained participants taking the perspective of the local resident.

Finally, the results of the correlations between preference and the rest of the measures in the congruent perspectives of each group were the same, high and significant correlations in the following items: *purchase intention*, *beauty*, *pleasantness* and *arousal*. There was also a significant correlation between the *comparison item* and *preference* (the better the flats were perceived to be in comparison to recent developments, the higher the preference) but the size of the effect was modest. This indicates that both trained and non-trained participants actually relied on the same cues for their preference, a result that does not fit what

has been reported by Gifford et al. (2002), the reasons behind this could be due to generic stimulus.

A limitation of this study was, similarly to Study 2, on the use of a generic stimulus (mainstream housing in the form of flats) given that, as such, responses to a generic stimulus may only be generic or universal: narrowing the potential perspective-taking differences. Even though the between-group comparisons showed effective discrimination (training does have an effect on the perception of the stimulus) future studies would benefit from including a range of stimuli for environmental sampling purposes, for example the inclusion of more than one type of design so that effects of different meanings imbued in the image can be checked.

The study could also be limited as it used trained participants as a proxy for architects. As discussed in section 4.5, the research literature indicates that it is safe to assume that after four years of architectural training the views of these trained participants have been already influenced by their professional education. In order to circumnavigate this issue, the study used 25 students of architecture, which in comparison to some studies (e.g. Akalin et al, 2009) is relatively low but other studies (e.g. Gifford et al, 2001) the number of trained participants is similar. Future studies on the differences between experts and laypeople will benefit from the inclusion of actual architects, better ratios between trained and non-trained groups or by ensuring that they are as ecologically valid as possible for the study purposes.

6.4 CHAPTER SUMMARY

This study replicated Study 1 using traditional informational variables as an alternative to exploring perceived environmental restorativeness, it also included a measure of purchase behaviour intention. Results showed that for the non-trained participants perspective-taking only had a significant effect in the reported *familiarity* to the stimulus, this was in line with the expectation that excessive familiarity would impinge on preference (Imamoglu, 2000).

The between group data (trained vs. non-trained participants) showed that first, non-trained participants significantly differed from trained participants in five measures: *beauty*, *pleasantness*, *familiarity*, *purchase* behaviour intention and *preference*. Second, non-trained participants' scores when taking the perspective of the architect were only similar to half of the trained participants' scores taking the

perspective of the architect. Third, trained participants' scores taking the perspective of the local resident were the same as the scores reported by the non-trained participants taking the perspective of the local resident in all of the measures.

Correlations for each of the groups revealed that preference was significantly related to the same measures in each of the groups (namely, *purchase* behaviour intention, *comparison* to recent developments, *beauty*, *pleasantness* and *arousal*), thus what differed between trained and non-trained participants was the value they assigned to each of the measures.

Up to this point the data from the interviews with the architects and the two studies have consistently shown that first, CGRs are an adequate format for environmental evaluations (whether testing for perceived restorativeness or prospective preference). Second, perspective-taking could be a viable mechanism for influencing environmental perception if the perspective to be taken is congruent with the perspective-taker's self-knowledge. That is, asking trained participants to take the perspective of a local resident is ecologically valid whereas asking non-trained participants to take the perspective of an architect is not, yet this scenario allows the study of how laypeople may behave when taking the perspective of the expert (Bromme, Rambow and Nuckles, 2001)

In line with these findings, and the confirmation that participants rely on self-knowledge through the between group comparisons in this study, the following chapter will deal with a case study where staff relocating to new office premises evaluate their perceptions and reactions to the new environment. First based on the final-design CGR and floor-layouts (prospective) and at two subsequent times after occupying the new building (in-situ).

CHAPTER 7. STUDY 4 –THE STABILITY OF PREFERENCE OVER TIME AND ITS RELATIONSHIP WITH EMOTION: A CASE STUDY

Chapter 3 showed how the literature on environmental preference has studied a range of predictors that increase or decrease the likelihood of an environment being favoured. These studies have usually relied on photographic stimuli of existing environments that participants rate once they are presented with them, via slides for example (e.g. Nasar, 1983). Another major strand of research has used simulations of environments, for example: sketches, drawings, models, computer generated renders and photomontage (e.g. Daniel and Meitner, 2001).

The rationale for these approaches could be broadly described as the prediction of environmental preference to either understand peoples' preferences or to evaluate the viability of future environments (e.g. Appleyard, 1976; Marans and Stokols, 1993). Up to this point the studies in this thesis have tackled both of these issues as well as exploring the perspective-taking mechanism: Study 2 centred on perspective-taking and perceived restorativeness and Study 3 focused on perspective-taking and the preference for and environmental evaluation of a proposed block of flats as represented using a photorealistic CGR.

These two studies have explored these issues using experimental setups where simulations of environments in the form of computer generated renders have been presented to the participants. The results have been in line with the literature in the field: representations are valid inferential tools for studying environmental evaluations (e.g. Danford and Willems, 1975; Daniel and Meitner, 2001; de Kort, IJsselsteijn, Kooijman and Schuurmans, 2003; Stamps, 1990; Stewart, Middleton, Downton and Ely, 1984).

Even though there is a strong research base for the simulation of feasible new environments in a variety of built environment contexts (e.g. Higgs, Berry, Kidner and Langford, 2008; Marans and Stokols, 1993; Pietsch, 2000), after conducting a review of the literature, to the best knowledge of the author the stability or variability of these responses in the real world have not been studied from the prospective phase (final-design) to the occupation of new premises (in-situ).

The impacts that environmental change might have on the occupants of a building are normally studied under the realm of post-occupancy evaluations (POE). A post-

occupancy evaluation is the *"examination of the effectiveness for human users of occupied designed environments"* (Zimring and Reizenstein, 1980, p. 429) and thus focuses on the users' experience of the performance of the environment they are occupying. Ideally, post-occupancy evaluations are supposed to take place in the last stage (Stage L) of the Plan of Work (discussed in section 2.1), but in practice this is not always the case (e.g. Cooper, 2001; Hadjri and Crozier, 2009).

An area where a wide range of issues with regards to environmental preference has been studied is that concerning the post-occupancy evaluations of work environments, in particular office environments. As explained in Chapter 4, this thesis comes into contact with this particular scenario of presentation of design in a serendipitous way that is capitalised upon: the opportunity to test some of this thesis' research interests in the real world as opposed to their experimental emulation. While it is inevitable that the researcher must compromise on experimental control in some areas, the advantages gained come in the form of enhanced ecological validity.

The studies of office environments have looked at the relationships between job related issues and the physical properties of the environment, for example job satisfaction, job performance, collaboration, communication and subjective well-being (e.g. Lee and Brand, 2005; O'Neill, 1994; Veitch, Charles, Farley and Newsham, 2007; Sundstrom, Town, Brown, Forman and Mcgee, 1982). The overarching issue linking research on office environments is concerned with how office design, i.e. the environment, may impact on a variety of processes at the individual level, e.g. preference, satisfaction, etcetera.

An area of continued debate is concerned with the impacts open-plan offices have on their occupants, as they are the commonly chosen design driven by financial factors, open-plan design (with few or no cellular offices) is often more cost-effective than traditional offices based around cellular or individual offices. The physical changes from traditional to open-plan design have been routinely reported as having some detrimental consequences, for example loss of privacy, increase of noise and distractions (e.g. Becker, Gield, Gaylin, and Sayer, 1983; Brookes and Kaplan, 1972; Sundstrom, Town, Rice, Osborn, and Brill, 1994).

In line with these objectives, a literature search looking for longitudinal studies on office environments was undertaken. Three exemplar studies are described below:

Sundstrom, Herbert, and Brown (1982), Stokols, Churchman, Scharf, and Wright (1990), and Brennan, Chugh, and Kline (2002).

Sundstrom et al. (1982) studied the relocation of staff (N=70) from a traditional to an open plan office. The study design allowed them to compare measurements between six months before the move and six weeks after occupation of the new premises. Their variables centred on employees' self reports measured through different scales related to work satisfaction, namely: visual and auditory privacy, communication (in terms of ease of access to colleagues), noise (in terms of perception of quietness/loudness of the office environment) and workspace utility (an index measure of perceived adequacy, pleasantness, usefulness, satisfaction and productivity); as well as the Articulation Index, a tangible auditory measure related to speech/environmental privacy measured in decibels.

Their results showed that the open plan office evaluation presented a reduction of visual, auditory privacy and speech privacy but, regardless of these negative changes, that the perception of noise remained the same. The perception of workspace utility was rated "as high as in the earlier office" (p. 390). The authors highlight that, contrary to expectations that open plan design will have a negative impact on communication, satisfaction about communication at the workplace did not change.

Stokols et al. (1990) studied employees before and six to 12 months after they went through different levels of experiences of change at the workplace: no renovation/no relocation, on-site renovations, short distance relocation, long distance relocation. The study centred on two main axes namely (a) the relationship between varying levels of environmental change and health, behavioural and organisational outcomes and (b) the role that personal and situational factors have as moderators of these changes. The two main hypotheses were: as environmental change increases so does the negative impact on health, behavioural and organisational outcomes and; the more positive the individuals' desirability of change and exploratory tendencies for new environments the more positive and fewer negative consequences of environmental change would be reported.

Their results showed that the first hypothesis was not supported as different levels of environmental change were not associated with different levels of disruption: all staff involved suffered disruptions in their everyday interactions with peers. Contrary to expectations, higher environmental change produced more

positive health, behavioural and organisational outcomes. The second hypothesis was supported to the extent that respondents who were looking forward to the renovation/relocation reported better health, less stress and more favourable ratings of the social environment. Overall, their study suggested that an office renovation or relocation may be equally disruptive and that both can generate a range of positive benefits (e.g. improved physical and social environments).

Brennan et al. (2002) focused on the relocation from a traditional to an open plan office focusing on the impacts on workers' satisfaction and productivity. Their study design included repeated measures across time (prior to the relocation, one month and six months into occupation of the new environments) to follow variations as people settled into the new environment.

The results from their longitudinal data (same participants in each of the three surveys) showed that participants in the open plan office were less satisfied with its physical environment (functionality and design), physical stressors (perception of environmental comfort: lighting, noise distractions, etcetera), team member relations (e.g. team cohesion and accessibility from/to others) and self report of job performance (e.g. achieving tasks, staying focused). These findings were constant between one month and six months after relocation, suggesting that behavioural and psychological adaptation to new work environments is slow.

The common denominator in these three studies is that they try to capture the transition that individuals go through when environmental changes take place. In general, the transition to an open plan office reported in these studies was characterised by a loss of general privacy. In two of the studies this was accompanied by an improvement in the physical environment but it is not possible to assert that this actually outweighed the perceived detrimental changes. The main suggestion is that while the physical transitions are relatively quick, the psychological or behavioural transitions are not.

This chapter presents a case study where the process of an office relocation is followed from the presentation of final-design to the occupation of the environment, allowing the assessment of staff's own prediction of expected reactions and then monitoring this at two subsequent evaluations. This design makes it possible to test relationships between people's own predictions of future reactions towards final design, based on a CGR and floor layouts, and their actual preferences (in-situ).

An overarching working hypothesis concerns how stable are staff's responses (see *Measures* in section 7.1) to the new environment based on the evaluation of the CGR and floor layouts when compared to the in-situ evaluations. Driven by the literature concerning the correspondence between photorealistic representations and the real world (Daniel and Meitner, 2001) it is expected that the following responses, based on the CGR and floor layouts, do not change over time: control, overall comfort, interior aesthetics, overall preference and satisfaction for the office and building.

The perception of environmental comfort (visual and conversational privacy and noise insulation) is expected to decrease over time, as this tends to be reported as the typical detrimental factor resulting from transitions to open-plan office environments (see Brennan et al., 2002 and Sundstrom et al., 1982).

With regards to this thesis' research questions, namely the emotional component of people-environment relationships described in section 3.2.2, it is expected that mood at the time of the evaluation and the emotional reaction staff have to the work environment will have an effect on their preference for it. There are no specific hypotheses with regards to the interaction between time and mood and time and emotional reactions.

7.1 METHOD

This case study took place at a modern university in Scotland planning to build a new campus by 2015. At this particular stage thee departments were relocated to a new campus, two of the departments were moved 3 miles (4.7km) south-east and one of them only moved from an adjacent building. The departments hosted a varied distribution of duties, namely: clerical, technical, administrative, financial, estates, management and executive responsibilities.

The existing facilities that staff were moving from had a varied composition. Prior to the move the departments were located at different buildings whose construction dates were 1884, 1960 and 2001 (departments A, B and C respectively). At the time of the relocation announcement, the vast majority of staff were already working

at a variety of shared and open-plan[16] offices except from those at managerial/ executive levels who had individual offices.

Generally speaking most of the staff had had the same working environment up to this relocation process (with the exception of department C which had been relocated in 2001). In other words, the geographical location of the departments within the University had remained stable over the years and, in line with organisational objectives, most of the departments had undergone physical refurbishments in order to maintain the building stock.

The research possibilities were discussed with the Estates Department specialists. As described in section 4.4, it was agreed that the aims and scope of this study would revolve around the perceived environmental dimensions of the relocation, to compliment a Post Occupational Evaluation (POE) which the University undertakes as part of their ongoing estates and facilities plan.

The combination of the organisation requirements, the existing literature and the interests of this thesis resulted in a questionnaire that explored the following areas: self-reported measure of current mood, perceived environmental control, perception of comfort, emotional reaction to, satisfaction with and preference for the workplace. These questions are explained in the *measures* section, see below.

The data was collected via an online questionnaire in order to minimise disruption to staff and to allow them as much flexibility as possible to provide their feedback. The questionnaire was designed following best practice recommendations for online research (see British Psychological Society, 2007; Dillman, Tortora and Bowker, 1998; Hewson, 2003; Huang and Liaw, 2005; Toepoel, Das and Van Soest, 2009,) with the exception of a back button or the ability to save progress. The reasons for these constraints were threefold: to avoid participants changed their responses; to maximise data integrity (as clicking 'next' submitted responses to the remote server); and to ensure people put the time aside to give their feedback (as they were granted time by the university during their working hours to do so).

[16] Open-plan has been defined as a space with a minimum of five users sharing the same physical space, where the latter does not have hard boundaries with which the user can generate privacy

The online questionnaire was piloted using 10 people. After minor amendments the resulting electronic questionnaire took between 15 and 30 minutes to complete and was distributed via email to all employees involved in the relocation. The invitations with the link to the questionnaire were distributed two weeks prior to the move, three and six months after relocation (May, September and December 2008, respectively).

*Participants***:** out of 87 potential employees data for 32 participants was gathered for all three questionnaires (response rate = 37%). The participants were representative of the job types (managerial 31%, clerical 41% and other specialised jobs 28%), gender composition (women 59% and men 41%, the over-representation of women replicates the existing female to male ratios) and years of service (from less than a year to over 10 years).

Design: the study used a within-subjects with repeated measures design: time 1 or prospective ratings *before* the relocation, time 2 or ratings *after* three months from occupation and time 3 or ratings after six months from occupation.

Apparatus: staff participated using their work desktop computer using the internet connection and web browser. Given that computer monitors may be set at different resolutions, the questionnaire was designed on an 800x600 pixels template. All visuals (floor layouts and CGR of the exterior of the building) used in the questionnaire were constrained to 640x480 pixels.

Visual stimuli: the questionnaire used the two visuals: a CGR of the facade of the new building to assess the prospective preference for the exterior of the building, and the floor layouts for the interiors. The CGR was a photorealistic photomontage produced by the design team who procured the building; it depicted the new building in its site and portrayed the everyday *scene* that users could expect. The floor layouts were void of extensive architectural details i.e. only included general layout details such as desks, meeting rooms, bathrooms, etcetera.

The choice of these visualisations replicated the way the new environment was communicated to the end-users during the relocation process. It confirms the issues unearthed during the interviews with the architects (section 2.2.) about the presentation of design to the layperson in commercial architecture: people were presented with an end-product that they have no had direct interaction with. Figure

12 shows the CGR and one of the three possible floor layouts; see Appendix 4 for images of all of them.

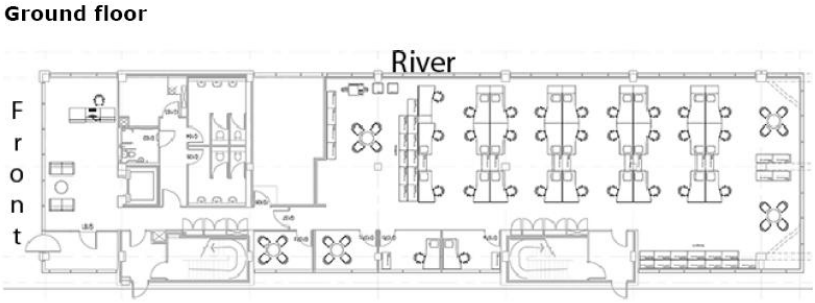

Figure 12. The photorealistic CGR and floor layouts of the new building used to show participants what the building would look like prior to its construction.

Measures: mood states were measured using the Positive Affect and Negative Affect Schedule, PANAS (Watson et al., 1988), see section 3.2.3 for details. For the purposes of this study the time scopes were set to moment or current (how they felt right at the time prior to completing the web-based questionnaire).

Perception of environmental control was concerned with participants' perceptions of being able to control temperature, noise and light on demand (see Brennan et al., 2002; Sundstrom et al., 1982). It was measured using a 3-point Likert-type item ranging from 'full control' to 'nil control', the middle point representing having some personal control and some control by asking janitorial staff to regulate these for them.

Preference was studied at two different levels: preference for the building as a whole (both interior and exterior together) and the perception of interior aesthetics (see Stokols et al., 1990). The former was measured using a 7-point semantic differential (very much-not at all), the latter were measured using six items in the form of 4-point Likert-type scales ranging from very attractive (1) to not at all

attractive (4). The areas evaluated for the perception of interior aesthetics were Furnishings, Decor or Style, Corridors, Foyer, Coffee/staff room and Meeting Rooms.

The *perception of comfort* (see Sundstrom et al., 1982) was evaluated via four 3-point Likert-type items: provision of working space (comfortable, fairly comfortable, uncomfortable) and three items measuring the most common environmental factors affecting comfort (visual and conversational privacy and noise insulation) that varied from having privacy and good noise insulation to having no privacy and bad noise insulation.

The *emotional reaction* the building as a whole (both interior and exterior together) was measured via with 7-point semantic differential scales (see Conniff et al., 2007; Bradley and Lang, 1994; Russell and Pratt, 1980). The emotional reaction items dealt with the following dichotomies: happy/sad, interested/bored, proud/embarrassed, relaxed/tense, optimistic/pessimistic, involved/uninvolved, welcomed/unwelcomed and inspired/uninspired.

Satisfaction with the workplace was measured via two items (see Stokols et al., 1990 and Brennan et al., 2002), satisfaction with the office or workstation and satisfaction with the building as a place to work. Response options ranged from *very satisfied* to *not at all satisfied* for both items.

Procedure: all staff members involved in the relocation were initially contacted and briefed about the relevance and usefulness of the present evaluation by the campus development team. Following this all staff were sent an email invitation to the survey. The invitation clearly and briefly reinforced the independent character of this evaluation, as well as its benefits and importance, and asked staff to follow a link to the on-line survey.

Once the survey was opened, staff were presented by a welcome page explaining the purpose of the evaluation and that there were at least two planned surveys. The second page gave general instructions on the survey and re-assured staff on the confidential nature of these evaluations (as personal details were requested so longitudinal data could be assessed). The third page contained important information regarding ‘no back button’ facility in the browser and requested staff to answer the survey in one session as no save function was made available (see Method section above). The fourth page contained the beginning of the survey by

introducing the PANAS before the questionnaire questions (see appendix 4 for the online questionnaire). Once participants reached the end of the questionnaire, they were presented with a debriefing page that included the researcher's contact details and one more reiteration of the confidentiality of the data.

7.2 RESULTS

Perceived environmental control

Perception of environmental control was maintained throughout the measurement times (expected M=1.84, after three months M=2.09, after six months M=1.97). No significant differences were found between expected and each of the in-situ scores (F(1.66, 51.39) = 2.44 p> .05). Mauchly's test indicated that the assumption of sphericity had been violated (X^2(2) 9.07 p<.05), therefore degrees of freedom are reported with a Huynh-Feldt[17] correction (ε=.829).

Perceived environmental Comfort

One-way repeated measures ANOVA tests indicated that there were no significant differences (p> .05) between the expected provision of working space and the actual measures after occupation F(2,62) = 1.49 p> .05, Mauchly's test indicated that the sphericity assumption was met (X^2(2) 2.10 p>.05).

The three items measuring visual privacy, conversational privacy and noise insulation were transformed into a scale of perceived environmental comfort for each of the evaluations. Table 11 shows the items, the response options headings and each of the Cronbach's alphas, the explanation for each of the response options can be seen in Appendix 4.

[17] One of the assumptions of the repeated measures ANOVA test is the assumption of sphericity or the equality of variances between treatment levels (as in the case of repeated measures design used in this study), it is assessed using the Mauchly's test. If the Mauchly's test is significant, the assumption of equality of variances between measures is not met and the validity of the F-ratios is questionable. According to Field (2005), there are three main ways of dealing with a violation of this assumption. One of them, the Huynh-Feldt correction for degrees of freedom, applies a correction factor to the degrees of freedom so the F-ratio can be assessed (see Field (2005) for more details).

Item	Response options	Cronbach's α		
		Expected	*After 3 months*	*After 6 months*
In terms of visual privacy, you consider your workspace is:	-Very private -Semi-private -Not private at all	.728	.749	.813
In terms of conversational privacy, you consider your workspace is:	-Very private -Semi-private -Not private at all			
In terms of everyday sources of noise, [...], you consider your workspace is:	-Quiet -Fairly quiet -Not quiet at all			

Table 11. Items used for the scale of perceived environmental comfort.

The scale was used in a one-way repeated measures ANOVA test and showed there were significant differences with respect to perceived environmental comfort $F(1.77, 54.87) = 6.65$ $p < .05$. Mauchly's test indicated that the assumption of sphericity had been violated ($X^2(2)$ 6.23 $p>.05$), therefore degrees of freedom are reported using a Huynh-Feldt correction ($\varepsilon=.885$). Pairwise comparisons with Bonferroni corrections[18] revealed that the differences were only true between expected and the three month scores. Results are shown in Figure 13.

[18] This is a correction applied to the criterion of significance, normally set at $p=.05$, whenever multiple pairwise comparisons are made (as in this case). The correction minimises the probability of making a Type I error, or accepting a result as significant when there is no genuine effect (a false positive), by taking the significance level and dividing it by the number of comparisons.

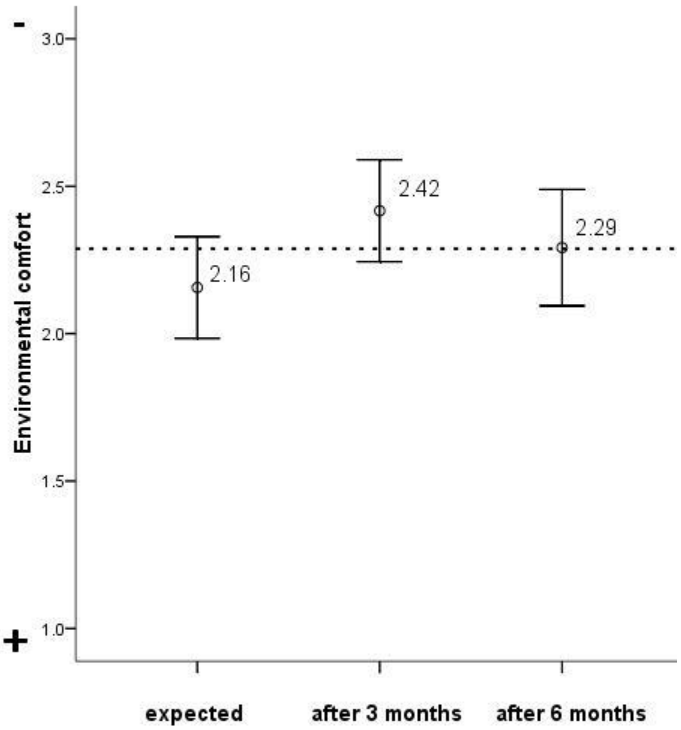

Figure 13. Means for the perception of environmental comfort scale.

Emotional reaction to the buildings

The eight items used to investigate emotional reaction to the buildings (happy/sad, interested/bored, proud/embarrassed, relaxed/tense, optimistic/pessimistic, involved/uninvolved, welcomed/unwelcomed and inspired/uninspired) were transformed into a scale at each of the evaluations and labelled *emotional reactions.* Cronbach's Alpha Reliabilities for the scales ranged between .927 and .962.

Scales were submitted to one-way repeated measures ANOVA tests. Results confirmed that there were significant differences in emotional responses to the building, $F(2, 62) = 4.94$ $p < .05$, Mauchly's test indicated that the sphericity assumption was met ($X^2(2)$ 1.52 $p > .05$). However, pairwise comparisons with Bonferroni correction showed that there were significant differences only between expected reactions and actual reactions after 6 months, see Figure 14.

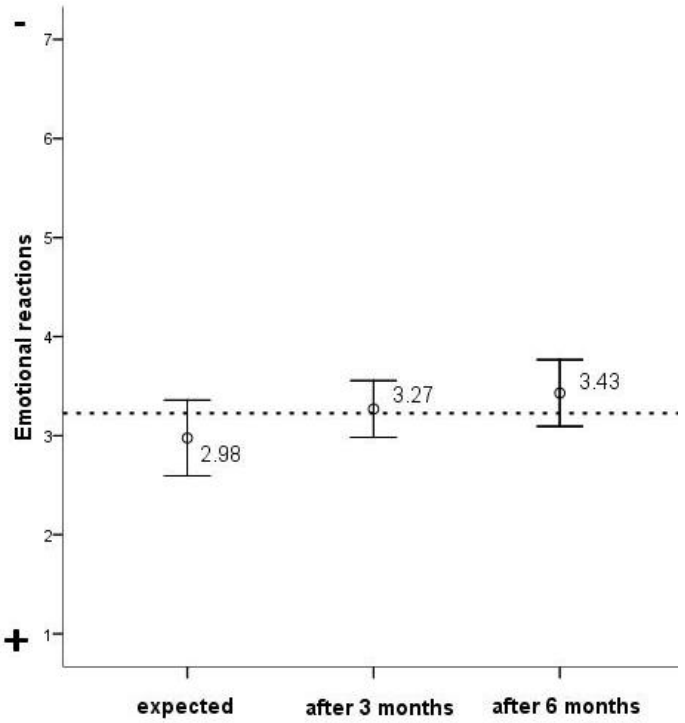

Figure 14. Means of the emotional reactions to the new office before, three and six months after occupation.

Satisfaction with the workplace

One-way repeated ANOVA test results on the satisfaction with the office workspace $F(2, 62) = .037$ (Mauchly's test indicated that the sphericity assumption was met ($X^2(2)$ 5.89 $p>.05$)) and satisfaction with the building as a place to work $F(2, 62) = .177$ (Mauchly's test indicated that the sphericity assumption was met ($X^2(2)$ 3.49 $p>.05$)) showed that there were no significant differences $p>.05$ over time.

