Experiencing Information: The importance of affect in new media information design

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Doctor of Philosophy

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Abstract

Today, more is becoming known about the importance of affective processes in the human brain. Affect describes the experience of feelings, moods and emotions. This thesis examines the role of affect in information design in new media contexts. Typically, the field of information design sees information as measurable and deductive, its two-dimensional diagrams, graphs, maps, symbols and tables striving for the disinterested and unambiguous representation of data. The addition of digital technology to information has the scope to create multilayered, multimodal informational experiences that harness affective states to augment understanding. Currently, information design does not consider the role of affect in information processing, overlooking people’s affective and holistic methods of sense-making, its design frameworks thus only partially addressing the range of people’s ways of processing information. Here, the thesis draws on recent accounts of affective information processing from cognitive and phenomenological psychology. Cognitive psychology shows affect having a strong influence on cognition in decision-making, memory formation and memory recall. The thesis demonstrates a broad, new approach to information design in new media contexts by approaching affect and experience as additional ways to communicate information. Its contribution to the broader area of design is in expanding the boundaries of information design beyond the area’s current focus on non-emotive, two-dimensional representations of information.

The thesis uses a case study from virtual heritage, developing a 3D digital model of the Vitthala Temple in Southern India. Virtual heritage transforms cultural heritage into digital 3D models and environments. It combines facts about a site with experience to create a feeling of presence, or the sense of really being in an environment. In information-rich, virtual heritage environments affective experience and information design converge, combining empirical, objective and consciously-processed information with affective, subjective and subconsciously-processed information to result in a holistic information experience. Perspectives from cognitive psychology inform the
development of the model of the Vitthala Temple, stressing the importance of affect in information processing. Experience design—a field that has embraced the importance of affect—provides useful frameworks for adding experience to information. Phenomenological psychology bridges the gap between information and experience design, offering an overarching theoretical perspective on the combination of affect, information and interpretation in the creation of an informational experience. A case study combining knowledge from information design, cognitive psychology, experience design and phenomenological psychology with contextualised issues of virtual heritage shows how theoretical knowledge meets the challenges of design practice.
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I owe my thanks to Dr Sarah Kenderdine from Museum Victoria for providing me with an applied project for the thesis. Her writings were influential on the direction of the thesis and the research material she provided me about Hampi and the Vitthala Temple was greatly appreciated.

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Declaration of Originality

I hereby declare that to the best of my knowledge and belief this thesis contains no material previously published or written by another person, except where due reference has been made in the text, and that no material in the thesis has been accepted for the award of any other degree or diploma at any university.

Some material in the introduction was developed as part of a paper presented at the Cumulus Conference, Melbourne 12-14 November, 2009. The core theme of the paper was the interdisciplinary nature of designing virtual heritage and the development and writing of the paper was done by me working with my supervisor, Dr Carolyn Barnes.

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Publications

Conference Paper

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Introduction

Information design, experience design and usability design are each subordinate areas of the broader area of general design in which specialist design practitioners and researchers focus their expertise. Drawing boundaries around these subfields impedes the development of valuable interdisciplinary perspectives on design, masking important connections between design fields and between design and other bodies of knowledge. Information design potentially embraces the whole of human communication, but is mostly approached as a specialised and closely guarded sub-discipline of communication design. Much of information design currently focuses on making designs more measurable, quantitative and scientific. This narrow focus restricts consideration of the role of feelings, emotions and moods, known more technically as affect in the field of psychology, from its sphere of practice. This thesis approaches information design more broadly, going beyond its established frameworks to consider how other bodies of knowledge and understanding can support information design to move into emerging applications for information.

The thesis explores the challenge of conveying affective information, exploring non-information design texts to fill gaps in information design theory. It demonstrates the application of interdisciplinary knowledge to information design and the broader area of design through a case study of a virtual heritage project. 3D virtual environments provide a unique context for investigating experience. Audiences experience them as 2D information on a flat computer screen and as a virtual 3D environment with depth and perspective through computer rendering techniques. 3D virtual environments are also composed of both deductive and affective information. In focusing on a complex information environment, I explore various challenges in affective information design, identifying a range of theoretical conflicts and how these impact on the design process.
The thesis considers the potential to address information and experience design as broad design approaches, not circumscribed sub-disciplines of general design. It investigates the convergence of information and experience design and affective and subjective experience in new forms of information provision. Exceeding information design’s established concerns to focus on information in affective and rational forms opens the field to knowledge and issues of affect. Mood has been shown to influence how people process information, but the representation of information can influence recipients’ emotions in turn, mostly unconsciously.\(^1\) Currently, the information design literature overlooks the possibility that unconscious feelings could complement an information experience. I address this gap by approaching feeling as a type of information and a message to be added to data, considering how information design might communicate this message to an audience. Drawing on knowledge from a range of disciplines, I use an applied project to test the value of these ideas to real world design practice and the challenges of their application.

The neglect of emotions in information design reflects the historical separation of logic and will in Western thought as far back as the work of Aristotle.\(^2\) Only recently, the psychologists Clore, Demasio, Forgas, Lazarus, Schwarz and Zajonc successfully challenged this divide, discovering that the interplay of cognition and emotion is fundamental to human thought. The literature of information design makes selective use of cognitive research in the form of perception theories to explain how people process designed information. Acknowledging the role of emotion in information processing broadens the scope of information design and allows subjective and affective forms of design to be used as information conduits. This thesis aims to show


that information design would benefit from harnessing new knowledge about
how people process information rather than building its practice on outdated
philosophical perspectives on human reason.

It is difficult to find literature in cognitive psychology that deals directly with
the related roles of cognition and emotion in forming an understanding of
information. Most psychology research on the subject of affect concerns the
neuroscience of how the brain creates and registers emotions. Research on the
implications of the emotions in cognitive processing mainly focuses on
decision-making, memory and social attitudes, not the creation of under-
standing. Some research explores how emotions influence the creation and
retrieval of memories. Other research explores how emotions influence the
choice of which information to process and which to ignore. There is still a
great deal of investigation to be done to establish the importance of emotions
in people’s processing of information. Despite the importance of psychology
to this thesis, it remains an investigation into the nature and purpose of
experience and information design. Relevance to the thesis question and to
experiential information design governed the incorporation of knowledge from
non-design disciplines. For example, I exclude neuropsychology’s research
into physiology of the brain and chemistry of neural processes in respect of
information processing, the ramifications of how people process information
and experience design being more relevant to the issues raised in the thesis.

0.1 Virtual heritage environments as information design experiences

Within the thesis, the author designed and developed a 3D virtual heritage
environment as a case study to demonstrate the relevance to design research
of knowledge from phenomenological and cognitive psychology. Virtual
heritage is the digitisation of cultural and natural heritage sites and artefacts.
It plays an increasing role in cultural and nature preservation, education,
entertainment, tourism and research. The case study focuses on a digital 3D
model designed and constructed by Alison de Kruiff and a website designed
by Sarah Kenderdine and Alison de Kruiff, for the travelling cultural heritage exhibition ‘Ancient Hampi: The Hindu Kingdom Brought to Life’. In the thesis, it provides a vehicle for examining issues of affective information in website design practice where competing factors of cost, time and technology present a challenge to pure theoretical principles. The digital 3D model, a rendered walk-through of the 3D model and the Place-Hampi website are made available on the CD accompanying this thesis.

The ongoing growth of information technology has increased the extent and range of virtual heritage projects through digitally responsive museum displays and the communication of heritage information via the World Wide Web. Virtual heritage encompasses any mix of heritage with 3D information technology, spanning cultural heritage digital panoramas, virtual reality displays of archaeological sites and augmented reality displays where real world exhibits are mixed with digital media. Addison divides virtual heritage into three categories: documentation (from site surveys to point cloud scans), representation (from digital reconstruction to visualisation) and dissemination (from immersive virtual worlds to augmented reality displays). The exploration of information and experience design issues in this thesis involves all three uses of virtual heritage, the website providing documentation on the Ancient Hampi exhibition and the Hampi site, the 3D virtual heritage environment as a digital reconstruction of the Vitthala Temple at Hampi and dissemination over the World Wide Web through a website.

Virtual heritage projects aim to simultaneously educate and entertain their audiences through immersion, but emotion without context achieves little. Virtual heritage environments demand integrity in information so that

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audiences do not confuse speculation with fact. Combining affect with information design can create experiences and meanings for an audience that are both educational and emotionally satisfying. Currently, the application of information design principles to the development of virtual heritage environments is problematic. Virtual environments include sensory data that lie outside the historical focus of information design. People process these environments in different cognitive ways to 2D information such as charts, graphs, graphic symbols, instructional documents, illustrations and tables. They process virtual 3D environments differently to physical 3D environments in viewing them through mediating technology. Virtual heritage is an atypical, yet appropriate context for investigating questions of information design because its primary purpose is to communicate information to an audience. Addressing neglected applications expands knowledge in information design, increasing its capacity to address the diversified forms and contexts for information today.