Perception of Interior aesthetics

One-way repeated measures ANOVA tests showed that there were significant differences in the perceived values of the building's interior aesthetics $F(10, 310) = 3.71$ $p< .05$, Mauchly's test indicated that the sphericity assumption was met ($X^2(54)$ 71.01 $p>.05$). Pairwise comparisons with Bonferroni correction showed that the differences occurred only between the expected scores and each of the post occupancy scores in all measures but the Furnishings scores which did not change (thick line), see Figure 15.

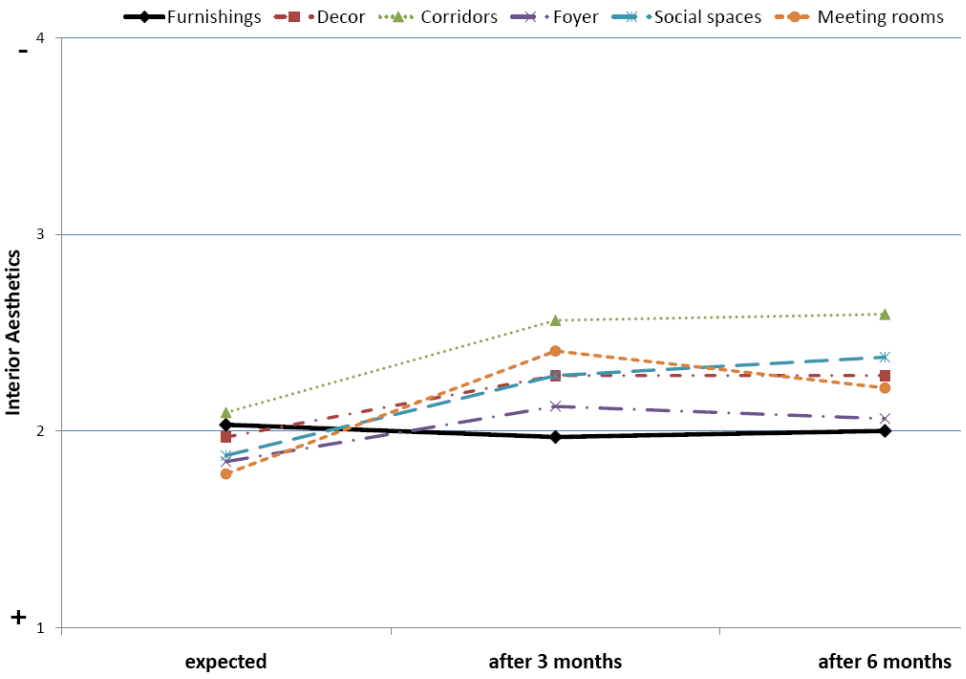

Figure 15. Means for interior aesthetics at each of the measurement times.

Preference overall

One-way repeated ANOVA tests on the preference items for the building as a whole, showed that there were significant differences between the measurement times, $F(2, 62) = 4.86$ $p < .05$, Mauchly's test indicated that the sphericity assumption was met ($X^2(2)$ 3.70 $p > .05$) However, pairwise comparisons with Bonferroni correction revealed that the differences were only significant between preference after three months and preference after six months, see Figure 16.

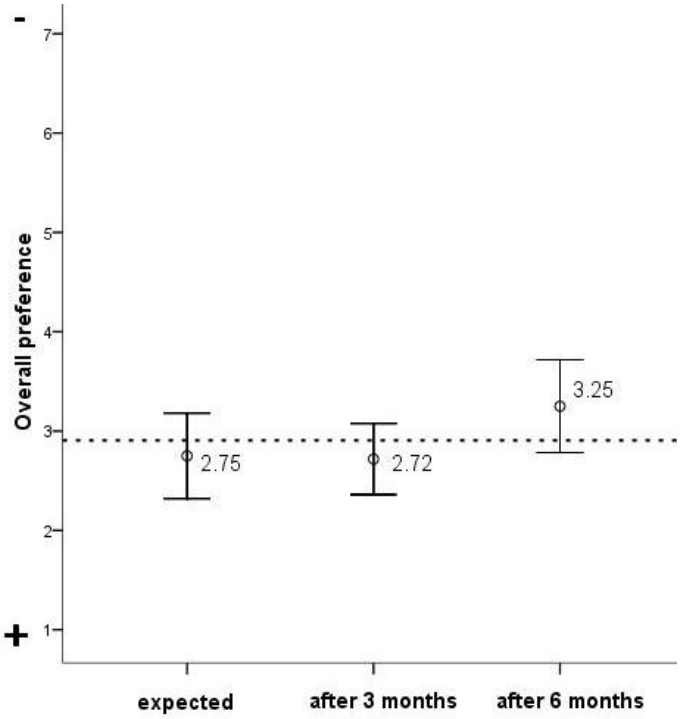

Figure 16. Overall preference ratings for the new office across time.

Current mood (as measured through the PANAS)

Although there were some PANAS scores variations across time, one-way repeated measures ANOVA tests showed that there were no significant differences of PA and NA scores across time measurements (p>.05), see Figure 17.

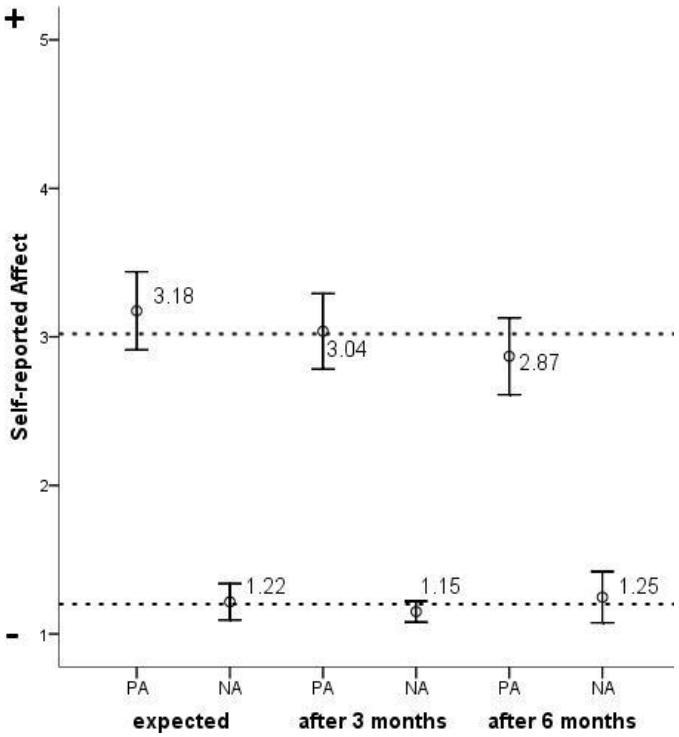

Figure 17. Means for self-reported positive affect (PA) and negative affect (NA) during each of the data collections.

Relationships between selected measures

The relationships between the PANAS, emotional reactions, overall preference and interior aesthetics were explored during each of the surveys using the Pearson moment correlation coefficient, the results for each of the survey times are presented below in Table 12.

Expected	**1**	**2**	**3**	**4**
1. PA				
2. NA	.021			
3. Emotional Reactions	-.344	.296		
4. Overall Preference	-.216	.321	**.789****	
5. Interior aesthetics	-.280	.304	**.458****	**.570****
3 month survey				
1. PA 3m				
2. NA 3m	**-.456****			
3. Emotional Reactions 3m	**-.653****	**.366***		
4. Overall Preference 3m	-.174	.158	**.628****	
5. Interior aesthetics 3m	-.131	-.083	**.465****	**.580****
6 month survey				
1. PA 6m				
2. NA 6m	-.061			
3. Emotional Reactions 6m	**-.446***	.251		
4. Overall Preference 6m	-.228	.168	**.742****	
5. Interior aesthetics 6m	-.013	-.225	.299	**.445***

*correlation significant at ** p<.01 level (2-tailed) and at * p<.05 level (2-tailed)*

Table 12. Correlations between selected measures at each of the survey times.

Results on the pre-relocation survey showed that the PANAS did not significantly correlate with any of the other measures. Emotional reactions were significantly correlated with overall preference and interior aesthetics. Overall preference and interior aesthetics were also significantly correlated, see Figure 18 (thick lines, significant at *p*<.05 level).

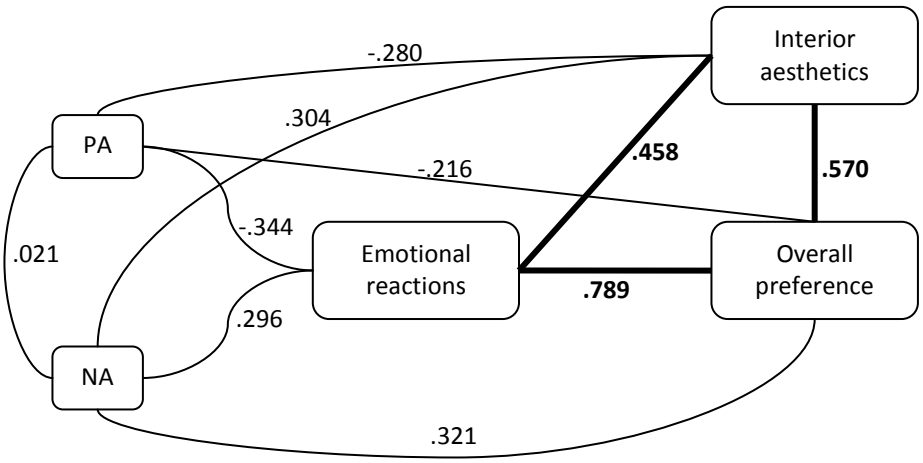

Figure 18. Correlations between prospective measures (at the pre-relocation stage).

During the 3 month survey PA and NA were significantly correlated with the emotional reactions people had to the new building but not to overall preference or interior aesthetics. Overall preference was again significantly correlated with emotional reactions and interior aesthetics, see Figure 19 (thick lines, significant at $p<.05$ level).

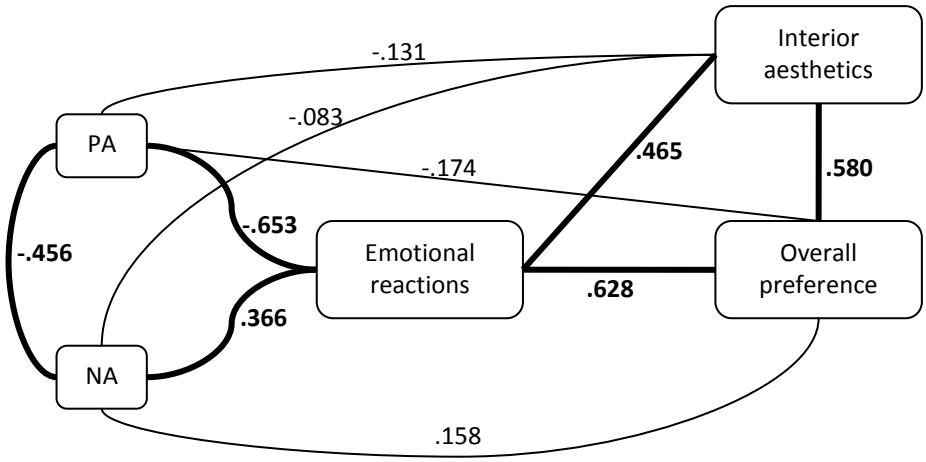

Figure 19. Correlations between measures at the 3 month survey.

Finally, during the 6 month survey only PA significantly correlated with emotional reactions. The significant relationship between emotional reactions and overall preference was maintained but emotional reactions no longer significantly correlated with interior aesthetics. The relationship between overall preference and interior aesthetics remained significant, see Figure 20.

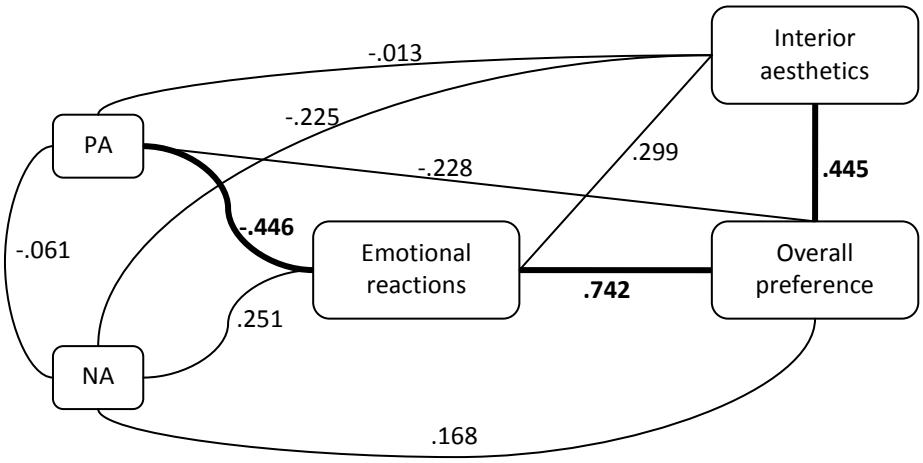

Figure 20. Correlations between measures at the 6 month survey.

Given the relationships between these measures two analyses were conducted in order to investigate the predictors of preference in this study. One model tested for

the mediating effects of emotional reactions between mood and overall preference and one tested the mediating effects of interior aesthetics between emotional reactions and overall preference.

Predictors of preference

According to Baron and Kenny (1986) mediation analysis can be tested using three regression equations with the following conditions: "*First, the independent variable must affect the mediator in the first equation; second, the independent variable must be shown to affect the dependent variable in the second equation; and third, the mediator must affect the dependent variable in the third equation.*" (Baron and Kenny, 1986; p. 1177).

Baron and Kenny (1986) showed it is possible to visualise a mediation analysis in the way of the interactions of three variables, see Figure 21, whereby X is the independent variable, M the mediator and Y the dependent variable. In case of this study's data it can be thus established that X=mood (PA or NA), M=emotional reactions and Y=overall preference:

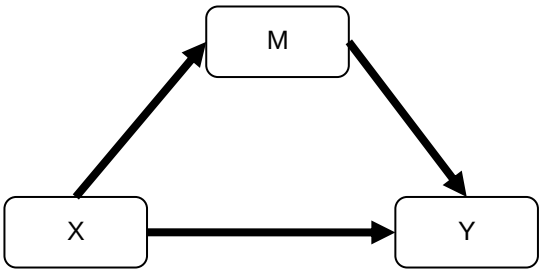

Figure 21. The mediating effect model

Based on the assumptions set out by Baron and Kenny (1986), the data for each of the measurement times were tested for the following effects (see Figure 22 for the visualisation of the model using the study variables):

- 1 a significant effect of X on M or the effect of PA/NA on emotional reactions
- 2 a significant effect of X on Y or the effect of PA/NA on overall preference
- 3 a significant effect of M on Y when the independent variable X is controlled or the effect of emotional reactions on overall preference when PA/NA are being controlled

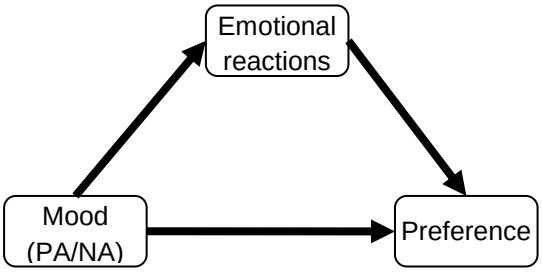

Figure 22. The mediating effect model using the variables in this study.

Given that there were three models (one for each of the time measurements, i.e. pre-relocation, 3 month survey and 6 month survey, see Figures 20-22) each of them was separately assessed for mediation analysis. Furthermore, as mood was measured using PANAS, it was required to run one test for positive affect (PA) and one for negative affect (NA), i.e. assess mediation analysis assumptions for PA and NA respectively.

Pre-relocation:

- assumption 1 was not met for positive affect (F (1,30) = 4.03, p>.05*).* The assumption for negative affect was also not met (F (1,30) = 2.88, p>.05*)*
- assumption 2 for PA was not met (F (1,30) = 1.46, p>.05*)* and neither was the assumption 2 for NA (F (1,30) = 3.43, p>.05*)*
- assumption 3 was met, emotional reactions significantly accounted for variance in overall preference when PA was controlled for (F (2,29) = 24.26, p<.05*)* and also when NA was controlled for (F (2,29) = 24.76, p<.05*)*.

Preliminary tests showed that assumptions 1 and 2 were not met and therefore mediation analysis could not be pursued for the pre-relocation survey data.

3 month data

- assumption 1 was met for positive affect (F (1,30) = 22.28, p<.05*).* Assumption 1 for negative affect was also met (F (1,30) = 4.64, p<.05*)*
- assumption 2 for PA was not met (F (1,30) = .936, p>.05*)* and neither was assumption 2 for NA (F (1,30) = .772, p>.05*)*
- assumption 3 was met given that emotional reactions significantly accounted for variance in overall preference when PA was controlled for (F (2,29) = 13.98, p<.05*)* but also when NA was controlled for (F (2,29) = 9.66, p<.05*)*

Preliminary tests showed that assumption 2 was not met and therefore mediation analysis could not be pursued for the 3 month survey data.

6 month data

- assumption 1 was met for positive affect (F (1,30) = 7.45, p<.05*).* Assumption 1 for negative affect was not met (F (1,30) = 2.018, p>.05*)*
- assumption 2 for PA was not met (F (1,30) = 1.64, p>.05*)* and neither was assumption 2 for NA (F (1,30) = .867, p>.05*)*
- assumption 3 was met given that emotional reactions significantly accounted for variance in overall preference when PA (F (2,29) = 18.78, p<.05*)* and NA (F (2,29) = 17,82, p<.05*)* were controlled for.

Preliminary tests showed that assumption 1 for negative affect was not met and that both PA and NA in assumption 2 were not met. Hence, mediation analysis could not be pursued for the 6 month survey data.

The overall results of the mediation analysis of the influence of mood (as measured with positive and negative affect – PA and NA respectively) on preference via emotional reactions showed that there was no mediating effect of emotional reactions given that assumption 2 was not met in neither of the analyses (Baron and Kenny, 1986).

Given the lack of mediation, a further analysis was conducted in order to test the predictive power of PA and NA on emotional reactions. This was done by forcing PA and NA into the same equation as the independent variables. The results for this multiple linear regression analyses showed that in each of the surveys PA significantly accounted for the variance of emotional reactions, suggesting that as PA increased so did the positivity of the emotional reactions to the new environment, (see Table 13).

Predictors of emotional reactions	**Expected**		**3 months**		**6 months**	
	B	**β *coeffS***	***B***	**β *coeffS***	***B***	**β *coeffS***
PA	-.511	-.351*	-.691	-.613**	-.563	-.432*
NA	.948	.303	.352	.086	.437	.225
	R^2 = .210*		***R^2 = .432*****		***R^2 = .249****	

**p<.05 **p<.01 ***p<.001*

Table 13. Multiple linear regression analyses for the prediction of emotional reactions based on Positive and Negative affect scores at each of the surveys.

Based on these results, it can be concluded that the effect of mood on preference through the emotional reactions to the environment is not a mediating effect –there is no effect of mood on overall preference to begin with (Holmbeck, 1997) – but the effect of mood on preference mainly is via Positive Affect and it is an indirect effect, i.e. via the emotional reactions people have to the environment. This was found in all of the three time measurements (pre-relocation, 3 months and 6 months).

The mediating effects of interior aesthetics between overall preference and emotional reactions to the environment were also tested via the mediation analysis assumptions described above (Baron and Kenny, 1986). Similarly to the previous analyses, the assumptions were tested for each of the measurement times, see Table 14.

	Regression 1 Interior aesthetics			**Regression 2 Preference**			**Regression 3 Preference**		
	B	**SE B**	**β**	**B**	**SE B**	**β**	**B**	**SE B**	**β**
Expected									
Emotional reactions	.190	.068	.458**	.885	.126	.789***	.750	.133	.668***
Interior aesthetics							.711	.320	.264*
R^2		**.210****			**.622*****			**.677*****	
3 months									
Emotional reactions	.234	.273	.465**	.785	.597	.628***	.571	.185	.457**
Interior aesthetics							.913	.369	.367*
R^2		**.216****			**.394*****			**.500*****	
6 months									
Emotional reactions	.107	.062	.299	1.030	.170	.742***	.928	.170	.669***
Interior aesthetics							.952	.475	.245
R^2		**.090**			**.551*****			**.606*****	

*p<.05 **p<.01 ***p<.001

Table 14. Regressions testing for mediation assumptions of interior aesthetics between emotional reactions and overall preference.

Table 14 shows that, first, both predictors significantly accounted for overall preference at the prospective and 3 month survey but that by the 6 month survey only emotional reactions significantly explained the variance (see Regression 3 coefficients). Second, when tested for mediation assumptions (Baron and Kenny, 1986) results show that the expected and 3 month data met the criteria (see Regressions 1, 2 and 3) but that the 6 month data did not.

In order to establish if the mediation is full or partial it is necessary to statistically test if the β values are reduced to non-significance. Baron and Kenny (1986) suggested using the Sobel test (Sobel, 1982, as cited in Baron and Kenny, 1986, p. 1177) in order to conduct this test. However, as discussed in Preacher and Hayes (2004), one of the assumptions of the Sobel test is that the sample size is large, otherwise this test lacks statistical power. Given the size of this study's sample the Sobel test would not be appropriate.

An alternative for significant testing of the effect of the mediating variable is bootstrapping. Bootstrapping is a technique that is "*is accomplished by taking a large number of samples of size n (where n is the original sample size) from the data, sampling with replacement, and computing the indirect effect, ab, in each sample.*" (Preacher and Hayes, 2004, p. 722) and is better suited for small samples (Mackinnon, 2008; Preacher and hayes, 2004; Shrout and Bolger, 2002). The bootstrapping technique provides point estimates and 95% confidence intervals for the mediating effect, in this interpretation mediation is said to have occurred when zero is not contained within the confidence interval.

The Bootstrapping method (with *n*= 5000 resamples) (Preacher and Hayes, 2004) was applied to both expected and 3 month data. Results showed that in the expected data, interior aesthetics did not mediate the relationship between emotional reactions and overall preference, 95% CI [-.0234, .3375], both predictors significantly contributed to overall preference. The results for the 3 month data showed that interior aesthetics mediated the relationship between emotional reactions and overall preference, 95% CI [.0129, .5395].

7.3 DISCUSSION

This study focused on exploring several areas considered central to occupancy evaluations. The working hypothesis of this study will be discussed in the following paragraphs.

The overarching working hypothesis was that the use of a CGR and floor layouts were going to allow staff to have an idea of their future in-situ responses to the environment. It expected that measures of control, overall comfort, interior aesthetics, overall preference and satisfaction for the office and building would not differ between prospective and in-situ ratings. The transition to an open-plan office

was expected to result in a decrease of the perception of overall comfort. In terms of this thesis' research interests, the mood at the time of the evaluation and emotional reactions to the environment were expected to have an effect on overall preference.

With respect to control, overall preference, overall comfort and satisfaction for the office and building the expected direction of these results were confirmed as there were no differences between expected and in-situ scores. The results of perceived environmental comfort, interior aesthetics and emotional reactions measures however, varied between expected and in-situ scores.

In terms of the perception of environmental comfort, consisting of visual privacy, conversational privacy and noise insulation, it was expected that it would decrease over time. The results partially confirmed this, as there were significant differences between the expected and the three month data, this is similar to the findings of Brennan et al. (2002) and Sundstrom et al. (1982) who reported that transitions to an open-plan office environment were associated with decrements of visual privacy, conversational privacy and increments of environmental noise. However, the six month data did not differ from the expected scores, suggesting that the three month data could be classed as the result of a transitional phase whereby people were adapting to the new environment.

The measures of the interior aesthetics of the building showed that the expectations of staff regarding the new environment were significantly different from the two in-situ ratings in all but the Furnishings which remained the same over time. The general pattern on how the aesthetics of the interiors of the new building were appraised by staff was as follows: mid to high expectations about the new environment and then two sequential drops in aesthetic value by three and six month scores. The appraisal of Furnishings (thick line in Figure 15) also started at mid to high expectations, marginally increased at the three month survey and then decreased to expected values: i.e. they remained the same over time.

As mentioned in the introduction to this study, the measures on the emotional reactions to the environment and their interaction with time did not have specific questions attached to them and these tests were exploratory. The results on this interaction showed that these changed between what was expected and the six month data: they became less positive over time.

In line with the research questions of this thesis the relationships between self-reported mood, emotional reactions, overall preference and interior aesthetics were tested using two mediation models for the prediction of overall preference. The first model, the mediational effects of emotional reactions between mood and overall preference, provided evidence for the role that emotion plays in an environmental evaluation. The results were consistent throughout the evaluations: the mood that people are in at the time of the evaluation (mainly Positive Affect) has an effect on their overall preference through the emotional reactions to the environment (prospectively or in situ, particularly at the 3 month survey).

The second model, the mediating effect of interior aesthetics between emotional reactions and overall preference, showed that for the measurement times where mediation assumptions could be satisfied (expected and 3 month survey), interior aesthetics only mediated this relationship at the 3 month survey. This is, prior to the occupation (expected survey) both emotional reactions and interior aesthetics contributed to overall preference, whereas at the 3 month survey the effect of emotional reactions onto overall preference was mediated by the interior aesthetics. Finally, at the 6 month survey interior aesthetics no longer predicted overall preference.

This shows that at the 3 month data, during the initial stages of adaptation to the new environment, interior aesthetics were the key variable predicting preference: they mediated the effect of emotional reactions onto overall preference. Interestingly, at the 6 month data this effect not only stopped but interior aesthetics became non significant altogether whilst emotional reactions maintained their effect on overall preference. This suggests that the effect that interior aesthetics have on overall preference is temporary: only for as long as it is required to become used to the environment, whereas the emotional reactions are an ongoing significant predictor of overall preference.

To sum up, the results showed that the CGR was effective in allowing staff to evaluate the perceived control of the environment, overall comfort, overall preference and overall satisfaction, these measures did not change between expected and in-situ scores. However, it was not effective in allowing staff to evaluate the perception of environmental comfort, interior aesthetics (with the exception of Furnishings) and the emotional reactions to the environment. This is shown in Table 15, scores that did not vary over time are indicated by '**=**' and scores that suffered significant and negative changes by '↓'.

Measures	3 month survey	6 month survey
Control	=	=
Overall comfort	=	=
Environmental comfort	↓	=
Interior aesthetics	↓	↓
Emotional reactions	=	↓
Overall preference	=	=
Satisfaction (office and building)	=	=

Table 15. Summary of the expected and in situ scores for the different studied variables.

The reason why some of these measures varied is related to the detail included in the visualisations used during the pre-relocation stage. The CGR and floor layouts addressed the facade of the building and layout of each of the offices, respectively, without going beyond the communication of what the environment would be like in general terms. For example, knowing the layout of the floor plan adds little information on what the actual finishes of the decor would be in this or that area, similarly the perception of environmental comfort can only be a tentative evaluation based on individual self-knowledge and expectations about the open-plan office. This is the difference of the Furnishing scores data, staff were actually involved with the selection of the furnishes during the design process and this translated into a smoother transition process with respect to this area.