The treatment of information in virtual heritage depends on the nature and purpose of the heritage project. For experts, factual accuracy may be a primary aim in documenting a site or artefact through digital means. If its digitisation aims to entertain and inform a general audience immersion, interest and involvement gain in importance. The virtual heritage project featured in this research is a digital 3D reconstruction of an Indian temple for delivery over the World Wide Web (figure 0.1). The model seeks to communicate the feeling of being there to the audience, providing an emotional reference point to give greater context to non-affective information about the site. The website (figure 0.2) accompanies the exhibition ‘Ancient Hampi: The Hindu Kingdom Brought to Life’ held at the Immigration Museum, Melbourne (2008–2010). It hosts various media elements including interactive maps, movies, panorama movies and photographs.

A virtual heritage project is a pertinent context for examining the juncture of information and experience design. Information placed in a three-dimensional virtual environment is navigable and depends on time, making it closer to a real-world environment than two-dimensional digital documents. Any interaction with information creates an experience, but the similarity to real-life experience in virtual environments makes experience
design a highly relevant context for information design. Considering experience in virtual heritage projects is vital to creating the feel of visiting a site through a virtual replica.

Creating a feeling of being at the site involves a psychological phenomenon known as ‘presence’. Presence is widely researched, its nature and source being the subject of intense debate. People experience presence when they feel immersed in a virtual environment, ignoring the mediating technology. Writers such as Lee and Biocca focus on conscious perception in making people believe they are somewhere else when the feeling of presence arises, but this ignores the important division between conscious and subconscious thought. The audience may feel like they are there and may not be actively aware of the mediating technology, but if asked where they are they will know they are in a simulated environment and have not been physically transported to a new locale. This conflict between the conscious and the subconscious is the most fascinating and challenging aspect of presence research.

Presence is an affective state prompted by a designed virtual environment. Most research into affect in cognition or information design looks at moods or emotions generated independently of the designed product. For example, how a good or bad mood might influence how a person responds to an example of information design. Presence, however, is primarily a product of the design and is only to a lesser degree influenced by external factors or someone’s inner state. The virtual environment is the direct cause of the feeling of presence since people cannot feel like they are ‘really there’ without seeing the virtual environment. The feeling of presence enhances the understanding of a site by providing greater context for the information. There is a great deal of research on presence, but little that explains how it adds to cognition or

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understanding. The thesis uses research in phenomenological psychology to explain how people process experiences and environments. It combines this with research into the processing of affect from cognitive psychology to reveal how feelings influence the processing of information.

0.2 Methodology: Design research, interdisciplinary by nature

Information and experience design are interdisciplinary in nature, being concerned with diverse aspects of information communication and experience across a broad range of disciplines. There is a strong argument that design research is inherently interdisciplinary in seeking to understand important aspects of the human world. In discussing the nature of design research, Cross cites Herbert Simon’s argument that, ‘The proper study of mankind is the science of design’. Simon argues that since the practice of design is intrinsic to the production of the artificial world, the investigation of design inevitably crosses into other fields of knowledge. Broad design issues are usually drawn from multifaceted situations in everyday life, defying the application of strict disciplinary boundaries. Design research can also be the impetus for communication between creative fields as disparate as engineering and music, but the ubiquity of design does not answer the problem of how to negotiate interdisciplinary knowledge in investigating design. A basic struggle exists between disciplinarity and interdisciplinarity in design research. Cross accepts that today there is greater recognition of design as a rightful academic discipline and there is commensurate increasing awareness of the strengths of design thinking within the context of design. This thesis draws on the strengths of disciplinary knowledge, but uses interdisciplinary research to address gaps in design knowledge.

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The thesis incorporates knowledge from a variety of non-design areas, including virtual heritage, presence research, phenomenological psychology and cognitive psychology. Rigour is at risk whenever disciplinary knowledge is mixed. The act of extending discussion to a number of different disciplines while maintaining relevance to design research creates additional demands on researchers. The requirement for design researchers to establish first principles may be unreasonable in applied research in design where interdisciplinarity features strongly and where the complexity of the problem provides only a rule-of-thumb for designers to follow. Cross argues that a primary challenge for design researchers is to find ‘a way of conversing about design that is... both interdisciplinary and disciplined. We do not want conversations that fail to connect across disciplines, that fail to reach common understanding, and that fail to create new knowledge and perceptions of design. It is the paradoxical task of creating an interdisciplinary discipline’.8

A greater risk is taking knowledge from other disciplines without understanding the full meaning of the borrowed ideas. Even if a researcher is careful to understand these new ideas as part of the sum of knowledge in their original field, the new applications might not match the complexity of the applied field.9 To understand extraneous knowledge in its original context requires an element of competency across multiple disciplines, otherwise the exploration of research questions will be broad rather than deep. This thesis incorporates knowledge from a number of specialised disciplines outside design research. It may not be possible for a design researcher to become an expert in cognitive and phenomenological psychology as integral fields of research, but it is possible to gain sufficient relevant knowledge by using the research question and applied project to set limitations for interdisciplinary research. There is a wealth of debate in the literature of cognitive psychology on emotions, but some of it is not relevant to the thesis. The impact of cog-

8 Cross, p. 8.
nition on emotion is far more important than the order in which these events occur in this research. Phenomenological psychology deals with both the processing of experience, which is known as transcendental phenomenology, and how experience shapes the self, which is known as existential phenomenology. This research excludes existential phenomenology to focus on how audiences use experience to shape their understanding of a virtual heritage site rather than how it affects their self-understanding.

In exploring affective information design, the thesis pioneers new territory. Golde and Gallagher warn that conducting research in a gap between two fields can leave no established frameworks or models for guidance.\(^\text{10}\) The current frameworks and models of information design are highly restrictive and do not address experience design. The thesis argues that design’s various sub-disciplines rely too heavily on limited frameworks, often resulting in the exclusion of relevant knowledge. Rather than view information design as a sub-area, I discuss it as an approach whose boundaries change depending on the nature of the design project.

Ideas and methods from one discipline can aid the identification, understanding and solution of gaps in another discipline.\(^\text{11}\) In some instances, interdisciplinary research is the only means of progress, Bruhn arguing that interdisciplinary research has proved its value ‘when traditional research approaches have failed to come up with answers to common problems’.\(^\text{12}\) The thesis identifies a gap in the knowledge and practice of information design and crafts a body of interdisciplinary knowledge to address this oversight in design research. The relationship between bodies of knowledge and methods determines whether research is multidisciplinary, inter-


disciplinary or transdisciplinary. Each crosses disciplinary boundaries, but the nature of the exchange differs. Choi and Pak argue multidisciplinary research happens without a merging of disciplinary boundaries, problems being worked on sequentially or in parallel. Interdisciplinary research is interactive, blurring the boundaries between disciplines and resulting in ‘new common methodologies, perspectives, knowledge, or even new disciplines’, where transdisciplinary research views complete systems in a holistic manner. For Aram, ‘instrumental interdisciplinarity involves bridge building between fields, epistemological interdisciplinarity involves re-structuring a former approach to defining a field, and transdisciplinarity seeks a movement towards coherence, unity and simplicity of knowledge’. For Thompson Klein, transdisciplinary research seeks ‘a common system of axioms for a set of disciplines … as in the emergence of “comprehensive paradigms” such as Marxism, feminism, fields that transcend any one discipline such as cultural studies, and synoptic studies such as philosophy or religious studies’. This thesis looks across disciplinary boundaries in search of common perspectives to enrich the fields of information and experience design. To bring information design, presence, affective information and experience together requires careful attention to the gaps within and between these research areas. The common link in this study is that each body of knowledge relates to mental processing of stimuli or data, concerning how people process information and experience.

0.3 Case study and the applied project

A case study demonstrated how interdisciplinary knowledge informed issues of affect in information design. A case study is an approach to an invest-

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14 Choi & Pak, p. 359.
15 Aram, p. 382.
igation rather than a method in itself, other methods being used to gather and analyse data around the case.\textsuperscript{17} Case studies investigate phenomena within their natural context, analysing what happens in real-world situations to expose theoretical issues. They are a recommended approach when a research question cannot be separated from its context.\textsuperscript{18} Context is important to design investigations, hence my use of a real-world design project to examine the questions of information design. The case study shows how limitations such as deadlines, limitations of technology and access to information conflict with theoretical principles. Understanding the barriers that prevent the application of theory in practice is as valuable to the knowledge of design as understanding the theories themselves. With their real-world setting, case studies represent multivariate, complex conditions as opposed to the isolated, control-led conditions found in laboratory studies.\textsuperscript{19} Case study makes collecting data more difficult, but the results reflect how design processes are in the world.