The study highlighted interesting issues with regards to the data gathering format. The web-based data gathering in conjunction with allowing staff the time to answer the questionnaire during their working hours seemed to have resulted in was considered to be an acceptable response rate (37%) across data collection times. This result fits with the reported literature on the advantages of online research (e.g. Fricker and Schonlau, 2002). However, this flexibility also meant that participants could have been prevented from answering the questionnaire undisturbed, as not all staff answered it at the same time (e.g. Kraut, Olson, Banaji, Bruckman, Cohen et al., 2004).

Even though some technical aspects of the questionnaire were controlled to ensure staff answered the questionnaire in one short session and to preserve data integrity, namely the lack of back navigation button and save functionality, this may have also affected staff's involvement. Full back navigation functionality is particularly contentious as it leaves the questionnaire open to potential misuse, e.g. "*participants may try to go back through a test or repeat it completely*" (British Psychological Society, 2007, p. 5). Future studies using this data gathering format

should employ token management techniques in order allow participants to save their progress yet allowing the researcher to monitor how long each participant takes to answer the questionnaire (whether minutes, hours or sessions spread over a period of time).

More generally, this study did not control for the information that staff received or knew pre-relocation (some staff may have sought more information about the new building than that provided by the Estates department). Future studies should include a self-report measure of the knowledge participants have about the environments they are relocating to as this may also shape how they respond to them.

This study would have benefited from having a longer measurement time interval in order to explore the stability of measures over time, for example 12 or 18 month intervals would have allowed determining if the measures considered in the environmental evaluations are consistent over time or if their effects behave in a cyclical way. It would also have been ideal to have set-up focus groups or in-depth interviews with selected members of staff in order to triangulate the online survey findings.

It must be pointed out that there are also challenges attached to longer measurement times and inclusion of other data gathering methods within the same study, for example organisational commitment to the research process and the cost of enabling staff to spend time on these chores with respect to the former and the time implications, from both staff and researcher, and expertise to carry them out with respect to the latter. Although the University was very accommodating to the researcher's needs there were reservations about the use of measures that deviated from the evaluation of the physical environment, see section 4.4 for the Estates Department specialists' take on this issue.

7.4 CHAPTER SUMMARY

The results presented here refer to a relocation which used an informed and semi-inclusive design process that translated into a smooth transition to the new workplace. Disruption was minimal and contrary to the research literature – which reports open-plan offices have detrimental effects upon its users such as loss of

privacy, increase of visual distractions, etcetera – staff did not report significant detrimental changes as the result of a full open-plan layout.

Some of the lack of detrimental changes may be explained by the incorporation of physical measures in the open-plan that provided privacy by prescription (managerial/ executive roles were given individual offices) and on demand (interview rooms, informal meeting areas and social areas). However, it must be stressed that these staff were already working in varying degrees of office configurations, i.e. office sharing/semi-open plan.

In general, measures which could be classed as general did not change over time, e.g. satisfaction with the office or overall preference, whereas measures that can be described as specific presented significant changes over time, e.g. interior aesthetics or emotional reactions. An interesting exception to these more specific scores was the measure of attractiveness of furnishings, the one aspect of the new environment staff were involved with via choosing colours, styles and furniture. Comparing this to the rest of the areas indicates that the involvement of staff in the process helped them to have a more stable adaptive process.

The findings of this study presented a paradox. Staff's overall preference remained the same across time measurements whereas their emotional reactions and perception of interior aesthetics became significantly less positive after six months. How could an environment be negatively appraised with respect to some factors but result in the same overall preference?

The answer to this conundrum cannot be found in these results but at least two explanations are plausible. First, it is suggested that the explanation to this may lie in the unaccounted variance in the model for the prediction of preference. Even though the correlations between emotional reactions, interior aesthetics and preference were large, the prediction of preference by emotional reactions and interior aesthetics (as seen in the mediation model) indicated that these variables still leave 32 to 50% of the variance unaccounted for.

Second, it can be inferred that this may be the by-product of staff's shift of attention to the office environment properties that they may not be normally aware of: when asked to evaluate their environments they effectively did so but when asked to evaluate their whole working life experience they reported that this was average. In other words, the habitual job demands, after repeated exposure to the

environment, seemed to have relegated the awareness of the built environment to a second layer.

Extrapolating this to the effects of design on people it could be implied that the design did not have overall detriments to the occupants but it also stopped short of producing greater benefits. Moreover, this could come at a cost as the environment has important health consequences upon its users (e.g. Evans, Allen, Tafalla and O'Meara, 1996), whether the person realises it or not, and the averaging that takes place in an overall preference judgement could be masquerading these well-being associations.

Although the participants' self-reported mood at the time of answering the surveys (as measured with the PANAS scales) did not show any significant changes across time it did have an indirect effect on preference through the emotional reactions to environment. This was established via the model for the meditating effect of emotional reactions between PA and NA and overall preference. This model showed that mediation analysis could not be established given that PA and NA scores were not significantly related to overall preference in the first place (assumption two of Baron and Kenny's [1986] proposed criteria for mediation analysis).

When the prediction of emotional reactions from PA and NA was tested the analysis showed two distinct findings. Only Positive Affect had a significant effect on the emotional reactions staff had for the environment which in turn had an effect on overall preference, an indirect effect, this occurred at each of the surveys. This represents supportive evidence on the benefits of using emotional reactions to the environment alongside the commonly used informational variables to study environmental preference: they provide a window into the effects of mood on preference.

The model for the mediating effects of interior aesthetics between emotional reactions and overall preference showed that interior aesthetics only mediated emotional reactions at the 3 month survey. At the expected survey both interior aesthetics and emotional reactions significantly explained variance in overall preference and at the 6 month survey only emotional reactions accounted for variance in overall preference.

Given that office environments are an important part of peoples' lives and, as this data showed, a substantial source of affect, the final study (Study 5) uses representations of office environments in an experimental set up in order to test the relationships between mood, preference and perspective-taking. One of its aims will be the manipulation of perspective-taking via instructions in order to test what would happen to the emotional reactions to the environment if participants are asked to remain detached.

The study will also build on the previous studies' limitations: it will use a between-subjects experimental design with a standardised instructions protocol for the framing of perspective-taking and will make use of a range of environmental scenes for the environmental evaluations.

CHAPTER 8. STUDY 5 – PERSPECTIVE-TAKING AND EMOTIONAL REACTIONS TO OFFICE ENVIRONMENTS

This thesis so far has shown that the evaluation of design is open to influences, for example vocational training, as shown in Study 3 with the significant differences between experts and laypeople. Studies 2 and 3 indicated that the perspective that people take during an evaluation has an impact on the perceptual processing of the environment as measured via PRS scores and semantic differentials, whereas Study 4 showed that mood has an influence on preference via the emotional reactions people have to the environment.

In practice, a key issue in an environmental evaluation is to gain insight into people's perceptions of the environment, which could be understood as the evaluation of the likely consequences of *an environment* on their lives, e.g. the evaluation of a new office environment dealt with in the previous study. However, the same proposed environment may be acceptable for some and disregarded by others. This is particularly important in the context of architecture and planning where the decision-making for altering the environment through accepting or opposing design has rested in the hands of a few: the experts. As described in section 4.5, the term expert in this thesis is limited to the influence that training may have on the evaluation of the environment.

One of the experts' tasks in architecture and design is deciding something for others, but how can someone know what somebody else's environmental preference is? In the case of the field of architecture, as seen in the interviews in Chapter 2, architects spend time understanding what the client/end-user requirements are, i.e. putting themselves in the client/end-user's perspective. However, as described in section 2.6, where commercial architecture projects are concerned such as offices, they adopt a more detached and prescriptive perspective dictated by their training i.e. "*what would you do in architecture here*? *, What's right?, What's right for the site?, What's right for the building?, What's right for the brief?*".

Such an approach implies that the *lens* used by architects for evaluating the environment is based on formal training but also on the suppression or diminishing of personal taste so the needs of others can be fulfilled. These two – personal preferences and detachment – cannot reasonably be separated as they are both

part of the individual, but it is expected that the former can be *reduced* so the latter can take place. As described in section 4.6, this thesis proposes that perspective-taking can be used to aid the evaluation of design, first, by understanding how people evaluate somebody else's preference, in other words, what do people do when they are asked to be detached during an environmental evaluation? Second, by testing how close the scores resulting from taking a perspective are with respect to actual other's evaluations.

During the design process the architect/designer works through a brief in order to understand and address the client/end-users' requirements and communicates this via the design. As reported in the literature and Study 2, there are differences between experts and laypeople and this study will explore if these are due to the actual process of taking the perspective of the *other*. It comes as no surprise that a degree of misfit between the requirements and the design product occurs, as the architect/designer has to accommodate what he or she interprets as the *average* or the *optimal* solution for a given scenario (by definition, the optimum will inevitably miss out some requirements whilst fulfilling the majority of them). Regardless, it is expected that successful design solutions answer the brief and that the end product is received with a *positive* aesthetic appreciation.

This study tests these ideas using office environments as the stimuli[19] as they provide a setting which is highly likely to be part of people's life experience, they are environments inhabited for prolonged periods at a time and above all, they are relatively independent of the building that houses them. More specifically, as a stimulus they allow the researcher to select the same attributes while keeping other architectural elements constant, e.g. using one type of office environments such as open-plan design whilst selecting different decor styles.

In the case study presented in Chapter 7 it was found that staff's emotional, aesthetic and preference evaluations of their work environment were closely related. Moreover, as described in section 7.4, participants' self-reported positive and negative affect prior to the evaluations had a significant effect on overall preference through the emotional reactions to the environment.

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[19] Chapter 4 described that the shift from domestic to commercial architecture responded to the availability of a case study upon which this thesis' research questions could be tested in a naturally occurring setting, hence increasing the ecological validity of the findings.

In brief, the present study builds on some of these previous findings, namely people's emotional reaction to and preference for the environments (in this case different design styles of open-plan offices) and expects that these are influenced by the participants' mood during the evaluation (e.g. Gifford, 1980; Korpela, 2003; Mealey and Theis, 1995; Regan and Horn, 2005) and by the effects of taking a perspective during the environmental evaluation. It will also test whether the emotional reactions people have to the environment can predict preference.

It will explore how people use their self-knowledge to evaluate their environment when asked to take a self-perspective, when asked to take a detached perspective and how they use their self-knowledge when asked to take the perspective of an architect or designer during the environmental evaluation (see Batson et al., 1997; Galinsky et al., 2005; Sevillano et al., 2007). Following the findings of Study 2, which reported that taking the perspective of the local resident was taken to a fuller extent than that of the architect, this study will ask participants how easy/difficult taking a perspective was in order to test if similar results arise.

This study also explores a technique for measuring emotional reactions to the environment by asking participants to generate their own emotion words in order to check if there is correspondence between responses based on scale measures and the freely generated emotion words (see Seitz et al., 2007).

Finally, two additional research questions were explored. One tested the participants' memory of the experimental stimuli using a recognition test of *seen* versus *not seen* environmental scenes at the end of the experiment, in an attempt to replicate findings from cognition and memory studies that have suggested that information relevant to the *self* is better remembered than information with less personal relevance (e.g. Cunningham, Turk, Macdonald and Macrae, 2008; Lamm, Batson and Decety, 2007; Rogers, Kuipers and Kirker, 1977).

The other additional research question tested the picture or place phenomenon (see Scott and Canter, 1997) using an exploratory analysis of the differences between framing of instructions. This was done by selecting the self perspective scores on the IAPS stimuli images and comparing them against the normative scores of these same images on the IAPS manual, thus allowing to test the picture or place phenomenon.

8.1 METHOD

Design: a between subjects design (three perspective-taking conditions) with twelve (4 practice trials plus 8 experimental stimuli) repeated measures in each condition.

Participants: 64 people with experience of working in an office environment were recruited in a convenience sample from two public universities and a research institute. The participants' ages ranged from 18 to 65. Men and women were equally allocated to one of three perspective-taking conditions, see Table 16.

		Condition		
		self	**other**	**detached**
gender	male	10	10	10
	female	12	11	11
age	18-25	4	5	4
	26-35	8	6	8
	36-50	7	9	9
	51-65	3	1	

Table 16. Distribution of participants across conditions based on age and gender.

Stimuli: four photographs from the International Affective Picture System (IAPS) (Lang et al., 2005; see section 3.2.3 for details) were used for practice trials. The chosen IAPS photographs were of two interior environments (cupboard and filing cabinets, slide numbers 7700 and 7224) and two landscapes (skyline and winter street, slide numbers 7570 and 5635).

The stimuli for the experiment consisted of eight photographs of office environments. These were obtained from a professional design company[20] that allowed access to their photographic archive. As part of their business the company maintains a photo-archive, using professional photographers who take images in keeping with the presentation formats of the design world, which is used to present design scenarios to potential clients. Their photo-archive is indexed by what they describe as the design styles that they can provide to their clients.

[20] The author is indebted to Paul Kelly, Head of Marketing at **Morgan Lovell plc,** who provided access to their professional photographic archive.

For the purposes of this study, exemplars of offices from two different design styles were considered: 'traditional' and 'contemporary' design styles. Establishing the different design styles was provided as experts' advice by the company that provided access to the archive[21]. Experts' advice on the selection of stimuli is widely used as a criteria, whether they are used as judges of the stimuli, as is the case in this study e.g. Akalin et al., 2009; Hubbard, 1996; Wilson, 1996; or from sampling exemplar within existing leading publications e.g. Devlin and Nasar, 1989; Oostendorp and Berlyne, 1978; Purcell, 1995. The next step consisted of selecting the photographs from the photo-archive.

In order to standardise the stimuli presented to participants a criterion of inclusion with which all photographs could be assessed was devised, this was based on similar strategies used in similar studies. For example, Devlin and Nasar (1989) selected their stimuli of high vs. popular architecture filtering colour photographs out of professional and non-professional magazines displaying images with full frontal elevation first, then they judged the resulting photographs so that similar quality of the specimens was ensured, the third criterion used in their study was the content of the photograph and finally a criterion used to judge the style characteristics.

In this study, the inclusion criteria were simplified in so far that the style of the offices design was already set by the professional design company, the remainder of the inclusion criteria required that photographs were of open-plan offices, that the photograph was taken from a location in the open-plan that afforded full view of the extent of the office[22], that they were shot in landscape mode, that the image was clearly illuminated and in sharp focus, and that the height from where the photograph was taken was similar between photographs that fulfilled all previous criteria.

Each of the photographs from the database indexed as 'traditional' or 'contemporary' design style was judged using this inclusion criterion. This resulted

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[21] The credentials of the company, with over 30 years of practice in their field, were taken bona fide. The rationale of what 'traditional' and 'contemporary' design styles are is not discussed as it is beyond the scope and area of expertise of this thesis.

[22] Extent is meant in the informational variables sense here, see section 5.1, i.e. the photograph should afford the viewer (a) a sense of compatibility between the environment and its purpose (office= environment for work) and (b) an inferred understanding of it (it is clear it is an environment for work).

in four photographs of 'traditional' design (images 1, 2, 5 and 7) and four photographs of 'contemporary' design (images 3, 4, 6 and 8), see Figure 23.

Stimuli

'Traditional'

1 2 5 7

'Contemporary'

3 4 6 8

Figure 23. The photographs used as experimental stimuli.

Measures:

Positive Affect and Negative Affect Schedule. Just as in study four, a self-reported measure of mood was taken prior to the experiment, the time-frame of the scales was set to *right now* or *current,* see section 3.2.3 for details.

Emotional reactions to stimuli. These were assessed using the Self-Assessment-Manikin (SAM) (Lang, 1980, in Lang et al., 2005), see section 3.2.3. Upon inspection of the standard instructions (see Appendix 5.1), a few concerns arose with regards to the use of the original SAM instructions for the purposes of this study, namely the SAM instructions:

- Are framed towards directing the participant to subsume to his/her self-serving biases whilst rating the pictures,

- Direct the attention of the participants to the *picture*, as opposed to the depicted *situation/environment*,

- Direct the attention of the participants to what the picture makes/has made them feel ("*...you will be rating each picture in terms of how it made you feel while viewing it.*" (Lang et al., 2005, p. 4), as opposed to what people feel while imagining being in the environment (for this study it is particularly important that self-reports reflect the perspective-taken during the experimental manipulation).

Thus, the SAM rating instructions were modified to provide:

- Instruction wording that accentuated the importance of visualising what the environment would make the participants feel,

- Instruction wording that stressed the prospective preference for and emotional reaction to the *environment* ("... as you would actually feel in each of the environments") and **not** the *picture* as described in the original instructions,

- Instruction wording that clearly expressed, as required, the emphasis on the *self* (see Appendix 5.2), the *other* (see Appendix 5.4) and a *detached* perspective (see Appendix 5.3), as opposed to the self-reflective mode of the original instructions.

Although this slightly deviated from the procedural requirements for the SAM to evaluate the IAPS stimuli, it must be stressed that this work did not seek to replicate the IAPS findings or use them as mood inductors. What this work tried to do via the SAM rating procedure was to achieve a degree of control and standardisation that has shown similar results in different countries, languages and cultures (Lang et al., 2005); and to add to the empirical demonstration of the picture or place phenomenon by Scott and Canter (1997) described in section 3.3, where different results can be achieved through different instructions.

Emotional reaction free word task. Participants were asked how the environment would make them feel, dependent on each perspective-taking condition, and asked to write down any words that came to mind (a minimum of three and a maximum of ten) with the objective of analysing the emotionality or affectivity of their responses to each of the stimuli. The cues for each of the conditions can be seen in Table 17.

Condition	*Cue*
self	This environment would make *me* feel:
detached	This environment will make *people* feel:
other	This environment will make the architect/designer feel:

Table 17. Sentences used in each of the conditions to prompt the emotional reactions to each stimulus.

Preference for the environments was measured via 7-point-semantic differentials, response options ranged from 'very much' to 'not at all'. Table 18 shows the questions asked in each of the perspective-taking conditions.

Condition	*Item wording*
self	I like this environment:
detached	This environment will be liked:
other	The architect/designer will like this environment:

Table 18. Items used for measuring preference in each of the perspective-taking conditions.

Perspective-taking items. Three items addressed the extent to which participants used the *self*, the *other* or were *detached* while imagining being in the environments, the 7-point response options were coded so that 7 represented 'completely' and 1 'not at all' (see Batson et al., 1997; Galinsky et al., 2005; Sevillano et al., 2007). Table 19 shows the exact wordings of these items.

Condition	*Perspective-taking items*
self	I imagined how ***I would feel*** in each of the environments
detached	I was ***objective***[23] whilst evaluating how each of the environments would make people feel
other	I imagined how ***somebody else*** would feel in each of the environments

Table 19. Items used to measure perspective-taking

Ease of perspective-taking. Participants reported how easy they found taking the perspective they were assigned using a 7-point scale, where 1 represented 'very easy' and 7 'very difficult' (see Sevillano et al., 2007). The wording of the item was condition specific, as shown in Table 20.

[23] In relation to this study the words 'objective' and 'objectively' were used as synonyms of 'detached' and were chosen in order to remain comparable to the wordings used in the wider literature described in section 3.4.

Condition	*Ease of perspective-taking items*
self	Imagining ***myself*** in each of the environments was:
detached	Imagining how the environments would ***objectively make people*** feel was:
other	Imagining ***the architect/designer*** in each of the environments was:

Table 20. Items used to measure the reported ease with which participants took a perspective.

Recognition test. Participants were shown 20 photographs which they had to correctly identify as *seen* or *not seen*. The selection consisted of the eight office environments used in the experiment and 12 distracters in the form of similar office environments (see Cunningham, Turk, Macdonald and Macrae, 2008; Lamm et al., 2007; Rogers et al., 1977). The 20 photographs were shown consecutively for two seconds each.

Apparatus: all participants (either one-to-one or up to six per session) were seated facing the front of a small meeting room with only artificial lighting and were presented with the experiment on a wall screen using a projector. The displayed photographs had a minimum size of 1.5 by 1.1 metres, size dependent on wall screen size. All seating positions afforded a clear and sharp view of the stimulus.

Procedure: Participants were received and given a testing booklet which welcomed them with an informed consent form followed by some basic questions (age and gender) and a PANAS self-report sheet. Once this was completed, the lights were dimmed and they were shown how to answer the SAM, the free-word task, the preference item and the procedure of the experiment using a presentation projected onto a wall screen.

As each of the conditions instructed participants to take a particular perspective during the offices evaluations the testing sessions were condition specific. The instructions were adjusted accordingly: the *self* condition directed the participants' attention to their self-knowledge, that is their personal experiences, feelings and views; the *other* condition asked the participants to take the perspective of an architect/designer and the *detached* condition instructed participants to suppress their self-knowledge and make a detached evaluation. All participants were instructed to imagine they were in the environments shown to them and to pay particular attention to how the environment would make them feel according to the assigned condition (see *emotional reactions to stimuli* described above).

After ensuring all participants had understood the procedure for evaluating each stimulus the four practice trials began followed by the eight office environments, the stimuli recognition test and the perspective-taking related items. Participants were debriefed at the end of the experiment and dismissed. Figure 24 depicts the structure of the experiment.

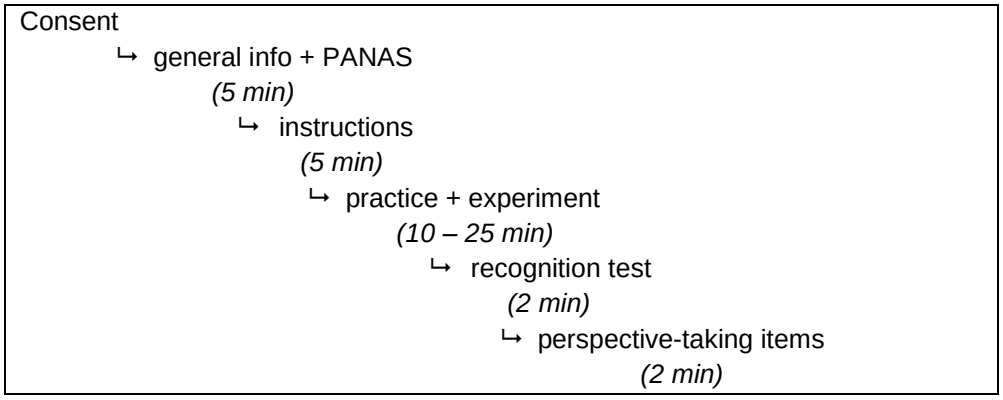

Figure 24. The different sections of each of the experimental sessions.

8.2 RESULTS

The data was firstly checked for the effects of gender and age. Statistical analyses revealed that there were no significant differences between the groups with respect to gender or age, $p>.05$.

The effect of perspective-taking on SAM and preference scores

One way analyses of variance tests showed that there were significant differences ($p<.05$) between the conditions on the pleasure [F (2, 44) = 3.32 $p<.05$, $\omega= .26$][24], dominance [F (2, 61) = 16.53 $p<.05$, $\omega= .37$] and preference [F (2, 61) = 4.79 $p<.05$, $\omega= .32$] scores. However, post hoc tests with Bonferroni correction revealed that only *self* and *other* conditions differed significantly ($p<.05$) in these three scores. The overall means of pleasure, arousal, dominance and preference

[24] One of the assumptions of the one-way ANOVA test is the assumption of homogeneity of variance or the equality of variances between variables (as in the case of between-subjects design used in this study), it is assessed using the Levene's test. If the Levene's test is significant, the assumption of homogeneity of variance is not met and the validity of the F-ratios is questionable. One way of dealing with the violation of this assumption is by using the F values and degrees of freedom of the Welch test, a test that makes adjustments to the F-ratio and the residual degrees of freedom thus correcting the problem (see Field (2005) for more details). Therefore the degrees of freedom do not add up to 61 like in the dominance and preference tests.

according to the perspective-taking condition but irrespective of design style are shown in Table 21.

	Condition					
	self		**detached**		**other**	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*
pleasure	4.94*	1.394	5.46	.762	5.71*	.720
arousal	4.98	1.431	5.01	.890	5.43	1.175
dominance	4.27*	1.137	4.90	1.275	5.51*	1.121
preference	3.53*	.976	4.08	.706	4.28*	.761
Valid N	22		21		20	

** significant at the p<.05 level (2-tailed)*

Table 21. SAM and preference scores for experimental stimuli (s1-s8) according to experimental condition.

Pleasure, arousal, dominance and preference scores were averaged by architectural style, 'traditional' (images 1, 2, 5 and 7) and 'contemporary' (images 3, 4, 6 and 8), and tested via paired t-tests in order to explore the impact of the design styles. Results showed that participants' ratings effectively discriminated between these design styles in each of the measures in the following way: 'contemporary' office environments were rated with higher pleasure, arousal, dominance and were more preferred than the 'traditional' ones. Table 22 shows the design styles' total means and the means reported by perspective-taking conditions.

In a second analysis the averaged architectural style scores of pleasure, arousal, dominance and preference were tested between perspective-taking conditions using t-tests. Results showed that in the case of pleasure scores only *detached* and *other* conditions significantly differed; for arousal and dominance only the *other* condition scores significantly differed between design styles and, with respect to preference all perspective-taking conditions significantly differed between them in terms of design style averaged means, see Table 22.

		Traditional		Contemporary			
		Mean	*SD*	*Mean*	*SD*	*difference*	*p (2-tailed)*
	self	4.68	1.456	5.19	1.559	-.51	.054
pleasure	detached	4.99	.998	5.93	1.173	-.94*	.012
	other	4.65	1.462	6.62	.727	-1.97*	.000
	Total	***4.77***	***1.313***	***5.90***	***1.328***	***-1.13****	***.000***
	self	4.75	1.477	5.22	1.593	-.47	.063
arousal	detached	4.95	1.177	5.07	1.143	-.12	.718
	other	5.04	1.516	5.83	1.365	-.78*	.050
	Total	***4.91***	***1.381***	***5.36***	***1.399***	***-.45****	***.015***
	self	4.03	1.312	4.51	1.255	-.48	.074
dominance	detached	4.74	1.340	5.07	1.417	-.33	.161
	other	4.97	1.496	6.04	1.013	-1.07*	.001
	Total	***4.57***	***1.421***	***5.20***	***1.375***	***-.62****	***.000***
	self	3.15	1.172	3.91	1.151	-.76*	.010
preference	detached	3.71	.930	4.45	.777	-.74*	.002
	other	3.70	1.147	4.84	.758	-1.14*	.000
	Total	***3.52***	***1.105***	***4.39***	***.983***	***-.88****	***.000***

** statistically significant at p<.05 level*

Table 22. SAM and preference scores for experimental stimuli (s1-s8) in each condition reported by design style.

In order to test the perspective-taking effect between groups particular to the design styles the data was submitted to one-way ANOVA tests. Results showed that in the case of 'traditional' design, scores between perspective-taking conditions did not significantly vary (p>.05); with regards to 'contemporary' design the results showed that there were significant differences (p<.05) between perspective-taking conditions in pleasure, dominance and preference but not in arousal scores (p>.05), the ANOVA test results can be seen in Table 23. Post hoc tests with Bonferroni correction revealed that the significant differences between groups for the scores of pleasure and preference occurred between *self* and *other* conditions (but not between *self* and *detached* or *other* and *detached*), whereas the dominance scores' significant differences occurred between *self* and *other* and *other* and *detached* (but not between *self* and *detached*).

			Sum of Squares	df	Mean Square	F	Sig.	ω
Pleasure	*Traditional*	Between Groups	1.468	2	.734	.418	.660	
		Within Groups	107.216	61	1.758			
		Total	108.684	63				
	Contemporary	Between Groups	21.984	2	10.992	7.523	.001	.41
		Within Groups	89.126	61	1.461			
		Total	111.109	63				
Arousal	*Traditional*	Between Groups	.975	2	.487	.249	.780	
		Within Groups	117.202	60	1.953			
		Total	118.177	62				
	Contemporary	Between Groups	6.530	2	3.265	1.706	.190	
		Within Groups	114.817	60	1.914			
		Total	121.347	62				
Dominance	*Traditional*	Between Groups	10.242	2	5.121	2.673	.077	
		Within Groups	116.881	61	1.916			
		Total	127.123	63				
	Contemporary	Between Groups	25.445	2	12.723	8.279	.001	.43
		Within Groups	93.738	61	1.537			
		Total	119.184	63				
Preference	*Traditional*	Between Groups	4.539	2	2.269	1.911	.157	
		Within Groups	72.445	61	1.188			
		Total	76.984	63				
	Contemporary	Between Groups	9.446	2	4.723	5.606	.006	.35
		Within Groups	51.394	61	.843			
		Total	60.840	63				

Table 23. One-way ANOVA tests between perspective-taking conditions for each of the measures according to the design style.

Analysis of freely generated emotion words

In total participants generated 2359 responses (all conditions). An initial check found 54 missing values (participants not providing any emotion words for a given stimulus) bringing the total of generated responses down to 2305. The analysis consisted of three steps; during the first step of the analysis the emotion words generated by the participants were matched to an available list of emotion words (Seitz et al., 2007) where each of the emotion words has a rating for its positivity-negativity and activeness-passiveness on a scale going from 0 (extremely negative or extremely passive) to 10 (extremely positive and extremely active). Once matched, these words were labelled *straight* matches.

The *straight* matches were based on a semantic proximity inclusion criterion, whereby only words that unequivocally matched the Seitz et al.'s list were included, i.e. synonyms were not considered in order to avoid experimenter's or semantic confounding effects. Table 24 shows how this was done, the column labelled *match*

contains a number 1 where a straight match is available and a number 0 when the emotion words generated by the participants is not available in the Seitz et al.'s list (indicated by NA in this column).

Emotion words generated by participants	Seitz et al.'s emotion word list	*match*
contented	Contentment	1
unrestricted	NA	0
peaceful	Serenity	0
inspired	Inspired	1
dreamy	Pensiveness	0
nice	NA	0
happy	Happiness	1

Table 24. Examples of how participants' emotion words were matched to the Seitz et al.'s emotion words list.

The first step resulted in 728 straight matches. People responded with an average of one straight match (*M*=.95, *SD*=.51) per stimulus, the frequency of responses for any single stimulus ranged from 0 to a maximum of 5. The numbers of unique and total straight matches were similar across participants, conditions and stimuli. The straight matches were distributed as follows: 276 total words generated for the IAPS stimuli, 247 total words for the images of 'traditional' design and 205 total words for the images of 'contemporary' design. The list of the most frequent 15 words in each of the stimuli groupings are presented in Table 25.

IAPS images		***'Traditional' design***		***'Contemporary' design***	
Match	***Freq***	***Match***	***Freq***	***Match***	***Freq***
Boredom	30	Boredom	47	Happiness	32
Happiness	27	Calmness	16	Calmness	30
Calmness	16	Happiness	14	Inspired	17
Inspired	12	Unhappiness	13	Boredom	14
Overwhelmed	11	Depression	11	Motivation	8
Depression	10	Motivation	11	Friendly	6
Stressed	10	Sadness	9	Unhappiness	6
Unhappiness	10	Inspired	7	Comfortable	5
Confusion	8	Interest	7	Pleased	5
Sadness	8	Stressed	6	Sociable	5
Annoyance	7	Uneasiness	6	Cheerfulness	4
Tiresomeness	7	Friendly	5	Enthusiasm	4
Anger	6	Frustration	5	Interest	4
Apprehensive	6	Tiresomeness	5	Satisfaction	4
Anxious	5	Uncomfortable	5	Uneasiness	4

Table 25. The 15 most frequently used words for IAPS, 'traditional' and 'contemporary' design stimuli.

In the second step, positivity and activity average scores for each of the stimuli were calculated for each participant, using the Seitz et al.'s (2007) positivity and activity scores based on the *straight* matches. Just as with the SAM scores these positivity and activity averages were aggregated by architectural style – 'traditional' (images 1, 2, 5 and 7) and 'contemporary' (images 3, 4, 6 and 8)- and tested for significance through paired t-tests.

Results showed significant differences in the *straight* matches used to describe how different design styles make people feel: 'contemporary' design was described with straight matches that were more positive and denoted more activity (as opposed to passivity) than the straight matches used for 'traditional' design. Table 26 shows the positivity and activity scores in each design style and by perspective-taking condition.

		Traditional		**Contemporary**			
		Mean	*SD*	*Mean*	*SD*	*difference*	*p (2-tailed)*
	self	5.18	2.03	6.21	1.73	-1.18	.065
positivity	detached	4.49	1.51	6.33	2.22	-1.62*	.010
	other	4.56	1.43	6.98	1.47	-2.40*	.000
	Total	***4.73***	***1.66***	***6.50***	***1.83***	***-1.75****	***.000***
	self	4.99	.80	5.71	1.12	-.60*	.001
activity	detached	4.79	.92	5.27	.82	-.44	.114
	other	5.11	.84	5.55	.98	-.34	.142
	Total	***4.96***	***.86***	***5.51***	***.98***	***-.45****	***.001***

** differences significant at p<.05 level*

Table 26. Positivity and activity scores for experimental stimuli (s1-s8) in each perspective-taking condition reported by design style.

Given the similar results found between using the straight matches and the SAM scores (see Table 22 for the explorations of the latter), both measures were tested for similarity using correlations, irrespective of design style and perspective-taking condition. This third step of the analysis showed that only SAM pleasure and positivity scores were significantly correlated, see Table 27.

SAM SCORES	n	Straight matches Positivity	Straight matches Activity
Pleasure	63	.345**	.195
Arousal	62	.240	.178
*** correlations significant at p<.01 level*			

Table 27. Correlations between SAM scores and straight matches.

Reference frames for environmental evaluation and ease of perspective-taking

The item measuring the ease of taking a perspective was tested using one-way ANOVA. Results showed that there were significant differences in the ease of taking a perspective [F (2, 61) = 10.33 p<.05]. However, post-hoc tests with Bonferroni correction revealed that the ease of taking the perspective of the *other* and taking a *detached* perspective did not differ between (p>.05) but were significantly more difficult (p<.05) than evaluating an environment from a *self* perspective. The items on the reported reference frames used during the evaluation, irrespective of perspective-taking condition, showed that evaluating the environments was a combination of drawing on *self* experiences, considering what *others* may say about it and performing an *objective* judgement about that environment[25]. Table 28 shows the overall means and the means for each of the perspective-taking conditions for these four items.

Frames of reference	Perspective-taking condition						total	
	self		detached		other			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Used self	6.09	.68	4.71	1.59	5.14	1.42	5.33	1.392
Used other	2.18	1.59	5.38	1.32	4.05	1.69	3.84	2.018
Was objective	4.27	2.12	4.86	1.53	4.38	1.28	4.50	1.681
Ease of perspective-taking	3.00	1.72	4.67	1.65	5.00	1.22	4.20	1.765

Table 28. Frames of reference used by participants in each of the perspective-taking conditions.

The frames of reference items were submitted to one-way ANOVA tests. Results showed that there were significant differences on how the participants in the *self* [F (2, 35) = 8.94 p<.05] and *other* [F (2, 61) = 23.37 p<.05] groups used the frames of

[25] The term objective is intended as a synonym of making a 'detached' judgement, the wording of these items reflects their usage in the literature described in section 3.4.

reference but that there were no significant differences in the *detached* group [*F* (2, 39) = .772 *p*>.05]. Planned contrasts revealed that participants used their self-knowledge differently, i.e. mostly according to the group they were assigned to. *Self* references were significantly higher in the *self* group than in the *detached* [(*t*(27)= 3.666, *p* <.05 (two-tailed), *r*.57] and *other* groups [*t*(28)= 2.76, *p* <.05 (two-tailed), *r*.46]. Being objective during the evaluations did not differ between groups according to this item (*p*>.05). Finally, using the reference of how *others* would feel was significantly higher in the *detached* [(*t*(61)= -6.78, *p* <.05 (two-tailed), *r*.65] and *other* groups [*t*(61)= -3.96, *p* <.05 (two-tailed), *r*.45] than in the *self* group.

Relationships between measures

The relationship between the PANAS, SAM (pleasure, arousal and dominance), straight matches (positivity and activity) and preference items were explored using the Pearson moment correlation coefficient, see Table 29.

	1	**2**	**3**	**4**	**5**	**6**	**7**
1. PA							
2. NA	.082						
3. Seitz Positivity	.154	.019					
4. Seitz Activity	-.009	.211	.514**				
5. Pleasure	.002	.189	.345**	.195			
6. Arousal	-.044	-.132	.240	.178	-.009		
7. Dominance	.039	.004	.303*	.083	.652**	.055	
8. Preference	-.062	.158	.398**	.208	.855**	.085	.678**

*correlation significant at ** p<.01 level (2-tailed) and at * p<.05 level (2-tailed)*

Table 29. Correlations between overall measures.

The correlations showed that PA and NA did not significantly interact with any of the other measures. With regards to the similarities between SAM and straight matches (labelled 'Seitz positivity' and 'Seitz activity') the correlations revealed that Positivity significantly correlated with Dominance as well as with Pleasure scores (as shown in the prediction of positivity and activity from SAM scores, see Table 27 for a reminder). Finally, the correlations showed that Positivity, Pleasure and Dominance were significantly correlated with preference. Figure 25 shows a model of the measures' correlations, for readability purposes only significant relationships (significant at least at the *p*<.05 level) are indicated by thick lines with their corresponding correlation coefficient.

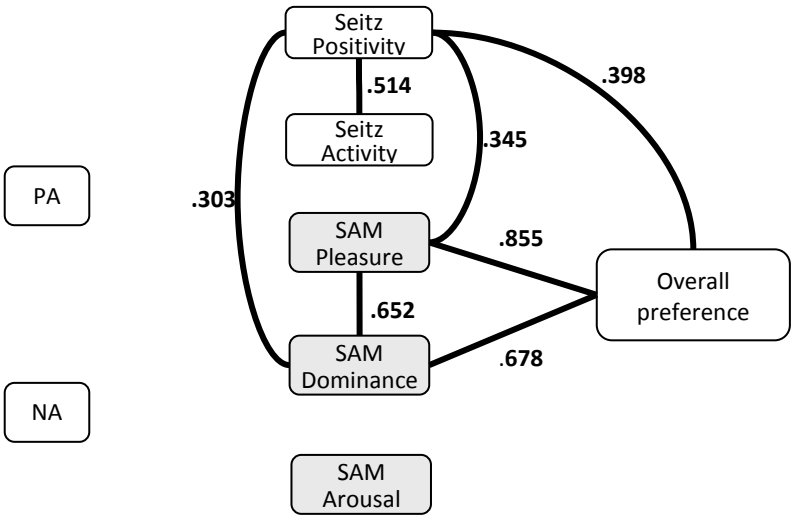

Figure 25. Model of the significant correlations between selected measures.

Prediction of emotional reactions and preference

The predictive power of mood (PA, NA) for the overall emotional reactions to the stimuli was explored via five multiple linear regression analyses, one for each of the SAM scales (pleasure, arousal and dominance) and one for each of the positivity and activity straight matches. Each of the analyses included PA and NA as independent variables forced into the same equation. Results showed that PA and NA did not explain any significant variance of pleasure, arousal or dominance in the case of SAM scores nor any of the variance of the straight matches for positivity or activity. Table 30 shows the regression coefficients for each of the measures.

Predicting	Pleasure		Arousal		Dominance		Positivity		Activity	
	B	**β *coeffs***	***B***	**β *coeffs***	***B***	**β *coeffs***	***B***	**β *coeffs***	***B***	**β *coeffs***
PA	-.021	-.014	-.058	-.034	.072	.039	.318	.153	-.035	-.028
NA	.533	.190	-.409	-.130	.002	.001	.021	.005	.492	.213
	R^2 = .036		**R^2 = .019**		**R^2 = .002**		**R^2 = .024**		**R^2 = .045**	

Table 30. Multiple linear regressions predicting SAM (pleasure, arousal and dominance) and straight matches' positivity and activity from PA and NA scores.

Three different multiple linear regression analyses were also run testing for the predictive power of the SAM scores for preference. Each of the models used preference – overall preference, 'traditional' design preference and 'contemporary' design preference – as the dependent variable and pleasure, arousal and dominance (overall, traditional and contemporary scores accordingly) as the independent variables. Table 31shows the regression analyses.

SAM Predictors	Overall preference		Traditional design preference		Contemporary design preference	
	B	**β *coeffs***	***B***	**β *coeffs***	***B***	**β *coeffs***
Pleasure	.630	.768***	.571	.638***	.508	.690***
Arousal	.061	.084	.047	.058	.013	.018
Dominance	.103	.146	.153	.191	.172	.241**
	R^2 = .769* **		**R^2 = .601*** **		**R^2 = .767*** **	

*** p<.01 *** p<.001*

Table 31. Multiple linear regressions testing the prediction of preference using the SAM scores.

Results showed that in the overall data model (irrespective of design style) the overall SAM scores explained 77% of the variance and this was mostly accounted for by pleasure. In the 'traditional' design model the 'traditional' design SAM scores explained 60% of the variance and this was mainly explained via pleasure. Finally, in the 'contemporary' design model the 'contemporary' SAM scores explained 77% of the variance and this was accounted by both pleasure and dominance.

Recognition test

The scores on the recognition test at the end of the experiment showed that there was a clear ceiling effect within and across groups: the vast majority of participants correctly identified the presented stimuli amongst the distracters with 85% accuracy (*M*=17.56).

Framing of instructions effect

The four stimuli used as practice trials were used to check for instruction framing effects. The IAPS database scores on pleasure, arousal and dominance of the four selected images were compared against the *self* condition participants' means scores via independent t-tests, Table 32 shows the means, t statistics and effects of these differences.

		self group (N=22)		*IAPS database (N=100)*		*Mean diffs*	*t statistic*	*r*
		Mean	*SD*	*Mean*	*SD*			
Filing cabinet	pleasure	3.68	2.73	4.45	1.36	-0.77	-2.24*	0.20
	arousal	4.00	2.47	2.81	1.94	1.19	2.53*	0.23
	dominance	4.32	2.21	6.26	2.23	-1.94	-3.63**	0.31
Skyline	pleasure	5.86	2.66	6.97	1.69	-1.11	-2.67**	0.24
	arousal	5.91	2.51	5.54	2.34	0.37	0.66	0.06
	dominance	5.14	2.59	5.33	2.25	-0.19	-0.35	0.03
Cupboard	pleasure	2.09	1.57	4.25	1.45	-2.16	-6.20***	0.49
	arousal	5.14	2.59	2.95	2.17	2.19	4.18***	0.36
	dominance	2.64	1.99	5.13	2.45	-2.49	-4.27***	0.36
Winter street	pleasure	5.55	2.04	6.25	1.56	-0.70	-1.85	0.17
	arousal	4.68	2.01	3.97	2.03	0.71	1.46	0.13
	dominance	4.36	1.62	5.69	1.98	-1.33	-2.82**	0.25

differences significant at * p < 0.05 ** p < 0.01 *** p < 0.001

Table 32. Scores differences due to framing of instructions as compared between this experiment and the IAPS scores across the four stimuli used in the practice trials.

Results showed that there were significant differences between the IAPS database scores and the *self* scores in the three measures for the *Filing cabinet* and *Cupboard*; the *Skyline* stimulus only significantly differed between framing conditions in the pleasure scores and, *Winter street* scores only significantly differed in the dominance scores.

8.3 DISCUSSION

This study experimentally tested whether self-reported mood and perspective-taking have an effect on preference and the emotional reactions to the environments and if emotional reactions to the environment can be used as predictors of preference. The emotional reactions to the environment were explored in two ways, one using the SAM scales and one using freely generated emotion words. The study also explored how people use their self-knowledge when being asked to take a perspective, and taking a perspective was used as a categorical variable to test its effects on an image recognition task.

The results on the influence of mood on emotional reactions (both SAM scores and emotion word straight matches) and preference showed that PA and NA did not have an effect on neither preference for nor the emotional reactions to the environment. These results do not fit in with expectations driven by the literature (e.g. Gifford, 1980; Korpela, 2003; Mealey and Theis, 1995; Regan and Horn, 2005)

and results from Study 4 where mood was significantly related to emotional reactions and these were related to preference.

The effects of perspective-taking on preference and emotional reactions to the environment were explored at both the general (irrespective of design style differences) and the specific design style levels. At the general level, overall results showed that there were significant differences in the pleasure, dominance and preference scores as a result of the perspective-taking manipulation.

When the overall measures are explored according to the perspectives taken the analyses showed that with respect to overall pleasure, people taking the perspective of the *other* reported higher scores (feeling happier) than those in the *self* perspective. The scores on dominance showed that both the *other* and *detached* groups had significantly higher scores (perception of more control) than the *self* group. Preference scores in the *other* and *detached* groups also differed when compared with the *self* condition scores: the *self* condition participants assigned significantly lower scores (less liked) to the environments than those in the *other* and *detached* groups.

Assuming that taking a detached perspective or the perspective of the other is similar to what the architects do when they design within the commercial architecture context, i.e. they do not design for a *specific* person but for a general user (see Rambow and Bromme, 1995), then these results suggest that the very process of taking a perspective will be very likely to incur into an increase of the scores on how the environment will be perceived by the client/end-user.

When the data was analysed according to the specific design style effects, results showed that participants clearly discriminated between 'contemporary' and 'traditional' design stimuli, this was shown through the overall significant differences between 'contemporary' and 'traditional' design in pleasure, arousal, dominance and preference scores. 'Contemporary' design stimuli were rated with significantly higher scores than 'traditional' design stimuli in all four measures.

Just as in the overall results, these results were further analysed for perspective-taking effects within each of the design styles. Results for the 'traditional' design stimuli showed that there were no significant differences ($p>.05$) in any of the measures between perspective-taking conditions. 'Contemporary' design stimuli's scores showed that there were significant differences between *self* and *other*

conditions in pleasure and preference and that with respect to dominance scores' the significant differences occurred between *self* and *other* and *other* and *detached* (but not between *self* and *detached*).

As mentioned in the introduction to this section, the emotional reactions to the environment were also studied using freely generated emotion words. These showed that people relied on a similar number of emotion words to talk about how the environment made them feel, the main difference being in how these emotion words were used. The emotion word analyses results were in keeping with the results found through the SAM scales: 'contemporary' design was described with emotion words with higher positivity and activity than the emotion words used to describe 'traditional' design. The emotion words in conjunction with the SAM scores showed convergent evidence suggesting that 'contemporary' design was appraised more positively than the 'traditional' design style.

Given the conceptual similarities between straight matches and SAM scores the two measures were compared against each other using correlations. The results showed that positivity scores significantly correlated with SAM pleasure scores, the effect size of the correlation was medium. SAM arousal scores and activity scores were not significantly related, the reasons behind this lack of interaction are puzzling as these two measures are theoretically related.

Having explored the initial questions the analysis focused on the predictive power of SAM scores for preference, these were tested using regression analyses for both overall and specific design styles. The regression models for the prediction of preference showed that valence successfully predicted both 'overall preference' and 'traditional design preference'; and that 'contemporary design preference' was successfully predicted by both pleasure and dominance. The results are similar to those found in Study 4, where emotional reactions to the environment also predicted preference, with the advantage of being able to account for the design style differences.

How did participants use their self-knowledge when asked to take a perspective? This data showed that taking a self-perspective was done by using significantly more self-references than people in the other two groups, taking a detached perspective or the architect/designer perspective was operationalised by the participants through a *reduction* of *self*-references and an increase in *others* references. The results for how 'objective' people's ratings were presented a

problem, as all participants reported being equally objective in spite of the perspective-taking condition they had been assigned to. It is suggested that the item was not understood as intended, i.e. 'not using self-knowledge' but instead was taken as the degree of 'objectivity' that people put into the tasks, this is similar to the results found by Sevillano et al. (2009) with regards to the same perspective in their study, for this they concluded that this would have been due to *"...the awkward wording of the item; participants likely interpreted objectively to mean "look carefully".*" (p. 692).

The study also explored how easy it was for participants to take a perspective, this followed on from Study 2 which found that participants reported taking a perspective of a local resident to a greater extent that of an architect. In this study, as well as using a self and architect perspectives, a third one was added, the detached perspective. The results on the ease of perspective-taking showed that taking a perspective of an architect/designer or taking a detached perspective were significantly more difficult than taking a self perspective, this indicates that not relying on self-knowledge is difficult and requires conscious effort and confirms that people use their self-knowledge as the main reference point for taking a perspective (e.g. Nickerson, 1999).

The recognition test included in this study attempted to replicate findings from other studies, in particular those of Lamm et al. (2007), where taking a self perspective has been reported to have a significant and positive effect on the identification of presented stimuli amongst distracters. This study results could not replicate these findings as there were ceiling effects in all conditions and therefore this data was unusable. Reasons for the ceiling effect could rest on the simplicity of the recognition task.

With regards to the empirical exploration of the picture or place phenomenon (Scott and Canter, 1997) results showed that there was a significant difference between focusing on how the stimulus makes someone feel (IAPS instructions) and how people feel whilst imagining being in an environment (this study's instructions). In general, this analysis suggested that imagining yourself in an environment results in an increase of arousal and a decrease of pleasure and dominance scores when compared to rating how the picture makes people feel. Future studies should seek to test both instruction protocols on a larger set of stimuli using comparable participants in order to corroborate this experimental effect.

The study had a number of limitations. First, each of the conditions in the study used a relatively low number of participants per condition and as such it may have resulted in missing small statistical effects. Fortunately the results are encouraging as the statistical effects found in the regression models were large. Second, the stimuli used in this study were providen by the professional design company. Future similar studies should invest in alternative methods of categorising visual stimuli in order to achieve greater control over the materials. Finally, this study could have benefited from the inclusion of trained participants just as in Study 3.

8.4 CHAPTER SUMMARY

This study explored the effects that mood and perspective-taking have on the emotional reactions (pleasure, arousal and dominance and freely generated emotion words) and preference for the environment, and whether it is possible to predict preference from the emotional reactions to the environment. Through the perspective-taking implications, the study explored how, and if, people can reduce their self-knowledge references by taking a perspective of the *other* or being *detached*, and how difficult it is to take different perspectives. The study also explored if perspective-taking had an effect on the recollection of the visual stimuli and tested instructions' framing differences by comparing the self group results against the IAPS database normative ratings.

The study assumed that a self-perspective is comparable to the perspectives taken in most of the environmental preference research where participants respond to items such as "I like this environment" (Nordh, Hartig, Hagerhall and Fry, 2009) or "I like this place" (Purcell, Peron and Berto, 2001) by selecting the response that best represents their judgement in a series of options, e.g. from not at all to completely. The study also assumes that taking the perspective of the *other* or being *detached* will direct people away from using their self-knowledge, in the former this is done by directing people's attention to the perspective of the other whereas in the latter it is explicitly done by asking people not to pay attention to their own feelings or views.

In this study the mood at the time of the evaluation, unlike the case study findings, did not have an effect on the emotional reactions to the environments (neither for SAM nor freely generated emotion words) or preference for them. Similarly to Study 4, the prediction of preference by the emotional reactions was

tested and found that pleasure was a good predictor of both 'traditional' and 'contemporary' design but also that dominance predicted preference for 'contemporary' design.

The results of the study found that taking a perspective is a mixture of drawing on *self* experiences and considering what *others* may say about it, the extent to which self and other references are used depends on the perspective taken, but it was clear that other and detached perspectives did lead to a reduction of self-knowledge references but also that these perspectives were significantly more difficult to take than a self perspective. Overall, the perspective-taking results revealed that there was an inter-personal perception bias as participants in the *self* condition gave lower pleasure, dominance and preference scores to the environments than those in the *detached* and *other* conditions, in colloquial words: it is 'only 'OK' for me but it should be 'good' for you.

With respect to the evaluation of different design styles the results clearly showed that overall and when perspective-taking conditions were considered, 'contemporary' design stimuli were scored as more pleasurable, arousing, controllable and preferred than 'traditional' design stimuli. When the freely generated emotion words were used instead of the SAM ratings the same trend of results were found: overall positivity and activity scores of 'contemporary design' (irrespective of perspective-taking condition) were significantly higher than the overall positivity and activity scores of 'functional design'. SAM and emotion words were tested for similarities via correlations and results found that positivity scores were significantly related to pleasure scores but that activity was not significantly related to arousal scores.

The results of the effects of perspective-taking on visual recognition of the stimuli clearly presented ceiling effects and couldn't be analysed. The analysis on the effects of different instructional sets, using the *self* condition and the IAPS scores, found that instructions have a significant impact on the SAM and preference scores, there are differences between asking people to report how a picture makes them feel and asking participants to imagine being in the environment depicted and report how they feel about it. This is an area that requires further research using comparable samples and environmental sampling as in the case of this exploratory analysis the sample from the IAPS database is derived from student populations whereas this study's sample is drawn from participants with office working experience.

CHAPTER 9. CONTRIBUTIONS TO KNOWLEDGE, GENERAL DISCUSSION, LIMITATIONS AND FURTHER RESEARCH

This thesis set out to study how preferences for the built environment, either in-situ (Study 4) or based on visual representations (Studies 2, 3, and 5), may be affected by specific variables: emotion, attention and perspective-taking. The main research questions were:

a) How does emotion influence environmental preference?
b) What is the impact of perspective-taking on environmental preference?
c) What are the benefits of using emotional reactions to the environment as predictors of preference?

The thesis addressed its main research questions using both quantitative and qualitative methods, mainly quantitative, underpinned by a pragmatic approach. A conceptual framework (section 4.6), developed on the basis that the unit of analysis in this thesis is the person who evaluates an environment or a representation of it, showed how emotion, attention and perspective-taking are linked and also highlighted that when evaluations or judgements of built environments are based on visualisations of final design, the responses are prospective.