Case study represents the combination of theory and practice, an area that is important to design research given design’s vocational application.\textsuperscript{20} Design knowledge is only valid if it is useful to designers. In the case study component of this thesis, the research questions set the data gathering methods and parameters of investigation.\textsuperscript{21} This was useful in investigating new research questions where there are no existing investigation frameworks, Hartley arguing that a flexible investigation framework suits areas of emergent

A theoretical framework is vital to a successful case study, without it a case study is in danger of being an interesting description of details with no significance to research. I used the research question to form an investigative framework for the case study, seeking to find how designers could incorporate issues of affect into the design process for new media information design.

The first step of a case study is selecting the type of case and whether to investigate a single case or multiple cases. I chose a single case so that I could participate in and document the design process from the point of view of the designer, virtual heritage projects being long and involved. Although the case study is context specific, generalisation is still possible provided the findings are generalised to theory. Rather than focus only on the specifics of the case, generalisation of the case study results by turning them into theory requires the investigator to look to theories of why things came to be as they did. The generalised knowledge in this thesis emerged from both the interdisciplinary theoretical enquiry and from the case study, meaning that designers can apply the findings to other virtual heritage design projects.

The case study in this thesis followed a virtual heritage design project through from the start to the finish and documented how design practice and theory worked together to create a design based on information, experience and affect. The case study is not a typical case because I was working on the Virtual Vitthala Temple as a single designer where a team of designers produce most virtual heritage projects. I could not visit the site personally to gather additional information and the nature of the site did not lend itself to the constraints of designing 3D for the World Wide Web. Hence, in some respects the case study does not meet the criteria of a typical case where the

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22 Hartley, p. 324.
23 Hartley, p. 324; Meyer, p. 332.
24 Hartley, p. 327.
context is that of a common situation.\textsuperscript{26} Instead, it forms a critical case created to test a theory within a clear set of propositions.\textsuperscript{27}

I selected this particular case study because it presented a set of benefits and challenges that would allow me to investigate the affective and informational aspects of virtual heritage and different applications of phenomenological method in the design process. I worked with Dr Sarah Kenderdine from Museum Victoria who is an expert in virtual heritage and presence research. She provided the content and design direction for the Place-Hampi website and provided floorplans, sketches, photographs and video on which I could base the 3D virtual environment. The travelling exhibition that formed a basis for the website and 3D virtual environment included a virtual component in the form of a 3D screen and projector system, which I explain in more detail in Chapter 5. Dr Kenderdine had already conducted user testing on the installation with Dr Anita Kocsis. This research could be compared and contrasted with the use of phenomenological method as a user-testing method in the case study. The complexity of the model tested the technology available for bringing 3D to the World Wide Web. The fact that few of the user-testing participants had been to India, and none had been to the Vitthala Temple, allowed me to test their experience of the virtual environment as a stand-alone experience that wasn’t based on a previous visit to the temple. Although these arguments do not preclude investigating affect, information and the phenomenological method in another virtual heritage project, the parameters of the project meant that it was suitable as an applied project within this thesis.

My role in the case study was as a designer. Dr Sarah Kenderdine provided the text, video and photographic content for the Place-Hampi website. I designed the layout under her supervision and direction, coded the pages and created the interactive multimedia assets. I used the information from the

\textsuperscript{26} Yin, \textit{Case Study Research}, p. 41.
\textsuperscript{27} Yin, \textit{Case Study Research}, p. 40.
website as well as floorplans and images provided by Dr Sarah Kenderdine as the basis for the 3D environment. I sourced additional information needed for the 3D design from the World Wide Web, journals and books. Finnian Millour assisted me in porting the project to Unity, a gaming platform that allows interactivity in 3D environments.

The proposition of the case study is that it is possible to use knowledge from phenomenological psychology and other disciplines to add considerations of affect to the information design process. I present the applied project as a descriptive case study. The role of a descriptive case study is not to establish any pattern of cause and effect, but to describe the phenomenon and its context. 28 In a descriptive case study, the research question sets the parameters of what is reported. The research question of the thesis centres on the importance of affect in information design in new media contexts. The thesis question restricts the account of the design of the Virtual Vitthala Temple to where interdisciplinary theory on affect, information and experience influenced key design decisions.