The results of the thesis overall make distinct contributions to knowledge and practice. These are presented in the following section and are followed by a general discussion, an assessment of the limitations of the research and an outline of potential future work that originates from this thesis.

9.1 CONTRIBUTIONS TO KNOWLEDGE AND PRACTICE

1. *Self-reported mood at the time of an environmental evaluation can influence environmental preference.*

Section 3.2.1.3 described mood as a state of being with individuals always considered to be in some mood (Russell, 1980; Russell and Barrett, 1999; Watson and Tellegen, 1985) and showed how mood has been reported to have an effect on environmental preference (Russell and Snodgrass, 1987; Gifford, 1980; Korpela, 2003; Mealey and Theis, 1995; Regan and Horn, 2005). The influence of mood on

preference investigated in this thesis was confirmed in an applied study (Study 4) where participants' mood at the time of the evaluation was found to have a significant effect on the emotional reactions to the environment, which then had a significant effect on preference.

The effect that mood had on the emotional reactions to the environment however, was only accounted for by Positive Affect (PA) at all measurement times. This finding suggests that the prescribed theoretical assumption behind Positive Affect, *"High PA is a state of ... pleasurable engagement"* (Watson et al., 1988, pp. 1063) is supported. In other words, as PA increased so did the positivity of emotional reactions' effect on overall preference.

1.1. The relationship between Positive Affect and emotional reactions varies with time.

The longitudinal design of Study 4 allows this thesis to show that the strength of the association between emotional reactions and Positive Affect at each of the survey stages did not hold constant over time (see section 7.2). This research design is novel in-so-far as previous research (e.g. Korpela, 2003; Mealey and Thesis, 1995) only addresses these associations via cross-sectional study designs that cannot test whether this relationship is stable over time.

Study 4 data show how in the pre-relocation and 6 month surveys, the relationship between Positive Affect and emotional reactions was low, whereas during the 3 month survey their association was high. This suggests that whilst self-reported mood does have an impact on how people react emotionally to an environment, this effect is greater during the early interactions with the environment. Thus, the time of assessment is important and this can be used to improve the timing of post-occupancy-evaluations but also highlights the importance of the fact that longitudinal assessments are able to show clearer patterns of responses.

1.2. Ecological validity can make the difference between finding or not finding an influence of mood on environmental preference.

The results from Study 4 are similar to those of Gifford (1980), Korpela (2003), Mealey and Theis (1995), and Regan and Horn (2005) described in section 3.2.2 whose non-experimental studies also found significant relationships between mood and environmental preference

The effect of mood on emotional reactions and preference were not found in Study 5, an experiment, showing that some of these relationships may be context-dependent and that the relationship between mood and environmental preference may be limited to naturally occurring situations.

2. *Asking people to take a perspective during an environmental evaluation has important effects on preference*.

By asking people to take different perspectives this thesis emulates the process architects/designers use when designing for their clients, and allows study of how people put themselves in the perspective of others during environmental evaluations. Although the literature on environmental preference is rich with examples of differences between experts and laypeople, little has been done to explore how taking a perspective may shape preference for a given environment. This thesis contributes the use of the construct of perspective-taking for environmental evaluation and exemplifies how it could be used through three different studies, Studies 2, 3 and 5. It does so by instructing participants to take different perspectives during the environmental evaluations.

2.1. Perspective-taking carries an interpersonal perception bias.

The results of the perspective-taking effects in Study 5 show that taking a perspective other than a self-perspective can result in an increase of the positive evaluation of, and emotional reactions to, an environment. Moreover, by manipulating perspectives participants took during the evaluation, it was possible to study how perspective-taking happens: taking the perspective of the *other* or a *detached* perspective was operationalised by the participants through imagining what *others* would feel whilst downplaying self-references.

Raising awareness of the fact that perspective-taking can increase the positive evaluation of an environment is important as it could help explain why groups involved in environmental evaluations may differ, e.g. experts vs. laypeople or different groups' opinions. However, this interpersonal perception bias can also be affected by training.

Study 3 results largely replicated findings from the literature on the differences between architects and lay people: their judgements about the environment differ. For example, after studying how architects and non-architects perceive two different

types of residential architectural style (high vs. low), Devlin and Nasar (1989) found that architects preferred the high residential architecture whereas non-architects preferred the low residential architecture.

Furthermore, Section 4.5 described the theoretical and empirical reasons for exploring whether laypeople would make similar judgements to those made by experts in environmental evaluations if they are asked to take the perspective of an expert, in this case an architect. In order to do this, the results of participants without training were compared against participants with training when taking the architect perspective (an incongruent perspective for the former and a congruent one for the latter). These analyses showed two distinct patterns of responses.

2.2. When taking the perspective of the architect, participants without training do not have the same scores as participants with training.

The results of this comparison, presented in Study 3 (section 6.2), showed that laypeople's scores of the environment taking the perspective of the architect were only the same in four of the measures' scores given by trained participants in the perspective of the architect: Complexity, Ornamentation, Familiarity and Arousal. In other words, for participants with no training, taking the perspective of an architect also resulted in an increase of the positive evaluation of perceived preference, beauty, pleasantness and purchase behaviour intention; conversely, the comparison to recent developments were reported as significantly worse than those reported by the participants with training using the same item. This is a distinct contribution to the understanding of how non-trained people take the perspective of an expert.

2.3. When taking the perspective of the local resident, participants with training do not differ significantly from participants without training.

The extent to which the responses of the participants with training were similar to the responses of the non-trained participants in the perspective of the local resident was tested (a congruent perspective for both trained and non-trained participants). The results showed that the scores of nine different measures given by participants with formal architectural education taking the perspective of the local resident did not significantly differ from the scores given by laypeople when they took the local resident perspective. In other words, this comparison shows that participants with training seem to be able to mimic the responses of participants with no training.

If this apparent skill can produce similar results, then why would there be such routinely reported differences between architects and laypeople when it comes to environmental preference? It is suggested that although there is a degree of training dependence, there is also a further mechanism at hand, the extent to which the designers take a perspective during the design process.

2.4 Architects take the perspective of their client/end-user in two ways: a detached and prescriptive perspective and a self-referential perspective.

It has been discussed in this work that an important step in the process of designing an environment happens when the architect has to imagine what it is like being in the environment from the perspective of the client/end-user. Through the interviews with the architects presented in section 2.5 this thesis shows that architects take a perspective in two clear ways: a detached and prescriptive perspective dictated by their professional training (labelled in this thesis *detached*) and a self-referential perspective or taking the position of the client.

There is no doubt that both perspectives are influenced by the architect's self-knowledge but there was a strong indication that architects tend to take a prescriptive perspective during the design process and that this is influenced by their training.

Furthermore, it must be stressed that the process whereby the architect tries putting him or herself in the position of the client/end-user usually happens when dealing with domestic projects on a non-commercial scale. Whenever commercial architecture is concerned (as is the case of all the visualisation examples used in the studies of this thesis), the architect/designer is very likely to be taking a more detached and prescriptive perspective. This is because they have to design for the *average* user as it is unusual for them to have direct communication with the client/end-user (e.g. Rambow and Bromme, 1995).

3. Prospective and in-situ scores are not significantly different when there has been involvement in the design decision-making process.

During the analysis of the results of Study 4, a finding emerged with regards to one of the items used for the perception of interior aesthetics. These items addressed the attractiveness of six aspects of the new environment: Furnishings, Decor or Style, Corridors, Foyer, Social Spaces and Meeting Rooms. The results

showed that there were changes in five of them between pre and post occupation. Furnishings was the only item in which no significant changes in attractiveness were reported between expected and occupation scores. This was the only part of the design process where staff had input into the design stage. The rest of the items were only visualised through floor layout plans and staff opinion was not taken into account for the final design.

This finding shows that involvement of the end-user in the design decision-making process allows the end-user to have information of what the new environment would be like, i.e. they know what to expect. This small contribution confirms the existing literature on participatory approaches to design where the end-user is at the centre of the design process (Lipman, 2003; Mathies & Kromker, 2000; Zimmerman and Rappaport, 1988).

4. *The emotional reactions participants have to a representation of the environment can be measured using the Self Assessment Manikin (SAM).*

This thesis successfully implemented the use of the Self Assessment Manikin (SAM) (Lang, 1980, in Lang et al., 2005) within an environmental evaluation context. As described in section 3.2.3, the SAM has been mainly used as a core measurement in the International Affective Picture System (IAPS), the results of which provide normative measurements of how people respond to different pictures. By providing a modification of the original SAM instructions to fulfil the perspective-taking manipulations in this thesis, this work also contributes a set of tested instructions which could later be used by other researchers interested in using the SAM for environmental evaluation situations. These could be standard evaluations whenever the interest is with respect to people's preference (instructions for the self); or for further research on perspective-taking scenarios (instructions for the other or detached).

9.2 GENERAL DISCUSSION

The results of this thesis are important for environmental psychology and design disciplines. These are discussed below under two main themes, mood and emotional reactions, and those pertaining to perspective-taking.

Mood and emotional reactions

At the general level, endeavours concerned with environmental evaluation could benefit from including procedures which allow the participants' mood at the time of the evaluation and their emotional reaction to the environment to be taken into account. The mood people are in at the time of the evaluation was shown to influence the emotional reactions they have to the environment. This could potentially make the difference between accepting or rejecting a design proposal or making a significant commitment such as purchasing a property or choosing the interior decor of an environment. Yet, generalisations from these data must consider that although the influence of mood on environmental preference through the emotional reactions people have to the environment is significant, the effect size is small. In other words, mood explains some of the variation in preference scores via emotional reactions but it does not account for their entirety.

The influence of mood on preference via emotional reactions was found in a real world setting but not in an experimental manipulation. This suggests that it may be difficult to replicate this effect under controlled conditions. Further research is necessary to grow the evidence base of influences on environmental preference in both experimental and real world settings. Not only because of their explanatory value in experimental and real world contexts, but also because this is one of the main guides used by architects when they want to test how the design is received by the client/end-user.

Whenever mood and emotional reactions are concerned, this thesis shows that these could easily be measured. For example, mood can be measured using the Positive Affect and Negative Affect Schedule, PANAS (Watson et al., 1988) whereas the emotional reactions to the environment could be measured using semantic differentials or in pictorial form, through the Self Assessment Manikin (SAM) (Lang, 1980, in Lang et al., 2005).

The differences between real world and experimental settings feeds back into the use of visualisations for the presentation of new environments. For example, the visualisation in Study 4 suggests that if people are presented with general visualisations they can make reliable general evaluations, but it cannot be expected that people will make reliable specific judgements (e.g. decor) about parts of the environment that were not visualised in the final design.

Moreover, given that there are some financial constraints attached to how much visualisation and to what degree of realism this involves (see section 2.6), one alternative to visualisation of new environments may reside in the inclusion of the client/end-user during the design process. Involving the client/end-user during the design process was shown to be an effective way of helping them understand what the environment would be like. For example, this thesis shows that inclusion of the client/end-user resulted in no differences between prospective and in-situ scores with regards to furnishings. This is logical as people mainly interact with a building 'inside-out', and as such it is possible to see that at the 3 month survey the relationship between staff emotional reactions to the building and overall preference was mediated by the interior aesthetics. Increasing involvement at an earlier stage may thus create more positive evaluations of preference.

Reducing the measurement of environmental preference to a limited number of well-researched dimensions is desirable for parsimony reasons. However, the results of this thesis suggest that environmental evaluations should include measures of emotional reactions to the environment, as these may successfully predict preference. A clear example of the utility of measures of emotional reactions to the environment was shown in Study 4, where emotional reactions predicted overall preference at pre-relocation and 6 month surveys but not at the 3 month survey. At this survey stage, the effect of emotional reactions on overall preference was mediated by the perception of interior aesthetics.

This is an important finding for architecture and built environment disciplines. It suggests that whilst well-designed and attractive interior environments are important during the initial interactions with the environment, these are relegated to a second layer as time goes by, and what reliably accounts for overall preference over the course of time is how people feel with regards to the environment. It is important to remember that the way people emotionally react to the environment is influenced by their mood at the time of making an evaluation and it is advisable to take both measurements in tandem, otherwise there is a risk of not being able to capture this effect.

Decision makers in architecture and built environment disciplines can benefit from knowing that some environments generate more positive emotional reactions than others in spite of the preferences that such environments generate. Thus, if one of the purposes of designing new environments concerns human health and well-being as stated in Future Health, a recent publication by the Commission for Architecture

and the Built Environment (CABE, 2009), the emotion-environment link must be incorporated into the design process. This thesis shows that these connections can be explored via visualisations at the final design stage before the formal financial commitment is taken; for example, as part of planning applications at the point where local residents have the opportunity to voice their opinions about refurbishments or new developments proposed for their local environment.

Perspective-taking

This thesis also studied how on the one hand architects can explore their client/end-users' environmental preferences and on the other hand, how people's environmental preference and emotional reactions can change depending on the perspective taken during the evaluation of the stimuli. This was framed in terms of a perspective-taking process whereby one person tries to take the position of another during a task, in this case the environmental evaluation, either by explicit request (the case of the experimental manipulations in this thesis' studies) or through everyday practices (the case of the architects designing for a client/end-user).

Taking a perspective: how it happens

Section 3.4 showed how perspective-taking has its roots in the process of empathy and how the concept of perspective-taking, unlike traditional definitions of empathy, accounts for both cognitive and affective content of taking a perspective. Accordingly, experiments using perspective-taking manipulations considered both cognitive and emotional measures.

As stated in the same section, two of the three possible accounts of perspective-taking are essential for this work (see Davis et al., 2004). One where existing self-knowledge is used in a different way to derive plausible guesses about others' personal states: it is inferential. And one where the self is positioned in the other's perspective in order to derive plausible guesses about the other's personal states: it is referential.

It is argued in this work that these two processes of taking a perspective are similar to what practising architects do when taking the perspective of their clients: they take a prescriptive perspective, dictated by their training (inferential); or take a referential perspective by imagining what the client/end-user would feel in the new environment and then trying to accommodate this imagined response in the design.

Interestingly, the architects interviewed in Study 1 tended to use an inferential perspective (termed detached or prescriptive) more often than a referential perspective (taking the perspective of the client/end-user) when designing new environments.

As a result of this, it is possible to suggest that some of the gaps that exist between experts and laypeople in terms of environmental preference are due to the fact that the architect is designing for an unknown other (in this thesis' particular situation where the client/end-user is not involved throughout the design process) and that this lack of knowledge results in discrepancies between what the architect infers the client/end-user likes/feels and what the latter actually does like and feel with regards to the environment.

The processes of taking a perspective are followed up in detail in Study 5, where different perspectives are manipulated to investigate what reference points participants use to perform three distinct environmental evaluations regarding preference for office environments: one from a self perspective, one from an other's perspective, and a detached perspective. The results of this study help in completing the picture of perspective-taking by confirming that participants effectively discriminated their reference points as per perspective-taking conditions.

Study 5 results suggest that a simple instruction could potentially be used to help experts, and potentially the other way round too, frame the perspective from which they *should* design in order to accommodate others' environmental preferences. If this tentative conclusion is compared against Study 3 results it becomes apparent that students of architecture with at least four years of formal training may indeed be able to infer somebody else's preference. Thus, it is advisable to request architects to not only take the 'perspective' of the client/end-user, but also to take a self-perspective so as to create synergies between these two apparently discrepant positions and, in doing so, the inter-personal perception bias *"only 'OK' for me but it should be 'good' for you"* can be reduced.

Another point should be made with regards to the architectural styles contained in the images and their relationship to perspective-taking. The results of Study 5 showed that 'contemporary' office environments were more preferred and had more positive emotional reactions than those classed as 'traditional'. This is topical for architects/designers in-so-far as it is clear that design matters, and that this effect is irrespective or even in spite of the perspective taken during the evaluation of the

environment, and poses the following question: would the 'beneficial' effects of 'contemporary' style office environments hold over time? Are these effects independent from issues of energy efficiency, sustainability or energy required to produce them in the first place? Although this thesis' results cannot answer these questions, it is important to acknowledge that the meanings of design categories were not explored and that doing so could possibly help explain differences between them.

Architects and perspective-taking: closing the gap

It is important to highlight that even though the process of perspective-taking has been described and discussed in terms of what is likely to be the case for those whose job is taking somebody else's perspective, the particular case of the architect is rather interesting. The analysis of the interviews with the architects showed that little is known in terms of systematic knowledge of how architects explore their client/end-user preferences. This is likely to be the case because they acquire such knowledge and skills through their everyday practice in a trial and error process, which is seldom made explicit.

The differences seem to start because, from the beginning of the design process, architects implicitly start designing with others in mind or from a prescriptive perspective when engaging in commercial architecture projects, where by default little or no face-to-face interaction with the client is possible. In the words of Rambow and Bromme (1995):

> ...*under contemporary conditions of practice, the architect's assumptions about occupant behaviour and occupant needs are hardly ever subjected to any true reality check, because the architect as a rule gets no opportunity to meet the future users of his/her design. His/her work ends at the latest with the completion of the building; at this moment in time the future occupants are usually not yet known at all. Besides, architects naturally hardly ever live in the flats they design. So at least in the design of multi-storey apartment buildings, there is usually no form of feedback about the correctness of the personal presuppositions and convictions at all.* (p. 353).

Thus, one way of closing this gap and helping both architect/designer and client/end-users communicate is by using the post-occupancy evaluation (POE) of every building, as this is one of the few instances in commercial architecture projects where the architect would have the opportunity to receive feedback from the

actual occupiers of the building. However, the up-take rate of post-occupancy evaluations that complete or finalise the design process has been slow (see introduction to Chapter 7).

In a recent review of the state of post-occupancy evaluation, Hadjri and Crozier (2009) point out that even though post-occupancy-evaluation is still not part of mainstream practices, the field is slowly moving in this direction. Hadjri and Crozier, however, add that the "*most significant contribution to the lack of POE work"* (p. 30) is not the finance and time required to carry them out, but the notion of the designer's professional liability, as negative POE findings can not only damage the professionals' reputation but also have detrimental financial consequences. This is a substantial barrier that can only be overcome by a concerted effort of the practising community supported by appropriate legislation.

One way of resolving the lack of feedback on the impacts of the design can be found in the creation of a database of post-occupancy-evaluations. This could allow professionals from different disciplines to consult what solutions have been given to different problems (see Doidge, 2001; Preiser, 1995; Ornstein, 1997 for similar suggestions). However, the implementation of post-occupancy-evaluation as a necessary requirement of the design process is faced with several challenges, for example the time required to perform the post-occupancy-evaluation, and establishing who is responsible for the cost of doing so (e.g. Roberts, 2001; Zimmerman and Martin, 2001).

In Scotland, policy on the public procurement of buildings shows encouraging future directions. The Scottish Government stipulates 48 guidance points with regards to Major Investment as part of The Scottish Public Finance Manual (Scottish Government, 2010). In particular, the 42nd guidance point stipulates that:

> *In the case of an accommodation related major investment project it is good practice to carry out a post-occupancy evaluation (POE) 12 months or more after its occupation. The focus of POE, which may be carried out by an independent consultant, is on whether the building is performing satisfactorily and is meeting needs and whether there are any lessons to be learned.*

Similarly, in September 2009, shortly after Hadjri and Crozier's paper, the Royal Institute of British Architects released the manifesto for architecture, *Buildings Matter*, in preparation for the 2010 election. The manifesto challenged the current and future Government to understand that "*the quality of the built environment*

around us has been proven to have dramatic effects on our happiness, health and how our children perform in school" (p. 1). The manifesto also reinforces the notion of post-occupancy evaluation, at least for publicly funded buildings: "*minimum design standards for all public buildings including post-occupancy evaluation"* (p. 3).

As can be seen, even though the current status of post-occupancy evaluations is arguably not ideal, there seems to be sufficient governmental and stakeholder support for change in the foreseeable future. More importantly, in spite of this resurgence of POE support, a few issues still need to be addressed: when does the POE need to be conducted? What should be measured? As seen in Study 4, carry out a POE after 3 months and it is likely that the relationships between people and overall preference will be mediated by the interior aesthetics, so that assumptions drawn from this may simplistically assume that the new environment has been a success. Conversely, carry out a POE after 6 months and little or no change will be detected in comparison to expected values, thus creating the risk of concluding that the relocation has had little or no benefits.

POE research could only benefit from the inclusion of the variables that this thesis has found to have a significant impact on environmental preference that are not routinely considered: mood and emotional reactions to the environment. More importantly, on the basis of this thesis' results it can be recommended that POEs should not only comprise one snapshot but are at least bi-modal so that variations over time can be captured.

This thesis continues the argument that there is a need to understand the impacts of the built environment on their occupants and users, and that greater interdisciplinary dialogue between built environment disciplines and the social sciences, in particular psychology, is still needed (e.g. Canter, 1974; Lee, 1976). Interdisciplinarity however, should not be taken up only at a POE stage; such interchange between different professionals can be used to embed in their training the notion that good design can not only be the result of better understanding of their own profession, but also of the end users that their skills service.

9.3 LIMITATIONS

This thesis focused on studying responses to visual representations as in standard communications of final-design, with the exception of Study 4 which also measured perceived environmental variables in-situ. In doing so, the complex perceptual interactions that occur in the experience of *being* in an environment are reduced to the visual input. Although there is evidence supporting the dominance of visual inputs on information processing (e.g. Colavita, 1974; Posner, Nissen and Klein, 1976; Gifford and Ng, 1982; Sinnett, Spence and Soto-Faraco, 2007), environmental preference research efforts should seek to address cross-modal or multi-sensory approaches. Computer representations might be a useful way in which to study these.

For example, one of these multi-sensory approaches already forms part of the visualisation formats used by architects to communicate their design to laypeople and is included within the *virtual environments* category (described in section 2.3). What separates this format from the rest is that the representation is not static; it is dynamic, i.e. it represents movement in the visualised environment. This type of visualisation can be further subdivided between user-controlled (active) and observation only (passive).

The choice of the visualisation format ultimately has to be commensurate with the objectives of the visualisation exercise. Static representations seem to be sufficient for enabling laypeople to make judgements about new environments whereas active navigation of virtual environments seem to be better used to enhance the sense of being in the prospective environment (Conniff, et al., 2010). The way this is implemented in practice however, goes back to the cost and time that such visualisations would incur, as this would eventually determine the extent to which an environment is simulated. In the case of Study 4, staff members would have benefited from experiencing their future offices in such a fashion but this was not available.

With regards to the visual representations used in this thesis, Studies 2 and 3 could have benefited from using a set of Computer Generated Renders (CGRs). Sampling different environments could have allowed checking whether the perspective-taking effects held across design styles, as was done in Study 5. Moreover, sampling different environments could have also helped explain some of

the messages conveyed by the CGRs that go beyond the physical representation of the environment, such as the social and activity connotations afforded by the particular content of the visuals, such as architectural style, quality of the landscape, age and weathering effects, type of cars. For example, if the CGR used in Studies 2 and 3 was manipulated to have different types of car (expensive and new cars versus budget and older cars), would the perceptions of the environment change?

In terms of measures, the thesis mainly relied on semantic differential scales and on a pictorial scale, the Self Assessment Manikin (SAM). In contrast to the self-administered format of the semantic differential scales, SAM followed an instruction protocol, ensuring that participants were clear on what their tasks and perspectives were and leaving little room for interpretation. However, use of the SAM poses extra time demands due to the thoroughness of the instructions. Thus the use of SAM and its standardised instruction protocol has to be factored into the overall time of the experimental set-up. Future work should also address whether the standardised instruction protocol is necessary for using SAM. This could be done by investigating whether there are any differences in SAM scores as a result of using and not using the standardised instruction protocol.

The measures of mood, emotional reactions and environmental preference in this thesis can be used to make some inferences about more general measures indicative of human well-being, such as satisfaction with life (e.g. Diener, Emmons, Larsen and Griffin, 1985), psychological stress and coping (e.g. Carver, 1997; Cohen, Kamarck and Mermelstein, 1983) and quality of life (e.g. WHOQOL Group, 1998). These measures were not considered as they did not form part of the core focus of this research, but it is acknowledged that their inclusion could have further closed the theoretical gap with regards to the measures used in this thesis.

This thesis' studies were designed so that ecological validity was at the forefront, but it is acknowledged that Studies 2 and 5 would have benefited from having a sub sample of architects, or architecture students with a minimum number of years of training, like the one used in Study 3. This could have allowed checking for possible differences as a result of training (as was done in Study 3) as well as differences due to perspective-taking manipulations.

More generally, being a thesis within Environmental Psychology that focuses on person-in-environment interactions, this work does not consider in detail how some of these person-environment interactions may be shaped by social processes. This

is not a limitation of this work but a critique of the Environmental Psychology research that shares this perspective. How are the effects of perspective-taking and emotional phenomena affected by particular social issues? Invariably, having a clear focus will reduce the number of concurrent variables that can be studied, but new creative ways of finding a better balance between individualistic and social approaches should be sought.

9.4 FURTHER RESEARCH

This thesis has generated several research questions for future enquiry. Through studying the effects of perspective-taking this thesis shows that the manipulation of perspective-taking could indeed be a valuable tool in the sensitisation of different groups that converge around contentious issues, e.g. a new work environment. Future studies should address how perspective-taking manipulations could be used in order to reduce inter-personal perception differences by sensitising people towards the overarching benefits of building on commonalities. This can be achieved through engagement between groups, face-to-face or otherwise, around the issue of interest in order to instigate social learning (e.g. Fisher, 1994).

For example, in a recent research project looking at household consumption (Polhill, Galán-Díaz, Gotts, Craig, Marshall, Sutherland, et al., 2010) we used a facilitated workshop in order to foster knowledge exchange between experts and stakeholders (laypeople) with regards to an agent-based model of household energy consumption. This was part of GILDED, a EU 7th Framework Programme funded Collaborative Project. The workshop provided a window of opportunity where stakeholders and experts interacted with each other in order to identify synergies and obstacles in the way household energy consumption is conceptualised. One of the main conclusions of this exercise was the experts' realisation that the way they think about the world is not intuitive to stakeholders, and that in order to have commonalities with non-expert audiences investment is required.

Similarly, workshops could be set up where client/end-users (stakeholders) and architects and design professionals (experts) can be requested to explicitly take each other's perspectives in order to find common ground for them to discuss issues or solve problems. Such endeavours will inevitably test the commitment of both professionals and client/end-users. Ideally, an exercise like this should be driven by

the expectation of better built environments, or paraphrasing the Government and stakeholders: it should be driven by the demands of realising environments conducive to health and well-being.

Perspective-taking manipulations could also be used as agents of behaviour change (e.g. acquisition, maintenance or suppression). For example, Dolnicar and Grun (2009) reported that people's environmentally friendly behaviours varied according to the environments that people were in. Overall, people engaged in fewer environmentally friendly behaviours when they were on holiday, e.g. recycling, than when they were at home, i.e. when the consequences are for themselves. The effects of perspective-taking could be used in this type of scenario in order to test if requesting people to take the perspective they would normally take at home would help change the targeted behaviour.

Another question for future study is how architecture, built environment, design and planning professionals (but also experts from other fields) use their self-knowledge to take a detached perspective. This thesis suggests that they will be likely to use more *other* and fewer *self* references, just as the laypeople in Study 5 did. More importantly, these research questions should be tested on a variety of building types in order to account for environmental sampling.

With regards to perspective-taking, it would also be interesting to track how architects' self-knowledge changes; first through their training and later on due to the effects that practice may have on their knowledge. For example, if following the results from Study 5 one assumes that taking a detached perspective involves making fewer self-references, does the tendency to avoid 'self references' change with years of training and practice? How does training and practice influence architects in their emotional reactions to the built environment?

Investigating the way perspective-taking develops through training could be feasibly done in the UK Higher Education system, for example, by incorporating additional items to the existing questionnaires that students have to complete at the end of the academic year to provide feedback about their courses. An ideal scenario would involve the procurement of a carefully assembled set of tasks that can be run as a cohort study on a yearly basis for the duration of the degree and through their professional practice. This could be instigated as a requirement for RIBA accreditation for example.

Another research question concerns the way professionals in architecture, built environment, design and planning disciplines perceive prospective preference and the way they deal with how end-users react to the physical environment, both in terms of preference and emotional reactions. As described in section 9.2, it is timely to identify how the professionals in charge of the delivery of the built environment can incorporate these findings into their workflow.

The effects of emotional phenomena on a variety of behaviours also merits further research, as these are not restricted to how people evaluate the environment. For example, the emotional reactions people have to stressful life events have been at the centre of coping mechanisms, i.e. "*thoughts or behaviors that people use to manage the internal and external demands of situations that are appraised as stressful*" (Folkman and Moskowitz, 2004, p. 747). In other words, the way people are made to feel by different life situations can act as triggers for behaviour.

In Fischer, Craig and Galan-Diaz (2010) we investigated the coping strategies people use to deal with climate change. One important component of coping is its emotional dimension, as it deals with people's expression of their emotional reactions to the events that are being evaluated, just like the emotional reactions to the environment. For example, we tested whether coping strategies could be used as useful predictors of the self-reported frequency of different current behaviours e.g. green or sustainable purchasing behaviours, transport, and energy behaviours.

Our preliminary analyses showed that as the expression of emotions increased so did the frequency of current eco or sustainable food purchasing behaviours. In other words, the more negative emotions people expressed with regards to climate change, the more likely they were to be doing something already in order to correct this situation, i.e. making green or sustainable shopping purchases. Such results indicate that the value of measuring emotional reactions goes beyond the environmental evaluation context and is intrinsic to behaviour.

Perspective-taking could also be used for scenario development and forecasting. For example, it has been argued that one of the challenging characteristics of climate change is its lack of tangible and immediate feedback (e.g. Fischhoff and Furby, 1983; Uzzell, 2000). This lack of immediate feedback could be overcome by asking people to take the perspective of individuals or groups that are currently facing the negative consequences of environmental phenomena and testing whether this would help people visualise the consequences.

The finding that mood, mainly Positive Affect, had significant consequences on preference in a real world setting but not in an experimental study should be further studied. For example, by introducing mood inductions prior to the experimental manipulations so the effects of mood on the environmental evaluations can be studied in-depth in controlled settings; in particular the apparent lack of interaction between Negative Affect and preference.

On a more applied note, some of the results in this thesis showed that participatory design (or inclusion of the end-user) resulted in little or no change between expected and delivered outcomes, indicative of a good adaptive response to change. Thus, how people's prospective responses (emotional reactions, preference, aesthetics, satisfaction, et cetera) differ from actual or in-situ responses in a fully inclusive, fully visualised design process should also be the focus of future research.

The central role of emotion in environmental evaluation and preference studied in this thesis was approached from a psychological perspective. Future endeavours should consider incorporating physiological measures so that these can be related with self-reported indicators such as the ones used in this thesis. For example, increases in Heart Rate have been related to reports of high arousal such as the stress response (Appelhans and Luecken, 2006) or during verbal responses to negative affective stimuli (Burbridge, Larsen, and Barch, 2005). Not only is matching psychological and physiological responses of value, different sensory modalities within the same study design should also be considered (see section 9.3).

Finally, future research should move towards a coherent interdisciplinary integration of the micro (e.g. psychological and physiological) and macro (e.g. physical environment, economic and social factors) levels which make up the basis of well-being.

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APPENDICES

APPENDIX 1. INTERVIEWS WITH PRACTISING ARCHITECTS

1.1 INTERVIEW RELEASE FORM

Release form

I agree to participate in a research study, "Responses to representations of the built environment: a perspective of role and perception". I understand that I will be taking part in a voluntary capacity and that the study has been explained to me fully. I give permission for the data collected to be used for Carlos Galán-Díaz PhD degree.

I understand that my personal data will be anonymised. I grant permission for the recording of interviews. I understand that I may ask to withdraw from the study at any time with no detriment to myself. I may also ask for my recording to be erased.

Carlos Galán-Díaz has to work within the Code of Conduct, Ethical Principles and Guidelines set out by the British Psychological Society, a copy of which could be electronically provided upon request.

Signed:

Date:

.....

The researcher Carlos Roberto Galán Díaz can be contacted at the following address:

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The Robert Gordon University
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c.r.galan-diaz1@rgu.ac.uk

1.2 TRANSCRIPT EXAMPLE

Description: architect name/ age/ gender
Architect 4/ 34/ male

in your everyday practice, how do you communicate the design to the client/end-user? (representation format)

still a lot of 2D drawings, plans, elevations, site plans, increasingly we are doing 3D images but we use sketchup as a product it is a sort of schematic 3D approach rather than the high photo realism type thing, just to give him a feel of what the building would be.

why do you use this method?

I think its becoming quicker to do, to create a 3D model I think we are starting to see the benefit of it through the design process. That you can focus in on the bits 3 dimensionally that are creating the problems in the design so you can address those earlier but yes far away client far easier for them to get a grasp on how do we do it. Previously we would've done a perspective drawing to try and give them that quality. But you know you can spend more time doing that than a quick 3D image these days, you can then give them a series of different views. ***(you mentioned that it helps you to see problems of the design, how does that come across)***. Well I think that… we used them for a number of schools recently and just getting the junctions between a lot of the roof forms where you've got several open surfaces and when you put it together the 3D allows you to deal with that and get a little pocket, pockets, little junctions that are difficult, maybe clumsy kind of look it up earlier.

what problems have you encountered while using such methods?

Not so much problems, I think that there is a bit of a lack of understanding from the client as to how long the preparation of some of these things take and that you might present something in 2D form and they would say what would be great is to see that in 3D, you know give us an idea of what it looks like er… you know you can, depending on what that request is of it could be quite a lot of time to convey something that is relatively straight forward. ***(you think the client undervalues the effort of a 2D because they expected a 3D perhaps?)*** no I think it's a, I think you get mixed understanding and some people you deal with have a very good grasp of that and others just can't relate 2D to 3D but usually with the healthcare we do a lot of the information from the client comes in the terms of al ist, a written list. So a lot of people can't see what that looks like so you get them a drawing a 2D drawing and just taking the list and creating a 2D drawing suddenly they can understand it because they can see where the door is, they can see where the window is, they can see how the room is laid out but for others that's not enough, they've physically need to see it. And I think that people are … thing is more, they understand you can do fly-rounds and you know 'it'd be great to have a fly-round' it's almost create to have rather than great to use.

what are your constraints for using other methods?

Only constraints we have are understanding and the time of learning new techniques when we do do some physical models, we've been doing that for a 10 million pound project at the moment, we've done a working model but there is a full-scale model being professionally made at the moment for that, that's again to take that design into the community if you like, so the client can see what we are doing and invite comments on it. But we do small models for our own working purposes, that's done to convey the design but we just pick things up as we go, I mentioned sketch up earlier, we started to use that in the last probably 18 months 2 years and there's now 3 or 4 people in the office that can do that in a relatively condensed period of time so because we can do it, we use it more, we use it earlier and then it's there available for the client. Sometimes they're, everyone is always keen to get something so they can see the building, but there's always some job that are getting that now without asking for it because we are using it to get through the process.

in your own view what are the ideal formats for the communication of design to a lay person?

I think a physical model is great because people can get down and look at it and see it in its context and that is really good. Like myself, sometimes the sort of stills are really good as well, stills of 3D models when you can do the photo-representatives or qualities is great but I feel you've got to either do it as a sketch so you are just getting a sort of form or you need to go right to the other extreme and have a really polished product. I think it's very difficult to get away with something in the middle that's trying to be really highly finished and not, because you can just pick holes at it you know. Which could be a better model because you are looking at that at a very reduced scale, anything you do in the computer there's the opportunity to zoom right in in it and if it's not fully refined it's, you know that can create issues. I think anything in the middle it really isn't.

how often do you use the/your ideal method for communicating design?

Physically built, professional model we may only do occasionally, maybe for very large projects, at the moment is for a 10 million pound project, the last one we did as a practice was about 4 years ago for a 20 million pound project so you know that's relatively rare and that's really when the client has, they have the need to go out and sort of share the design wider, you know public client. The sketch 3D stuff we are doing quite a lot now, we can do that in house, few years ago we had to go external, now we can do it ourselves we use it a lot more.

(how much would it cost to build a physical model?) errr, we would do them at about 1/200 scale and you may this sort of size (about 70 by 70 cm) for the extent of the site and the model will be the bit in the middle, four or five years ago it was costing us about 8 thousand pound to model the royal Aberdeen children's hospital. At the moment, I think it is,

I'm not involved, but I think it's about 6 thousand pounds for Aberdeen dental school model, but yeah, it's a lot of money.

in your own view, what are the main difficulties your clients have had while visualising the new design?

I think that with the 2D drawings it's just getting a, translating it into the 3D perspective. So that's the limitation, whether they are looking at plans I think it is a case of scale, you know, not really understanding how big a room is and at the early stages of design that can be more difficult, again with the healthcare stuff we do we have to provide loaded room layouts so as the design progresses you are putting the patients bed in, the monitoring equipment the wardrobe, the seats the wastebins all sort of furniture and equipment that you need to service a hospital bed, with the door, with the windows. Once all that information is on it they can understand because you can start to scale things up, that's a bigger bed therefore the room is twice as big as the bed but when it's just an empty room even with the door a lot of people find it difficult to say well 'that's 4 metres by 3 metres or it's big enough' and that's the crucial thing is it big enough? People they don't understand that they are loathe to take commitment.

when you design, how often do you imagine being the client/user? do you design for the layperson or considering how they will understand it?

No, I would say it's a very much driven by what the client is looking for. And that's very much a necessity of any healthcare building because they layout of the building is very much driven by the patient needs to come in here and needs to go through these various functions in the building and the building needs to be laid out in order to address how you use it and then as you work out from that yeah, you are developing a form that's receptive to how the building's working and then you've got to obviously enclose it. I guess we get a bit more free rein to make it look how we want but inside it needs to entirely work how they need it to work. We've got a few things as a practice that we do and think work well so we do those again but you know we try and constantly keep updating as well so that we are not able to get pigeonholed by creating a certain look. We've… obviously building regulations are changing, buildings are, having become more sustainable err… increasingly and only recently our clients are becoming more aware of that and that again is influencing how the building's look. We've had clients in the past where the, financially the bottom line has been very important, but the last couple of years we are starting to look you know, 20, 25 years down the line looking at the life cycling and investing a bit more money up front, all of those things are changing how buildings look so.

how do you try to envisage what it is like to being your client?

(Chuckles) that's more difficult, we always spend, whether is somebody locally or outwith the area we always go through the process of visiting site, sitting with them going through of what they want, trying to understand why it is they are doing the project they are, meeting

with everyone who is involved. Largely in terms of those who are involved in using or maintaining the building on the longer term just to find what they are trying to get out of it. Trying to see what the client has done before, find out what works for them, what doesn't. but, it's almost a bit sort of trying to gravitate to find out where it is who you are practically must try and keeping involved and in regular contact with them so they are not certainly the people we are dealing with, it will be unlikely that we may be in a situation that we are doing a great presentation from our initial briefing to a full presentation there would be a process we'd have gone through where we have perhaps discussed the layout plan and build it up so we get a degree of input and feedback through the process so it's unlikely that we have a 3D image or a 3D model or perhaps even elevations without having been to the client and understood that we are addressing their issues. We do have a few jobs where we are in a competitive situation and we are trying to win the project through our submission and sometimes that includes a design so you know, there are circumstances where we have to, as you say, trying put yourselves in their shoes and see what they are trying to get out of us see what they've been doing as a client before and then give it our best.

(how long does it take?) difficult to say because it really relies upon on the scale of the project, we've had some project recently that we have met the client, met with them once a few weeks into it to kind of show them where we were going and then the next discussion was an electronic transfer of plans and elevations to them for them to say yes 'fine' before we submitted the planning application. We've got another project at the moment where we've been appointed for 3 years where we have, probably had, monthly meetings if not more regular monthly meetings. In and around that project where its' maybe not always been the main point of discussion but it's always being discussed then, it's taking 3 years because the brief has changed significantly during that time but you know, you can, you've got 15 meetings on that project and we've still have to submit the planning but hopefully will next month, fingers crossed.

(communication importance) I don't think that anyone gets success out of giving a client a building that they, that doesn't work for them. Well it needs to operate for them, it needs to do what they want it to do, buildings cost a lot of money, a lot of the clients might only build one building so it's a huge investment for them so you have to get it right.

(he asks what are students being taught nowadays and if architecture education is addressing this issues, I reply that I don't think I'm qualified to answer that question) I mean I maybe, I don't know, I don't want to give mixed messages but the fact that there are these 3D capabilities and package, drawing packages and Photoshop I do think that a lot of students can, I don't know, present their work in a manner that maybe act, sort of conceals their ability. Because we get a lot of people who you know, you do wonder the depth of their experience when they come in here and putting together drawings and assembling the information onto drawings to then present, I am not convinced that the students these days

can do that as well. And I think that that comes from, when I was at college we were still drawing, you were drawing on paper and you were, you know, you had your sheet and you had to set up your sheet in terms of how you were going to put it together, there is a certain different way of working that comes with simply cutting and pasting things together that is not structured in terms how you would build the design up from…. And I look a lot of drawings now in the office and wonder 'why would you do that', why would you set it out like that, why would you, why would you, you know, why would you do a drawing at that size on that bit of paper because it doesn't, you see they are communicating too much or too little.

(I add that as a non-architect I don't think they have many presentation skills) I think that's what I'm saying in 3D stuff you know, if you do it well you can maybe cover a lot of gaps, I'm looking at it as someone that is over above you and doing that has an overall bob of not having sorted out these basic things. A lot of the CV's of the people we've had in the last few years and we are speaking about the opportunity to do their year out or a job at the end of it, a lot of models you see how hugely rely on models, and the time that seems to be devoted to constructing those models that seems to be an awful lot particularly the context model that as a group admittedly there seems to be a huge amount of time invested in constructing the context and seem to be less focus in the design of the building and how it fits into that context. I could've said a few years ago I've only seen a few people every so often that would've felt that, you know, I wish there should be more time looking at the building itself.

(in a recent project I saw that students from this particular class focused more on the particulars rather than the context) you need, it still needs to be quite different because the university certainly gives you the whole sort of process, the thinking process behind it, there are other skills that you may hone at work but you need to have the thought process behind it but we've recently taken, well they start next week. But we've had a few students from outwith Aberdeen trying to seek out employment in Aberdeen because is not yet quite struggling as much as other parts of the country, and you know, you look at their CV and you go 'oh wow' he's come up we've offered him a job because he, it's a bit fortuitous in terms of timing but he sent in something that really gives the impression that he could do what he said. And he came up and saw his portfolio and seemed to be quite strong, I'm not saying some of his buildings did not stand out and half-worked contextually, but he did clearly spent a lot of time you know working through his design and presenting it in a really clear manner.

When I was at college me, we barely did anything with computers, you know we did a little bit of AutoCAD just as a couple of weeks before I went out, and we did a one hour a week of three did stuff but it's nothing, and I think and that's why I finished about 12 years ago but It's obviously changed a a huge amount we didn't have access to the computer, what we can do changes a lot of the time, obviously you need the teaching and nobody when I came here nobody knew how to use AutoCAD but nobody, no student that comes here today and not

being able to just sit there and draw, how well is a different question. They can all use AutoCAD, you can immediately come in and give them something to do just to sort of bed them in and see where they are.

(is it standard practice to draw on computers?) we still have a few drawing boards in here but err… yeah I think you need to be able to draw. I don't think you get a better product by hand but what I find is that if you are having to draw on paper you are having to draw based on, you are having to plan out the whole building, when you see people drawing in a computer they all go right in and they are drawing this bit that the pulled out and then they are drawing this bit here, you know they are not constantly having to look at the whole thing, I think that's the big failing of computers at the moment they don't let you design the whole, you've got to design the whole from the bits whereas if you are drawing on paper you are probably designing from the whole out to the bits. I think you are constantly looking at the whole thing, you are drawing a part of the whole thing, whereas in the computer I think you are almost drawing a bit in isolation without having to then stare back, maybe it's just me.

APPENDIX 2. STUDY 2 QUESTIONNAIRE

The questionnaire that participants used to write their answers in the experimental sessions, in this case the 'local resident' version.

Consent form

I understand that my participation in this project is individual and that I will be alongside other participants in the same room. This will involve the completion of some general questions (such as demographic data) and two questionnaires regarding my views on the built environment. These answers will be based on viewing an image of an urban scene two separate times, as indicated by the researcher who will project the images onto the room's screen. The study will require approximately 30 minutes of my time.

I understand that participation in this study is entirely voluntary and that I can withdraw from the study at any time without giving a reason and without the loss of course credits.

I understand that I am free to ask any questions prior to the commencement of each task, and that I am free to withdraw without providing a reason or discussing my concerns with the experimenter.

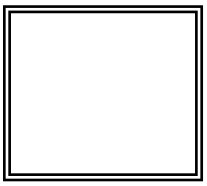
I understand that the information provided by me will be held anonymously so that it is impossible to trace this information back to me individually. Information will be held in paper form and only anonymous data will be used for the outcomes of this project. In accordance with the Data Protection Act this information may be retained indefinitely.

I understand that at the end of the experiment I will be provided with additional information and feedback about the purpose of the study.

I, …… (NAME), consent to participate in this study conducted by Carlos GalánDíaz in the School of Psychology, University of Aberdeen, under the supervision of Dr. David G. Pearson.

Signed:

Date:



1. Age: ……

2. Gender: F ☐ M ☐

3. Occupation: …….

(if you are a student please state what you are studying)

……

Thank you for taking part in this research. I am interested in how you *evaluate places* based on an image. To help me understand your experience I have provided a series of questions for you to respond to.

I would like to ask you to be as honest with your answers as possible. Your most sincere answer will help us understand the process in a better way.

I would like you to answer one page at a time and await further instructions from the experimenter before moving onto the next page.

If you have any doubts please do not hesitate to raise your hand and the experimenter will come and assist you.

Please wait for the researcher's instructions.

Please look at the image on the screen.

Thinking about the place you just saw, how would you describe it? Please use as many words as you can think of.

As mentioned before, I am interested in how you evaluate places. I would like you to imagine that there has been a design competition for a building and that you are the local resident who will be judging it as part of a user group set by the council. You are being asked to use your knowledge as a local resident to evaluate the qualities of the building based on this image. Please circle the number to indicate the extent to which you agree or disagree with the following statements.

	Not at all						Completely
Being here is an escape experience	1	2	3	4	5	6	7
My attention is drawn to many interesting things	1	2	3	4	5	6	7
This place has fascinating qualities	1	2	3	4	5	6	7
Being here suits my personality	1	2	3	4	5	6	7
It is easy to see how things are organized	1	2	3	4	5	6	7
Spending time here gives me a break from my day-to-day routine	1	2	3	4	5	6	7
This place is boring	1	2	3	4	5	6	7
	Not at all						Completely
It is a confusing place	1	2	3	4	5	6	7
I can do things I like here	1	2	3	4	5	6	7
There are landmarks to help me get around	1	2	3	4	5	6	7
I want to spend more time looking at the surroundings	1	2	3	4	5	6	7
Coming here helps me to get relief from unwanted demands on my attention	1	2	3	4	5	6	7
There is too much going on	1	2	3	4	5	6	7
I want to get to know this place better	1	2	3	4	5	6	7
	Not at all						Completely
It is easy to find my way around here	1	2	3	4	5	6	7
It is a place to get away from it all	1	2	3	4	5	6	7
I can find ways to enjoy myself here	1	2	3	4	5	6	7
The setting is fascinating	1	2	3	4	5	6	7
There is a great deal of distraction	1	2	3	4	5	6	7
There is much to explore and discover here	1	2	3	4	5	6	7
I have a sense that I belong here	1	2	3	4	5	6	7
	Not at all						Completely
I could easily form a mental map of this place	1	2	3	4	5	6	7
Being here helps me to relax my focus on getting things done	1	2	3	4	5	6	7
There is nothing worth looking at here	1	2	3	4	5	6	7
I have a sense of oneness with this setting	1	2	3	4	5	6	7
It is chaotic here	1	2	3	4	5	6	7
I put myself into the role of a local resident	1	2	3	4	5	6	7

Now I would like you to imagine that there has been a design competition for a building and that you are the architect who will be judging it as part of an expert's panel set by the council. You are being asked to use your expertise as an architect to evaluate the qualities of the building based on this image. Please circle the number to indicate the extent to which you agree or disagree with the following statements.

	Not at all						Completely
Being here is an escape experience	1	2	3	4	5	6	7
My attention is drawn to many interesting things	1	2	3	4	5	6	7
This place has fascinating qualities	1	2	3	4	5	6	7
Being here suits my personality	1	2	3	4	5	6	7
It is easy to see how things are organized	1	2	3	4	5	6	7
Spending time here gives me a break from my day-to-day routine	1	2	3	4	5	6	7
This place is boring	1	2	3	4	5	6	7
	Not at all						Completely
It is a confusing place	1	2	3	4	5	6	7
I can do things I like here	1	2	3	4	5	6	7
There are landmarks to help me get around	1	2	3	4	5	6	7
I want to spend more time looking at the surroundings	1	2	3	4	5	6	7
Coming here helps me to get relief from unwanted demands on my attention	1	2	3	4	5	6	7
There is too much going on	1	2	3	4	5	6	7
I want to get to know this place better	1	2	3	4	5	6	7
	Not at all						Completely
It is easy to find my way around here	1	2	3	4	5	6	7
It is a place to get away from it all	1	2	3	4	5	6	7
I can find ways to enjoy myself here	1	2	3	4	5	6	7
The setting is fascinating	1	2	3	4	5	6	7
There is a great deal of distraction	1	2	3	4	5	6	7
There is much to explore and discover here	1	2	3	4	5	6	7
I have a sense that I belong here	1	2	3	4	5	6	7
	Not at all						Completely
I could easily form a mental map of this place	1	2	3	4	5	6	7
Being here helps me to relax my focus on getting things done	1	2	3	4	5	6	7
There is nothing worth looking at here	1	2	3	4	5	6	7
I have a sense of oneness with this setting	1	2	3	4	5	6	7
It is chaotic here	1	2	3	4	5	6	7
I put myself into the role of a local resident	1	2	3	4	5	6	7

DEBRIEFING SHEET

Thank you for your time. The present experiment is part of a PhD project which is looking at the impact of perspective-taking on built environment preference, that is, how our preferences (what we like and dislike about the environment) may be influenced by the point of reference (perspective) that we take when evaluating something.

Specifically, this experiment examines whether participants behave according to the perspective-taking assigned to them.

It is common for architects and urban designers to present design ideas to clients and public using photos, sketches and computer generated images since these methods are some of the most accessible to them. However, it is common to hear that people have trouble understanding these images, which can lead to disappointment with the end result. Furthermore, some of these problems originate from the fact that public and clients bring their own *baggage* into the evaluation, that is they judge the design ideas from a very personal point of view (their own perspective).

In order to study this very obvious fact (that people judge from a personal point of view), the experiment tried to manipulate the perspective that the *observer* should have in mind when evaluating the design. Hopefully, once the results are processed, it will be possible to corroborate if people not only evaluate design from a personal perspective but could also evaluate design according to other roles or perspectives, in this case by imagining being an architect or being a local resident.

If you would like to know the results of the experiment when they are analysed in a few months, please send your email or postal address and I will be in touch with the relevant link or digest of the results.

Thanks once again for participating in our experiment.

Carlos R. Galán Díaz

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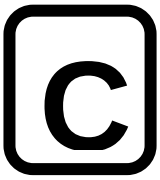
APPENDIX 3. STUDY 3 QUESTIONNAIRE ANSWER SHEET

Answer sheet used for the experiment, in this case the example refers to the perspective of the architect condition:

In order to answer the following questions you must look at the picture projected on the screen:



I would like you to imagine that there has been a design competition for a building and that you are the architect who will be judging it as part of an expert's panel set by the council. You are being asked to use your expertise as an architect to evaluate the qualities of the building based on this image. Please circle the number to indicate the extent to which you agree or disagree with the following statements.

To what degree do you feel that the proposed design is worse or better than other developments being built in and around Aberdeen City in the recent years?

Much Worse --- 1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- Much Better

Look at the scene shown in **picture C**. Please tick the box on each of the following scales that best represents your overall impression of the scene.

	1	2	3	4	5	6	7	8	9	
Beautiful	☐	☐	☐	☐	☐	☐	☐	☐	☐	Ugly
Pleasant	☐	☐	☐	☐	☐	☐	☐	☐	☐	Unpleasant
Like	☐	☐	☐	☐	☐	☐	☐	☐	☐	Dislike
Simple	☐	☐	☐	☐	☐	☐	☐	☐	☐	Complex
Plain	☐	☐	☐	☐	☐	☐	☐	☐	☐	Ornate
Familiar	☐	☐	☐	☐	☐	☐	☐	☐	☐	Unfamiliar
Exciting	☐	☐	☐	☐	☐	☐	☐	☐	☐	Boring

Imagine that money is not an issue, will you purchase a flat in such a place?

Definitely --- 1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- Not at all

APPENDIX 4. STUDY 4 WEB-BASED QUESTIONNAIRE

Welcome page presented at the pre-relocation questionnaire:

Dear Colleague

We are nearing the point where you will be relocating to your new office at Garthdee. As part of the relocation process, we want to ask you to help us inform future practice by telling us about your current workplace, your expectations of your new workplace, and your opinions about the Garthdee decantation process.

In order to do this, we have teamed up with a researcher from the Scott Sutherland School who will be impartially monitoring the decantation process, and at a later date performing a post-occupancy evaluation (POE).

We can assure you that the information provided by you will be held confidentially. Your personal details are requested so that our researcher, Carlos Galan-Diaz, can contact you once you have moved in.

The following questionnaire should take about 20 minutes of your time. We hope you will find it interesting to complete.

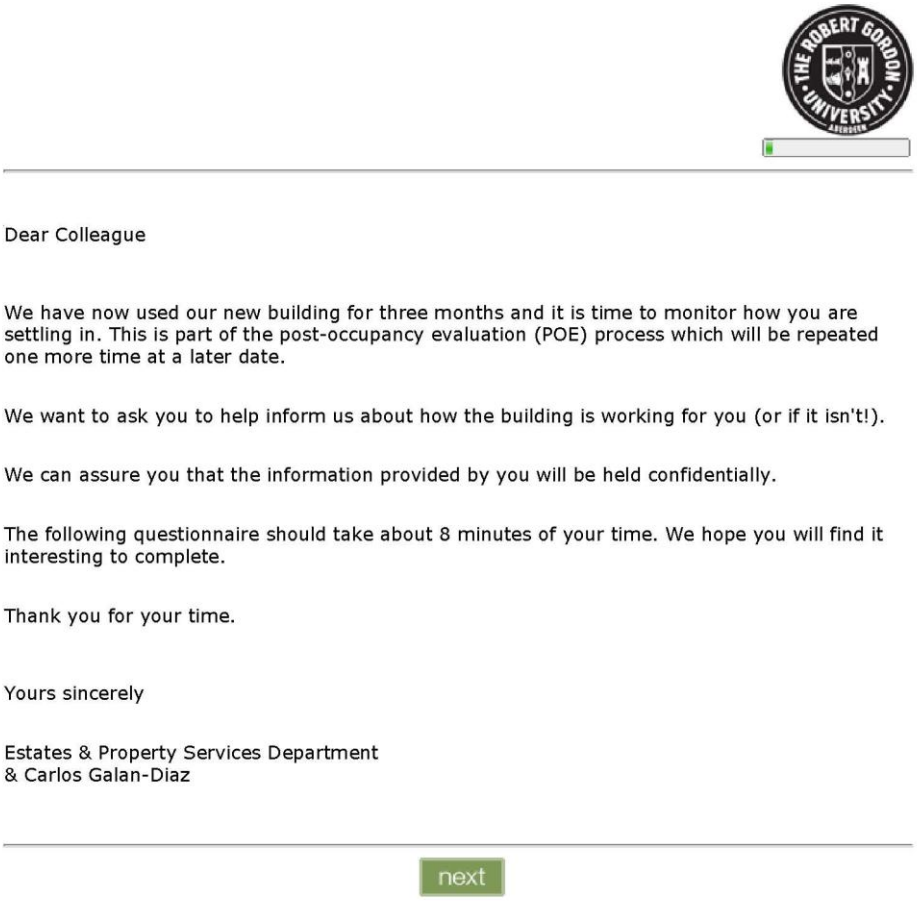
Thank you for your time.

Yours sincerely

Estates & Property Services Department
& Carlos Galan-Diaz

next

Welcome page presented after the relocation took place, the example shows the one used at the three month survey.



Dear Colleague

We have now used our new building for three months and it is time to monitor how you are settling in. This is part of the post-occupancy evaluation (POE) process which will be repeated one more time at a later date.

We want to ask you to help inform us about how the building is working for you (or if it isn't!).

We can assure you that the information provided by you will be held confidentially.

The following questionnaire should take about 8 minutes of your time. We hope you will find it interesting to complete.

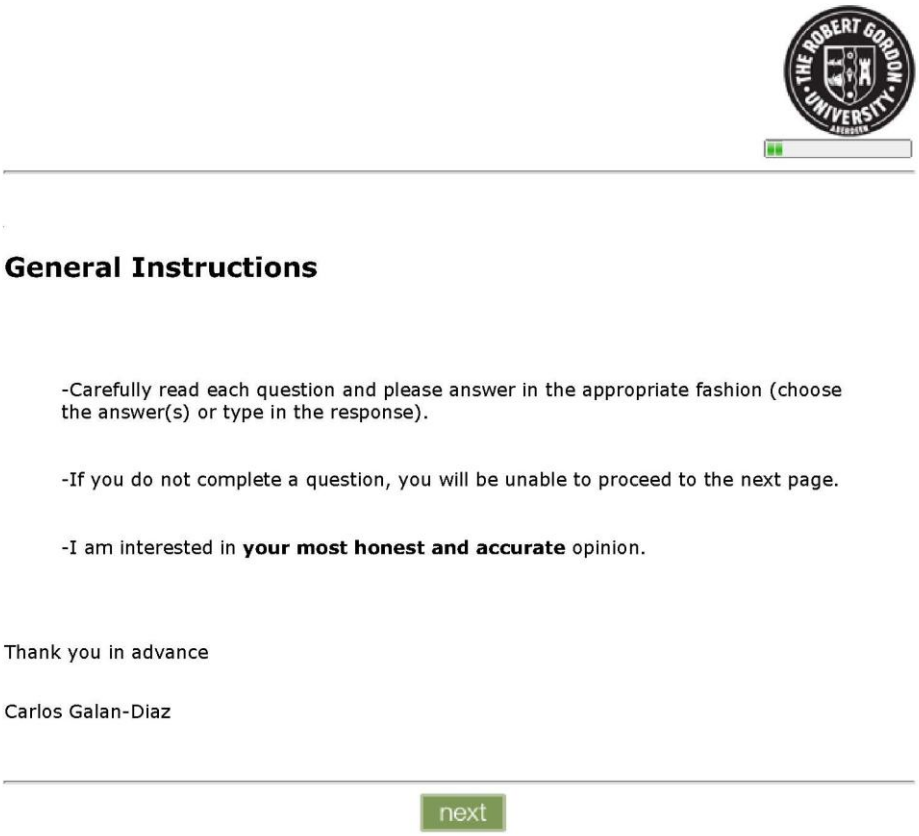
Thank you for your time.

Yours sincerely

Estates & Property Services Department
& Carlos Galan-Diaz

next

General instructions:



General Instructions

-Carefully read each question and please answer in the appropriate fashion (choose the answer(s) or type in the response).

-If you do not complete a question, you will be unable to proceed to the next page.

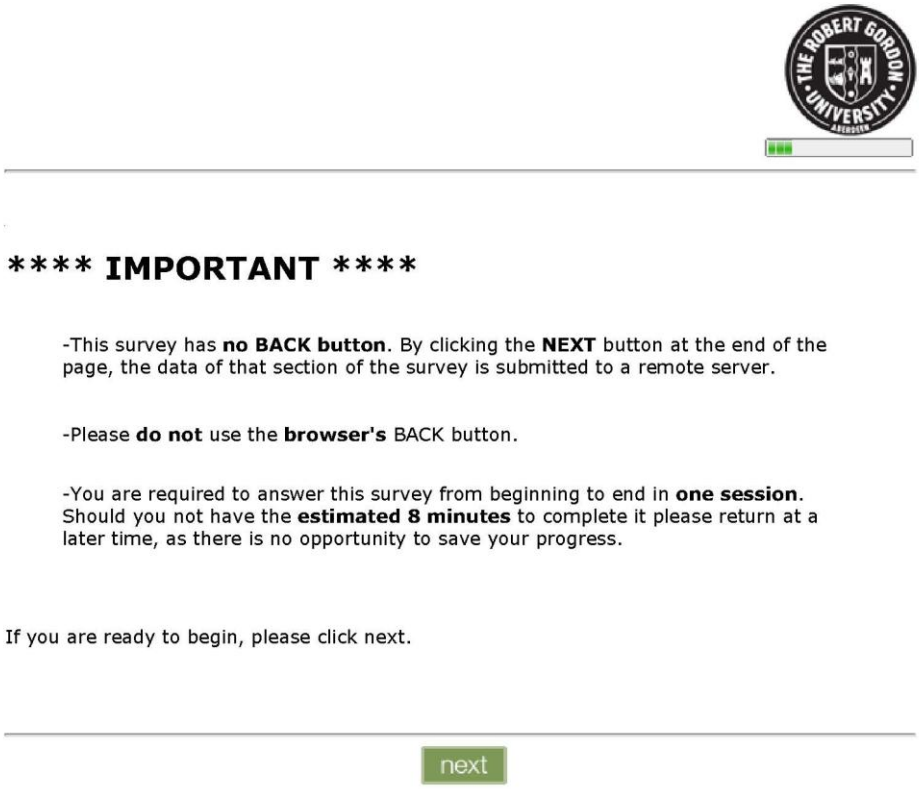
-I am interested in **your most honest and accurate** opinion.

Thank you in advance

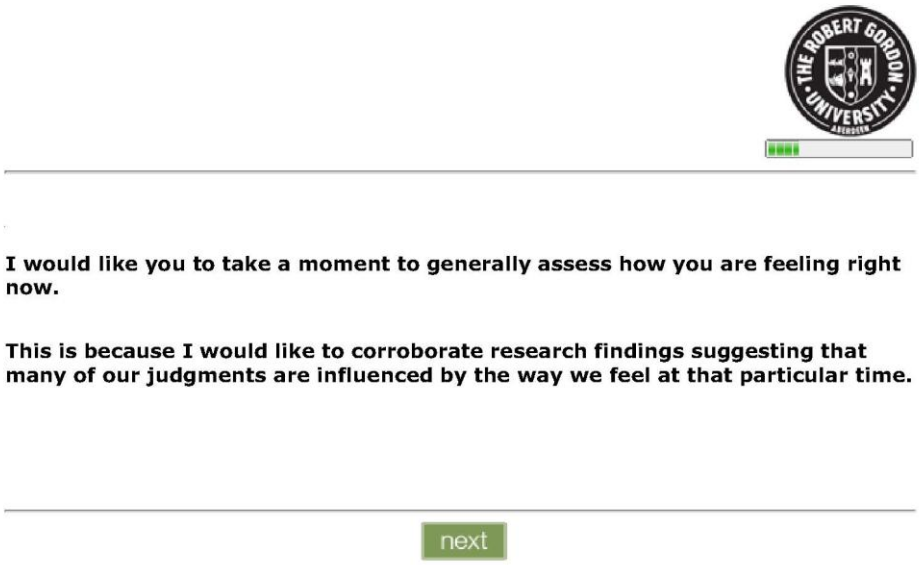
Carlos Galan-Diaz

next

Lack of back button and saving functionality explanation, the example refers to the three month survey:



Introduction to PANAS:



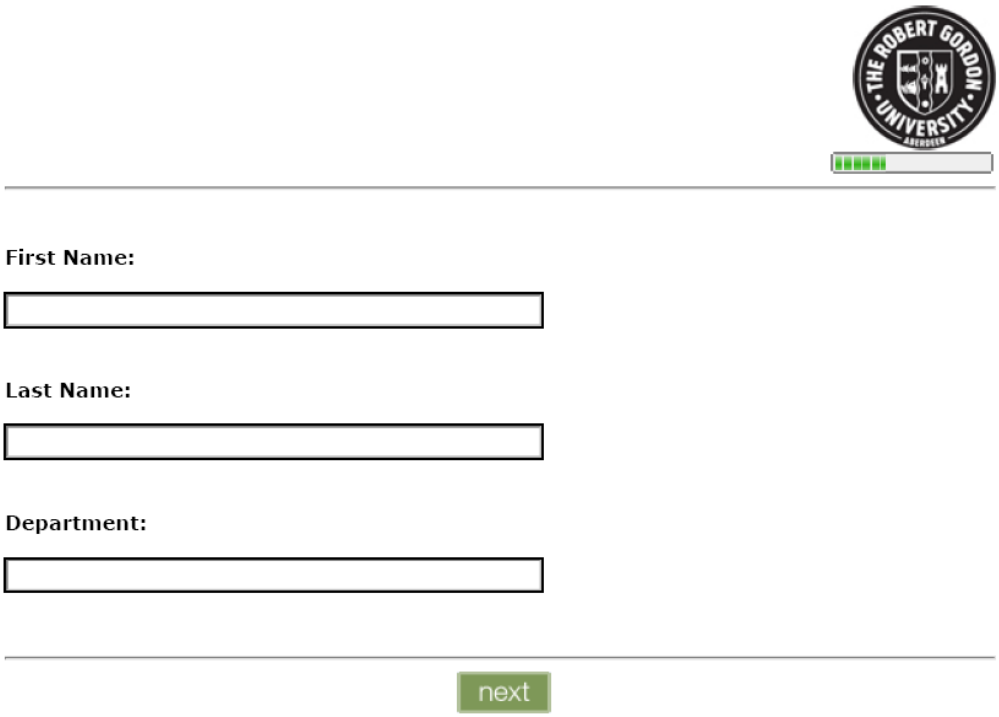
This scale consists of a number of words that describe different feelings and emotions. Indicate to what extent you currently feel this way, that is, how you feel right now.

Please tick the option that best describes how you feel right now:

	very slightly or not at all	a little	moderately	quite a bit	extremely
enthusiastic	☐	☐	☐	☐	☐
interested	☐	☐	☐	☐	☐
determined	☐	☐	☐	☐	☐
excited	☐	☐	☐	☐	☐
inspired	☐	☐	☐	☐	☐
alert	☐	☐	☐	☐	☐
active	☐	☐	☐	☐	☐
strong	☐	☐	☐	☐	☐
proud	☐	☐	☐	☐	☐
attentive	☐	☐	☐	☐	☐
	very slightly or not at all	**a little**	**moderately**	**quite a bit**	**extremely**
scared	☐	☐	☐	☐	☐
afraid	☐	☐	☐	☐	☐
upset	☐	☐	☐	☐	☐
distressed	☐	☐	☐	☐	☐
jittery	☐	☐	☐	☐	☐
nervous	☐	☐	☐	☐	☐
ashamed	☐	☐	☐	☐	☐
guilty	☐	☐	☐	☐	☐
irritable	☐	☐	☐	☐	☐
hostile	☐	☐	☐	☐	☐

next

The rest of the questionnaire is presented in the following pages, the example refers to the three and six month surveys:



Your workspace

The following questions refer to different aspects of your workspace

next

You work in:

- ◯ an individual office
- ◯ the open plan layout

In terms of the provision of working space (desk, cabinets, shelving), you consider your workspace is:

- ◯ Comfortable (generous space=more than what I require)
- ◯ Fairly comfortable (enough space=just what I require without compromise)
- ◯ Uncomfortable (not enough space at all=I feel that it is crowded and I need more space)

In terms of visual privacy, you consider your workspace is:

- ◯ Very private (I can avoid office distractions; for example via panels around my desk or by closing the door)
- ◯ Semi-private (I can avoid most office distractions; panels help me keep focused on my work)
- ◯ Not private at all (I cannot avoid office distractions as there is no provision for this, for example there are no panels to filter out unwanted distractions)

In terms of conversational privacy, you consider your workspace is:

- ◯ Very private (I can talk about sensitive issues with others in private, for example by closing the door)
- ◯ Semi-private (I can find private spaces in which to talk about sensitive issues, for example meeting rooms)
- ◯ Not private at all (I do not have quiet spaces to talk about sensitive issues, as the design has not provided such facility)

In terms of everyday sources of noise, for example: sounds from printers, telephones, fax machines, keyboards, people walking in corridors/other spaces, people speaking to each other/ talking on the phone, etc., you consider your workspace is:

- ◯ Quiet (good sound isolation, noise does not carry between spaces)
- ◯ Fairly quiet (sound isolation between spaces sometimes let some noises through)
- ◯ Not quiet at all (sound isolation is poor and you can hear noises coming from everywhere)

Overall, how satisfied are you with:

	Very satisfied	Fairly satisfied	Not very satisfied	Not at all satisfied
the lighting at your work area?	◯	◯	◯	◯
your office or workstation?	◯	◯	◯	◯
your current building as a place to work?	◯	◯	◯	◯

next

Interior appearance of your building

The following section will ask you about several aspects of your building with regard to its interior space.

next

Think of the overall appearance of the interior of your building and answer each of the following questions with the option that best represents your opinion:

	Very Attractive	Fairly Attractive	Not very attractive	Not at all attractive
Furnishings (desks, chairs, sitting space, shelving, cabinets) are:	○	○	○	○
Decor or style (colours of walls, doors, carpets) is:	○	○	○	○
Corridors are:	○	○	○	○
Foyer is:	○	○	○	○
Social/breakout spaces are:	○	○	○	○
Meeting rooms are:	○	○	○	○

If you have other comments regarding the interior of the building, please use the box below to let us know about them:
if you have no comments please type in NA

You consider that the air quality in your building is:

Good (fresh, well circulated air)			Neither good nor bad			Bad (stuffy, poorly circulated)
○	○	○	○	○	○	○

In terms of the temperature, you consider your building is:

Too warm			Neither too warm nor too cold			Too cold
○	○	○	○	○	○	○

In terms of the light in the building, you consider your building is:

Well lit (good natural light most of the day)			Fairly well lit (natural light is sufficient for least at half the working day)			Poorly lit (artificial light is ON most of the day)
○	○	○	○	○	○	○

With respect to the last three questions (air/temperature/light), in your building you:

- ○ Can control them all on demand (lights /radiators /ventilation /windows)
- ○ Can control some of them on demand or ask janitors to regulate them (ventilation /radiators/ windows)
- ○ Can not control them at all (they are set for you and you just have to adapt to them)

---

next

The building as a whole

The following section will ask you about the building as whole, that is, both interior and exterior together.

next

Thinking about the look of the building, you think your building:

- ◯ Is in keeping with the local surroundings: it blends in
- ◯ Is not in keeping with the local surroundings very well: it somewhat stands out from the local surroundings
- ◯ Is not in keeping with the local surroundings at all: it completely stands out from the local surroundings

Think about your working environment as a <u>whole</u>, both interior and exterior.

Please tick the box on each of the following scales that best represents how the physical environment makes you <u>feel</u>:

happy	◯	◯	◯	◯	◯	◯	◯ sad
interested	◯	◯	◯	◯	◯	◯	◯ bored
proud	◯	◯	◯	◯	◯	◯	◯ embarrassed
relaxed	◯	◯	◯	◯	◯	◯	◯ tense
optimistic	◯	◯	◯	◯	◯	◯	◯ pessimistic
involved	◯	◯	◯	◯	◯	◯	◯ uninvolved
welcomed	◯	◯	◯	◯	◯	◯	◯ unwelcomed
inspired	◯	◯	◯	◯	◯	◯	◯ uninspired

Think about your building <u>as a whole</u>, both interior and exterior together, and please tell me how much you like it:

Very much	◯	◯	◯	◯	◯	◯	◯ Not at all

next

You have reached the final page. Thank you for answering the survey.

The purpose of this survey is twofold: to enable you to feedback your opinions on the new building and to inform future design and relocation processes across the university.

This survey is the first of two as part of the post-occupancy evaluation (POE).

I would like to reiterate that information disclosed in this survey is strictly confidential. Should you have any queries regarding your participation please do not hesitate to contact me.

Carlos R. Galan-Diaz

The Scott Sutherland School
The Robert Gordon University
Aberdeen, UK
AB10 7QB
c.r.galan-diaz1@rgu.ac.uk

Please close this window to exit.

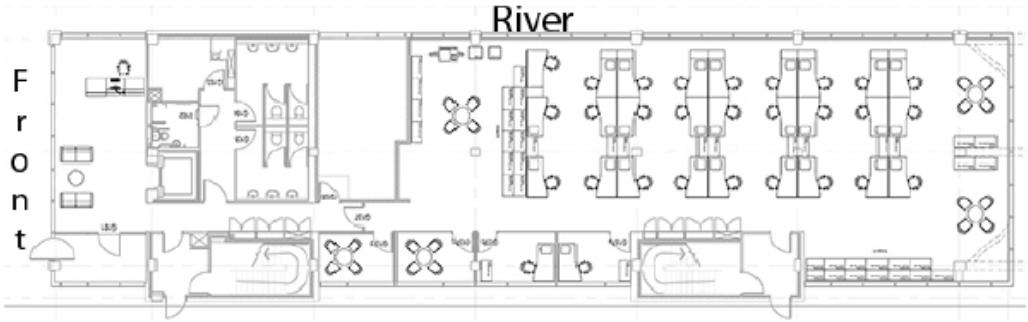
The visuals used during the pre-relocation online questionnaire, in addition to the questions already presented above:

Please indicate the floor in which your office will be based:

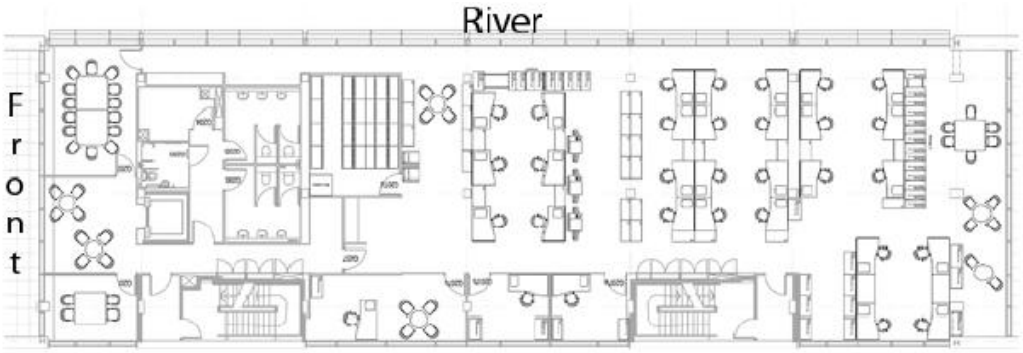
- ◯ Ground floor
- ◯ First floor
- ◯ Second floor
- ◯ Third floor

Please look at your floor layout in order to answer the following question:

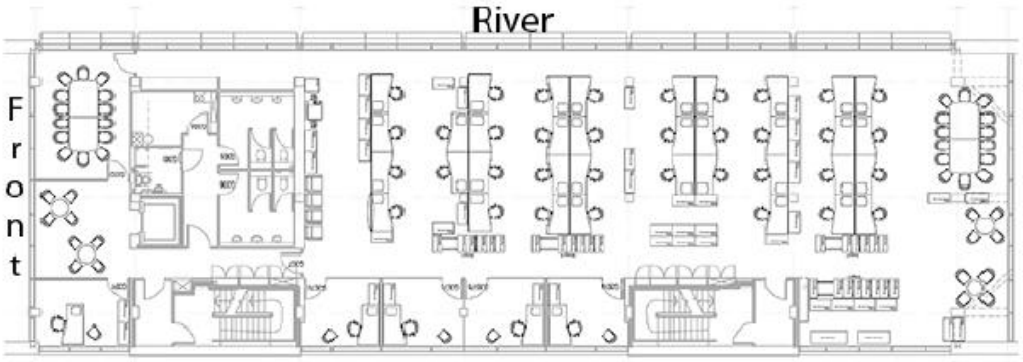
Ground floor



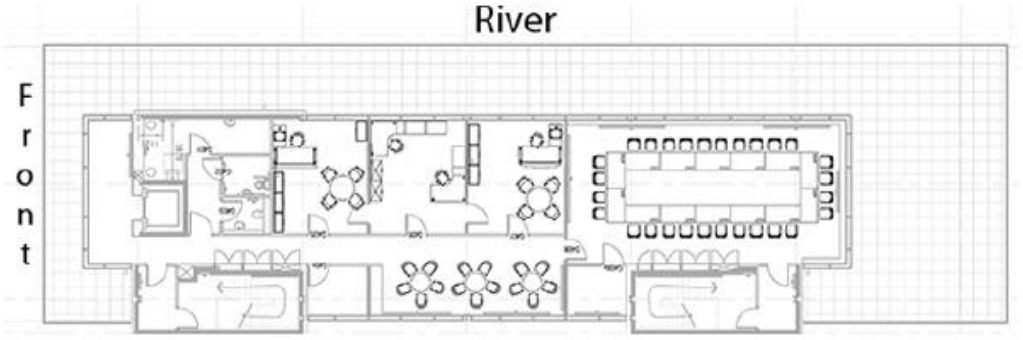
First floor



Second floor



Third floor



next

Please look at the following image:

Thinking about the look of the building, you think your building:

- ◯ Is in keeping with the local surroundings: it blends in
- ◯ Is not in keeping with the local surroundings very well: it somewhat stands out from the local surroundings
- ◯ Is not in keeping with the local surroundings at all: it completely stands out from the local surroundings

Think about your working environment as a <u>whole</u>, both interior and exterior.

Please tick the box on each of the following scales that best represents how the physical environment makes you <u>feel</u>:

happy	◯	◯	◯	◯	◯	◯	◯ sad
interested	◯	◯	◯	◯	◯	◯	◯ bored
proud	◯	◯	◯	◯	◯	◯	◯ embarrassed
relaxed	◯	◯	◯	◯	◯	◯	◯ tense
optimistic	◯	◯	◯	◯	◯	◯	◯ pessimistic
involved	◯	◯	◯	◯	◯	◯	◯ uninvolved
welcomed	◯	◯	◯	◯	◯	◯	◯ unwelcomed
inspired	◯	◯	◯	◯	◯	◯	◯ uninspired

Think about your building <u>as a whole</u>, both interior and exterior together, and please tell me how much you like it:

Very much	◯	◯	◯	◯	◯	◯	◯ Not at all

next

APPENDIX 5. PERSPECTIVE-TAKING INSTRUCTIONS OVERVIEW

5.1 OFFICIAL IAPS INSTRUCTIONS

These are the standard instructions as they appear in the IAPS Manual (Lang et al., 2005):

We thank you for coming today and appreciate your participation in this experiment. In this study, we are interested in how people respond to pictures that represent a lot of different events that occur in life. For about the next 40 minutes, you will be looking at different pictures projected on the screen in front of you, and you will be rating each picture in terms of how it made you feel while viewing it. There are no right or wrong answers, so simply respond as honestly as you can. Before we start, I'd like you to read and sign the informed consent that accompanies your rating booklet. When you are finished reading the consent form, please sign your name on the appropriate line on the third page if you wish to participate in this study. Now let me explain your involvement in more detail. First, complete the information on the cover of the ratings booklet.

If you'll look at the sheet labeled page three, you will see 3 sets of 5 figures, each arranged along a continuum. We call this set of figures SAM, and you will be using these figures to rate how you felt while viewing each picture. You will use one page--make all 3 ratings -- for *each* picture that you observe. SAM shows three different kinds of feelings: Happy vs. Unhappy, Excited vs. Calm, and Controlled vs. In-control.

** At this point, **turn out the lights, and turn on the first SAM demonstration slide** (see below).

You can see that each SAM figure varies along each scale. In this illustration, the first SAM scale is the happyunhappy scale, which ranges from a smile to a frown. At one extreme of the happy vs. unhappy scale, you felt happy, pleased, satisfied, contented, hopeful. If you felt completely *happy* while viewing the picture, you can indicate this by placing an "X" over the figure at the left, like this

(demonstrate with **SAM**).

The other end of the scale is when you felt completely unhappy, annoyed, unsatisfied, melancholic, despaired, bored. You can indicate feeling completely *unhappy* by placing an "X" on the figure at the right, like this

(demonstrate with **SAM**).

The figures also allow you to describe intermediate feelings of pleasure, by placing an "X" over any of the other pictures. If you felt completely neutral, neither happy nor unhappy, place an "X" over the figure in the middle. If, in your judgment, your feeling of pleasure or displeasure falls *between* two of the pictures, then place an "X" between the figures, like this

(demonstrate with **SAM**).

This permits you to make more finely graded ratings of how you feel in reaction to the pictures. The excited vs. calm dimension is the second type of feeling displayed here. At one extreme of the scale you felt stimulated, excited, frenzied, jittery, wide-awake, aroused. If you felt completely *aroused* while viewing the picture, place an "X" over the figure at the left of the row, like this

(demonstrate with **SAM**).

On the other hand, at the other end of the scale, you felt completely relaxed, calm, sluggish, dull, sleepy, unaroused. You can indicate you felt completely *calm* by placing an "X" over the figure at the right of the row, like this

(demonstrate with **SAM**).

As with the happy-unhappy scale, you can represent intermediate levels by placing an "X" over any of the other figures. If you are not at all excited nor at all calm, place an "X" over the figure in the middle of the row. Again, if you wish to make a more finely tuned rating of how excited or calm you feel, place an "X" *between* the pictures, like this.
(demonstrate with **SAM**).

The last scale of feeling that you will rate is the dimension of controlled vs. in-control. At one end of the scale you have feelings characterized as completely

controlled, influenced, cared-for, awed, submissive, guided. Please indicate feeling *controlled* by placing an "X" over the figure at the left, like this

(demonstrate with **SAM**).

At the other extreme of this scale, you felt completely controlling, influential, in control, important, dominant, autonomous. You can indicate that you felt *dominant* by placing an "X" over the figure at the right of the row, like this

(demonstrate with **SAM**).

Note that when the figure is large, you feel important and influential, and that it will be very small when you feel controlled and guided. If you feel neither in control nor controlled you should make an "X" over the middle picture. Remember you can also represent your feelings between these endpoints. Either place an "X" over any of the intermediate figures, or *between* them--like this

(demonstrate with **SAM**).

Some of the pictures may prompt emotional experiences; others may seem relatively neutral. Your rating of each picture should reflect your immediate personal experience, and no more. Please rate each one *AS YOU ACTUALLY FELT WHILE YOU WATCHED THE PICTURE*.

The procedure will be as follows:

Before each of the pictures, which you will rate, there will be a *warning slide* that indicates the number of page you should use to rate the upcoming picture. At these times, you should always be certain that the *picture number* corresponds to the *ratings page number*. For example, when you see "Rate the next slide on page 10"

(demonstrate with slide),

you should turn to page number 10 of your ratings booklet. The warning slide should *also* prompt you to quickly complete the previous rating and pay close attention to the screen. It is important that your eyes be directed towards the screen when the pictures to be rated are shown. You'll have only a few seconds to watch each picture. Please view the picture for the *entire* time it is on and make your

ratings immediately *after* the picture is removed. If, for some reason, you should *miss* viewing any picture, please leave that ratings page *blank*. Remember: Your ratings page number must *always* have the same number as the picture. *After* each picture, you'll see projected 'Please rate the slide on all three dimensions

(**demonstrate with slide**).

Take this time to record your emotional experience of the picture in the booklet, as I've already said. It is very important *not* to dwell on your ratings of the pictures, since there will not be much time. Also remember that you will need to check the correct page number given on the warning slide for the next trial.

Please note that the 3 dimensions are not presented in the same order on each page of the ratings booklet. Look at pages 3, 4, and 5 now to see that the dimensions are presented in *different* orders. We are interested in your own *personal* ratings of the pictures. Therefore, please don't make any comments that might influence the ratings that other people make. You can understand how this might bias our results.

Before we begin, here are examples of the kinds of pictures you will be viewing and rating. Right now, I'd like you to take your sample rating sheet and practice rating the following pictures, all on the same sheet. This is just to help you get a feel for how the ratings are done.

(**Present the practice slides**; these should be inserted at the beginning of Tray 1 and should have the same structure as an experimental trial).

Are there any questions before we begin? Just a reminder before we begin; when the warning slide comes on, make sure the slide number and the ratings page number match. Then view the picture slide for the entire time it is on. After the picture is off, make your ratings on all 3 dimensions as quickly as possible and get ready for the next picture. It is important that we have information from each of you on all of these pictures. There are no right or wrong answers; so *rate every picture on all three dimensions*.

At the end of the experiment:

Please review your booklets carefully to be certain you have completed all ratings on all pictures, completed the information on the front of the booklet and printed your name on the first ratings page. We want to thank you very much for your participation today. It is important that you not discuss this experiment with anyone until after the end of the semester, since this might affect our results. Please leave the booklets in the box as you leave the room, and thank you very much.

5.2 INSTRUCTIONS FOR THE *SELF* CONDITION

Thank you for taking part in this study. I am interested in how people feel when they visit a range of office environments. I would like you to look at some photographs of different offices and then answer some questions while imagining how you would feel if you were in those places. More specifically, as you look at each environment think about your reactions and imagine as clearly and vividly as possible everything that you would feel in that place. In short, imagine that you actually are in each of the environments.

I would like you to rate each environment you see using the following scales.

** At this point, **turn out the lights, and turn on the first SAM demonstration slide**.

We call this set of figures SAM, and you will be using these figures to rate how you would feel in each of the environments. SAM shows three different kinds of feelings: Happy vs. Unhappy, Active vs. Calm, and Controlled vs. In-control. You can see that each SAM figure varies along each scale.

The first SAM scale is the happy unhappy scale, which ranges from a smile to a frown. At one extreme of the happy vs. unhappy scale, the environment would make you feel happy, pleased, satisfied, contented, hopeful. If you would feel completely *happy* in that environment, you can indicate this by placing an “X” over the figure at the left, like this

(demonstrate with happy-unhappy **SAM** using pointer).

The other end of the scale is when the environment would make you feel completely unhappy, annoyed, dissatisfied, melancholic, despairing, bored. You can indicate the environment would make you feel completely *unhappy* by placing an “X” on the figure at the right, like this

(demonstrate with happy-unhappy **SAM** using pointer).

The figures also allow you to describe intermediate feelings of pleasure, by placing an “X” over any of the other pictures. If the environment would make you feel completely neutral, neither happy nor unhappy, place an “X” over the figure in the

middle. If, in your judgment, the feeling of pleasure or displeasure the environment would make you feel falls *between* two of the pictures, then place an “X” between the figures, like this

(demonstrate with happy-unhappy **SAM** using pointer).

This permits you to make more finely graded ratings of how you would feel in reaction to each of the environments.

The active vs. calm dimension is the second type of feeling displayed here. At one extreme of the scale the environment would make you feel stimulated, excited, frenzied, jittery, wide-awake, aroused. If the environment would make you feel completely *aroused*, place an “X” over the figure at the left of the row, like this

(demonstrate with excited-calm **SAM** using pointer).

On the other hand, at the other end of the scale, the environment would make you feel completely relaxed, calm, sluggish, dull, sleepy, unaroused. You can indicate the environment would make you feel completely *calm* by placing an “X” over the figure at the right of the row, like this

(demonstrate with excited-calm **SAM** using pointer).

As with the happy-unhappy scale, you can represent intermediate levels by placing an “X” over any of the other figures. If the environment would make you feel not at all excited nor at all calm, place an “X” over the figure in the middle of the row.

(demonstrate with excited-calm **SAM** using pointer).

The last scale of feeling that you will rate is the dimension of controlled vs. in-control while imagining to be in that environment. At one end of the scale the environment would make you have feelings characterized as completely controlled, influenced, cared-for, awed, submissive, guided. Please indicate feeling *controlled* by placing an “X” over the figure at the left, like this

(demonstrate with control-controlled **SAM** using pointer).

At the other extreme of this scale, the environment would make you feel completely controlling, influential, in control, important, dominant, autonomous. You can indicate

that the environment would make you feel *dominant* by placing an “X” over the figure at the right of the row, like this

(demonstrate with control-controlled **SAM** using pointer).

Note that when the figure is large, the environment would make you feel important and influential, and that it will be very small when the environment would make you feel controlled and guided. If the environment would make you feel neither in control nor controlled you should make an “X” over the middle picture, like this

(demonstrate with control-controlled **SAM** using pointer).

Remember you can also represent your feelings between these endpoints.

(demonstrate with control-controlled **SAM** using pointer).

Some of the environments may prompt emotional experiences; others may seem relatively neutral. Your rating of each environment should reflect your immediate personal experience, and no more. Please rate each one ***AS YOU WOULD ACTUALLY FEEL IN EACH ENVIRONMENT.***

Once you have made your ratings then turn to the open question and please answer it using no more than 10 single words, use one line for each word. Once again, please do not dwell on your response and write whatever comes to your mind first, there are no right or wrong answers. Ideally you should produce a minimum of 5 words.

This environment would make *me* feel

(**demonstrate** with slide of **open question**).

Once this is done please answer the next two multiple choice questions,

I like this environment:

Just as in the SAM, you can indicate that you would like this environment very much or not at all.

(**demonstrate** with slide of **preference rating**).

The procedure will be as follows:

Before each of the environments, which you will rate, there will be a *warning slide* that indicates an image is coming on screen.

(**demonstrate** with slide "please look at the following environment").

It is important that your eyes be directed towards the screen when the environment to be rated is shown. You'll have only a few seconds to watch each environment. Please view the environment for the *entire* time it is on and make your ratings immediately *after* the environment is removed.

After each environment, you'll see projected 'Please rate the environment'. Take this time to record what your emotional experience of the environment would be in the answer sheets, as I've already said. It is very important *not* to dwell on your ratings of the environments. *Please note* that the 3 dimensions are not presented in the same order on each page of the answer sheets.

(**demonstrate** with slide "Please rate the environment").

Before we begin, here are examples of the kinds of environments you will be viewing and rating. Right now, I'd like you to take your sample rating sheets and practice rating the following environments. This is just to help you get a feel for how the ratings are done.

(**Present the practice slides**; these should be inserted at the beginning of slideshow and should have the same structure as an experimental trial).

Are there any questions before we begin?

5.3 INSTRUCTIONS FOR THE *DETACHED* CONDITION

Thank you for taking part in this study. I am interested in how a range of office environments make people feel when they visit them. What I would like you to do is to look at some environments and then answer some questions while being as objective as possible about how the environment would make people feel. More specifically, as you look at each environment, please imagine how each place would make people feel in general. Concentrate on the experience of the environment, try to be as objective as possible about it. Do not concern yourself with your own experiences, feelings or views. In short, just try to be objective.

I would like you to rate each environment you see using the following scales.

** At this point, **turn out the lights, and turn on the first SAM demonstration slide**.

We call this set of figures SAM, and you will be using these figures to rate how you think each of the environments would make people feel. SAM shows three different kinds of feelings: Happy vs. Unhappy, Active vs. Calm, and Controlled vs. In-control. You can see that each SAM figure varies along each scale.

The first SAM scale is the happy unhappy scale, which ranges from a smile to a frown. At one extreme of the happy vs. unhappy scale, you think the environment would make people feel happy, pleased, satisfied, contented, hopeful. If you think the environment would make people feel completely *happy*, you can indicate this by placing an “X” over the figure at the left, like this

(demonstrate with happy-unhappy **SAM** using pointer).

The other end of the scale is when you think the environment would make people feel completely unhappy, annoyed, dissatisfied, melancholic, despairing, bored. You can indicate the environment would make people feel completely *unhappy* by placing an “X” on the figure at the right, like this

(demonstrate with happy-unhappy **SAM** using pointer).

The figures also allow you to describe intermediate feelings of pleasure, by placing an “X” over any of the other pictures. If you think the environment would make

people feel completely neutral, neither happy nor unhappy, place an “X” over the figure in the middle. If, in your judgment, the feeling of pleasure or displeasure the environment makes people feel would fall *between* two of the pictures, then place an “X” between the figures, like this

(demonstrate with happy-unhappy **SAM** using pointer).

This permits you to make more finely graded ratings of how you think each of the environments would make people feel.

The active vs. calm dimension is the second type of feeling displayed here. At one extreme of the scale you think the environment would make people feel stimulated, excited, frenzied, jittery, wide-awake, aroused. If you think the environment would make people feel completely *aroused* while viewing the picture, place an “X” over the figure at the left of the row, like this

(demonstrate with excited-calm **SAM** using pointer).

On the other hand, at the other end of the scale, you think the environment would make people feel completely relaxed, calm, sluggish, dull, sleepy, unaroused. You can indicate you think the environment would make people feel completely *calm* by placing an “X” over the figure at the right of the row, like this

(demonstrate with excited-calm **SAM** using pointer).

As with the happy-unhappy scale, you can represent intermediate levels by placing an “X” over any of the other figures. If you think the environment would make people feel not at all excited nor at all calm, place an “X” over the figure in the middle of the row, like this

(demonstrate with excited-calm **SAM** using pointer).

The last scale of feeling that you will rate is the dimension of controlled vs. in-control while you think how the environment would make people feel. At one end of the scale you think the environment would make people have feelings characterized as completely controlled, influenced, cared-for, awed, submissive, guided. Please indicate the environment would make people feel *controlled* by placing an “X” over the figure at the left, like this

(demonstrate with control-controlled **SAM** using pointer).

At the other extreme of this scale, you think the environment would make people feel completely controlling, influential, in control, important, dominant, autonomous. You can indicate that you think the environment would make people feel *dominant* by placing an “X” over the figure at the right of the row, like this

(demonstrate with control-controlled **SAM** using pointer).

Note that when the figure is large, you think the environment would make people feel important and influential, and that it will be very small when you think the environment would make people feel controlled and guided. If you think the environment would make people feel neither in control nor controlled you should make an “X” over the middle picture, like this

(demonstrate with control-controlled **SAM** using pointer).

Remember you can also represent that the environment would make people feel between these endpoints.

(demonstrate with control-controlled **SAM** using pointer).

Some of the environments may prompt emotional experiences; others may seem relatively neutral. Your rating of each environment should reflect your objective evaluation, and no more. Please rate each one ***AS YOU OBJECTIVELY THINK EACH ENVIRONMENT WOULD ACTUALLY MAKE PEOPLE FEEL.***

Once you have made your ratings then turn to the open question and please answer it using no more than 10 single words, use one line for each word. Once again, please do not dwell on your response and write whatever comes to your mind first, there are no right or wrong answers. Ideally you should produce a minimum of 5 words.
This environment make *people* feel
(**demonstrate** with slide of **open question**).

Once this is done please answer the next two multiple choice questions,
This environment will be liked

Just as in the SAM, you can indicate that you think this environment would be liked very much or not at all.

(**demonstrate** with slide of **preference rating**).

The procedure will be as follows:

Before each of the environments, which you will rate whilst being as objective and as neutral as possible, there will be a *warning slide* that indicates an image is coming on screen.

(**demonstrate** with slide "please look at the following environment").

It is important that your eyes be directed towards the screen when the environment to be rated is shown. You'll have only a few seconds to look at each place. Please view the environment for the *entire* time it is on and make your ratings immediately *after* the environment is removed.

After each environment, you'll see projected 'Please rate the slide on all three dimensions and answer the questions'. Take this time to record what you think the environment would make people feel in the answer sheets, as I've already said. It is very important *not* to dwell on your ratings of the environments. *Please note* that the 3 dimensions are not presented in the same order on each page of the answer sheets.

(**demonstrate** with slide "Please rate the environment on all three dimensions and answer the questions").

Before we begin, here are examples of the kinds of environments you will be viewing and rating. Right now, I'd like you to take your sample answer sheets and practice rating the following environments. This is just to help you get a feel for how the ratings are done.

(**Present the practice slides**; these should be inserted at the beginning of slideshow and should have the same structure as an experimental trial).

Are there any questions before we begin?

5.4 INSTRUCTIONS FOR THE *OTHER* CONDITION

Thank you for taking part in this study. I am interested in how people imagine what architects/designers feel when they evaluate a range of office environments. What I would like you to do is to look at some environments and then answer some questions while imagining how the architect/designer would feel when experiencing those environments. More specifically, as you look at each place, please imagine how the architect/designer would feel in each environment and imagine as clearly and vividly as possible everything that the architect/designer would feel in each environment. In short, imagine that you are the architect/designer in each of the environments.

I would like you to rate each environment you see using the following scales.

** At this point, **turn out the lights, and turn on the first SAM demonstration slide**.

We call this set of figures SAM, and you will be using these figures to rate how you think the architect/designer would feel while being in each of the environments. SAM shows three different kinds of feelings: Happy vs. Unhappy, Active vs. Calm, and Controlled vs. In-control. You can see that each SAM figure varies along each scale.

The first SAM scale is the happy unhappy scale, which ranges from a smile to a frown. At one extreme of the happy vs. unhappy scale, you think the environment would make the architect/designer feel happy, pleased, satisfied, contented, hopeful. If you think the architect/designer would feel completely *happy* in that environment, you can indicate this by placing an “X” over the figure at the left, like this

(demonstrate with happy-unhappy **SAM** using pointer).

The other end of the scale is when you think the environment would make the architect/designer feel completely unhappy, annoyed, dissatisfied, melancholic, despairing, bored. You can indicate that the environment would make the architect/designer feel completely *unhappy* by placing an “X” on the figure at the right, like this

(demonstrate with happy-unhappy **SAM** using pointer).

The figures also allow you to describe intermediate feelings of pleasure, by placing an “X” over any of the other pictures. If you think the environment would make the architect/designer feel completely neutral, neither happy nor unhappy, place an “X” over the figure in the middle. If, in your judgment, the feelings of pleasure or displeasure the environment make the architect/designer feel would fall *between* two of the pictures, then place an “X” between the figures, like this

(demonstrate with happy-unhappy **SAM** using pointer).

This permits you to make more finely graded ratings of how you think the architect/designer would feel in reaction to each of the environments.

The active vs. calm dimension is the second type of feeling displayed here. At one extreme of the scale you think the environment would make the architect/designer feel stimulated, excited, frenzied, jittery, wide-awake, aroused. If you think the architect/designer would feel completely aroused while in that environment, place an “X” over the figure at the left of the row, like this

(demonstrate with excited-calm **SAM** using pointer).

On the other hand, at the other end of the scale, you think the environment would make the architect/designer feel completely relaxed, calm, sluggish, dull, sleepy, unaroused. You can indicate the environment would make the architect/designer feel completely calm by placing an “X” over the figure at the right of the row, like this

(demonstrate with excited-calm **SAM** using pointer).

As with the happy-unhappy scale, you can represent intermediate levels by placing an “X” over any of the other figures. If you think the environment would make the architect/designer feel not at all excited nor at all calm, place an “X” over the figure in the middle of the row.

(demonstrate with excited-calm **SAM** using pointer).

The last scale of feeling that you will rate is the dimension of controlled vs. in-control while imagining the architect/designer in that environment. At one end of the scale

you think the environment would make the architect/designer have feelings characterized as completely controlled, influenced, cared-for, awed, submissive, guided. Please indicate the environment would make the architect/designer feel *controlled* by placing an "X" over the figure at the left, like this

(demonstrate with control-controlled **SAM** using pointer).

At the other extreme of this scale, you think the environment would make the architect/designer feel completely controlling, influential, in control, important, dominant, autonomous. You can indicate that the environment would make the architect/designer feel *dominant* by placing an "X" over the figure at the right of the row, like this

(demonstrate with control-controlled **SAM** using pointer).

Note that when the figure is large, you think the environment would make the architect/designer feel important and influential, and that it will be very small when the environment would make the architect/designer feel controlled and guided. If you think the environment would make the architect/designer feel neither in control nor controlled you should make an "X" over the middle picture, like this

(demonstrate with control-controlled **SAM** using pointer).

Remember you can also represent the architect/designer feelings between these endpoints.

(demonstrate with control-controlled **SAM** using pointer).

Some of the environments may prompt emotional experiences; others may seem relatively neutral. Your rating of each environment should reflect your immediate evaluation of the architect/designer experience, and no more. Please rate each one ***AS YOU THINK THE ARCHITECT/DESIGNER WOULD ACTUALLY FEEL IN EACH ENVIRONMENT.***

Once you have made your ratings then turn to the open question and please answer it using no more than 10 single words, use one line for each word. Once again, please do not dwell on your response and write whatever comes to your mind first,

there are no right or wrong answers. Ideally you should produce a minimum of 5 words.

This environment will make the architect/designer feel:
(**demonstrate** with slide of **open question**).

Once this is done please answer the next two multiple choice questions,

The architect/designer will like this environment:

Just as in the SAM, you can indicate that you think the architect/designer would like this environment very much or not at all.

(**demonstrate** with slide of **preference rating**).

The procedure will be as follows:

Before each of the environments, which you will rate thinking of what the architect/designer would feel like, there will be a *warning slide* that indicates an image is coming on screen.

(**demonstrate** with slide "please look at the following environment").

It is important that your eyes be directed towards the screen when the environment to be rated is shown. You'll have only six seconds to look at each environment. Please view the environment for the *entire* time it is on and make your ratings immediately *after* the environment is removed.

After each environment, you'll see projected 'Please rate the environment'. Take this time to record what you think the architect/designer emotional experience of the environment would be in the answer sheets, as I've already said. It is very important *not* to dwell on the ratings of the environments. *Please note* that the 3 dimensions are not presented in the same order on each page of the answer sheets.
(**demonstrate** with slide "Please rate the environment").

Before we begin, here are examples of the kinds of environments you will be viewing and rating. Right now, I'd like you to take your sample answer sheets and

practice rating the following environments. This is just to help you get a feel for how the ratings are done.

(**Present the practice slides**; these should be inserted at the beginning of slideshow and should have the same structure as an experimental trial).

Are there any questions before we begin?

5.5 QUESTIONNAIRE SAMPLE SHEETS

The following are extracts from the self-condition questionnaire participants used to record their answers:

Consent form

I understand that my participation in this project is individual and that I may be alongside other participants in the same room. This study will involve the completion of some general questions (such as age, sex, etc) and a questionnaire regarding my views on the built environment. These answers will be based on viewing photographs of indoor environments, as indicated by the researcher who will project the images onto the room's screen. The study will require approximately 30 minutes of my time.

I understand that participation in this study is entirely voluntary and that I can withdraw from the study at any time without giving a reason.

I understand that I am free to ask any questions prior to the commencement of each task, and that I am free to withdraw without providing a reason or discussing my concerns with the experimenter.

I understand that the information provided by me will be held anonymously so that it is impossible to trace this information back to me individually. Information will be held in paper form and only anonymous data will be used for the outcomes of this project. In accordance with the Data Protection Act this information may be retained indefinitely.

I understand that at the end of the experiment I will be provided with additional information and feedback about the purpose of the study.

I, …… (NAME), consent to participate in this study conducted by Carlos Galán-Díaz.

Signed:

Date:

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you currently feel this way, that is, how you feel right now.

Please tick the box that best describes how you feel right now:

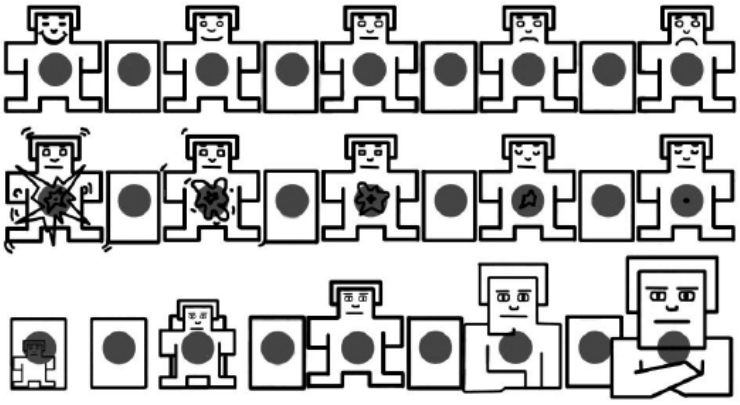
Example:	☑	☐	☐	☐	☐

	very slightly or not at all	a little	moderately	quite a bit	extremely
enthusiastic	☐	☐	☐	☐	☐
interested	☐	☐	☐	☐	☐
determined	☐	☐	☐	☐	☐
excited	☐	☐	☐	☐	☐
inspired	☐	☐	☐	☐	☐
alert	☐	☐	☐	☐	☐
active	☐	☐	☐	☐	☐
strong	☐	☐	☐	☐	☐
proud	☐	☐	☐	☐	☐
attentive	☐	☐	☐	☐	☐

	very slightly or not at all	a little	moderately	quite a bit	extremely
scared	☐	☐	☐	☐	☐
afraid	☐	☐	☐	☐	☐
upset	☐	☐	☐	☐	☐
distressed	☐	☐	☐	☐	☐
jittery	☐	☐	☐	☐	☐
nervous	☐	☐	☐	☐	☐
ashamed	☐	☐	☐	☐	☐
guilty	☐	☐	☐	☐	☐
irritable	☐	☐	☐	☐	☐
hostile	☐	☐	☐	☐	☐

PRACTICE ONE

In this environment I would feel:



This environment would make me feel:

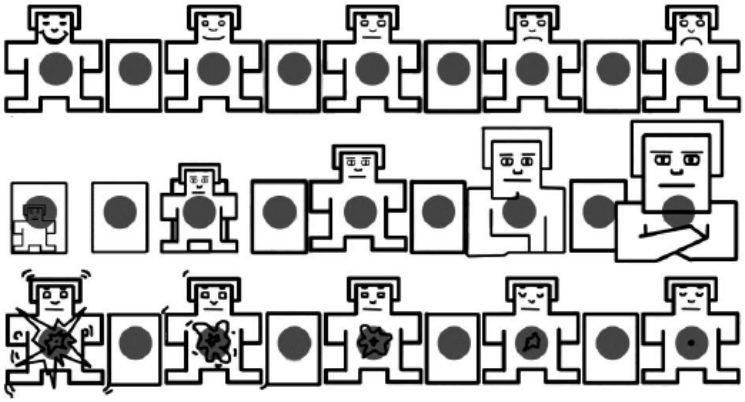
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

I like this environment:

Very much ☐ ☐ ☐ ☐ ☐ ☐ ☐ Not at all

ENVIRONMENT TWO

In this environment I would feel:



This environment would make me feel:

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

I like this environment:

Very much ☐ ☐ ☐ ☐ ☐ ☐ ☐ Not at all

Memory test

Please indicate if you were presented with the following images or not:

Image	YES	NO
1.	☐	☐
2.	☐	☐
3.	☐	☐
4.	☐	☐
5.	☐	☐
6.	☐	☐
7.	☐	☐
8.	☐	☐
9.	☐	☐
10.	☐	☐
11.	☐	☐
12.	☐	☐
13.	☐	☐
14.	☐	☐
15.	☐	☐
16.	☐	☐
17.	☐	☐
18.	☐	☐
19.	☐	☐
20.	☐	☐

Final questions:

Please indicate to what extent you agree with the following statements:

I imagined how ***I would feel*** in each of the environments

Completely ☐ ☐ ☐ ☐ ☐ ☐ ☐ Not at all

I imagined how ***somebody else*** would feel in each of the environments

Completely ☐ ☐ ☐ ☐ ☐ ☐ ☐ Not at all

I was ***objective*** whilst evaluating how each of the environments would make people feel

Completely ☐ ☐ ☐ ☐ ☐ ☐ ☐ Not at all

Imagining ***myself*** in each of the environments was:

Very easy ☐ ☐ ☐ ☐ ☐ ☐ ☐ Very difficult