There are arguments against the use of case studies in empirical research. Some argue that context-independent theoretical knowledge is superior to context-dependent practical knowledge. Others see case study research as an inappropriate base for building theory or testing hypotheses. Yet others argue that case studies are difficult to summarise and have an inherent bias towards verification. 29 Flyvbjerg argues, however, that expert knowledge is based on the accumulated experience of context-driven concrete cases, not just an awareness of general theory. 30 Access to a detailed, multifaceted application of knowledge creates a more nuanced view than general theory allows. 31 Case study research cannot be reported in a few key findings. As Flyvbjerg states,

28 Yin, Applications of Case Study Research, p. 23.
30 Flyvbjerg, p. 222.
31 Flyvbjerg, p. 223.
‘The case story is itself the result.’ The thesis generalises to theory the results of the case study. This generalised theory explains the strengths and weaknesses of phenomenological method as a way to incorporate affect and information in the design process. The case study describes an account of how I applied theory to the design process and how the design process challenged the application of acquired interdisciplinary knowledge in the context of a real-world project. The case study’s purpose was not to create or test a conclusive and final design prototype that would exemplify the acquired theory. Its focus was on the design process and generalisable theory, not on the design.

0.4 Contribution to knowledge

Demonstrating a contribution to knowledge is complicated in any form of interdisciplinary investigation. Comparing the state of knowledge in a field before and after the study highlights the contribution of a research investigation; in interdisciplinary research it is difficult to isolate what field benefited in what ways from the research. Although the thesis relies on interdisciplinary enquiry, the primary focus is the area of information design. The thesis contributes to knowledge in information design by establishing the importance of affect to information processing and by pioneering psychological phenomenological method as a tool for the design process and for user-testing in design. By using phenomenological psychology to address issues of information in experience, the thesis adapts non-design theory to form new design methods for designing information experiences. The incorporation of phenomenological psychology method into the design process offers a new way for designers to analyse and incorporate experience into design.

0.5 Scope and limitations of the thesis

This thesis represents one path to investigate the research question. There are many other disciplines I could have drawn on in my interdisciplinary enquiry

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32 Flyvbjerg, pp. 238–239.
33 Barnes & Melles, p. 7.
to examine issues of information, affect and experience outside of psychology. Philosophy and educational theory are two examples. Within psychology there are approaches and schools beyond phenomenological psychology that address information, affect and experience. Other areas could be used to demonstrate the connection between information, affect and experience such as theatre, film or storytelling. The incorporation of affect into information design experiences could have many solutions. This thesis represents an original response based on relevant interdisciplinary knowledge and demonstrated in a contextual application.

The single case study means it is impossible to generalise the results, but non-generalised knowledge still adds to the collective knowledge in an area. Instead, the case study generalises findings to theory, creating new knowledge for designers to work with. The goal of the case study was to examine the application of theory to one context-specific design process, demonstrating the adaption of non-design theory to the discipline of design.

Although the experiences of designers in different fields differ, this thesis argues that some divisions between design disciplines are unnecessary. The thesis indicates where it is necessary to distinguish the type of designer in question (digital designer, information designer, etc.) and uses the terms design and designer where it speaks of a broader design approach that is not restricted to disciplinary silos.

0.6 Structure of the Thesis

After this introduction, the thesis comprises five chapters and a conclusion. Chapter One, ‘Information design and affect’, discusses the history and limitations of information design, showing the field’s neglect of affect. The chapter discusses how the rise of new media challenges the field to consider the role of affect in information design. Chapter Two, ‘The role of affect in

34 Flyvbjerg, p. 227.
cognition’, shows affect to be an important sense-making tool, providing evidence from cognitive psychology as to why affect should be a consideration in information design. Chapter Three, ‘Phenomenological psychology and the experience of information’ discusses an experience as a context for information processing. The chapter proposes that there are useful affinities between experience and information design in new media given that in new media contexts people encounter information as a multidimensional, multi-sensorial experience. The chapter uses knowledge from phenomenological psychology to examine affect as critical information to be addressed in the design process. Chapter Four, ‘Virtual heritage and the feeling of presence’, relates the abstract issues of affect and information in an area of design practice that combines concrete data with affective dimensions. Chapter Five, ‘The Virtual Vitthala case study’ demonstrates the application of theory to design practice. The conclusion to the thesis discusses the significance of the theoretical findings for information design and outlines recommendations for further research.
Chapter 1
Information Design and affect

This thesis sits in the area of information design. Information design is a discipline in flux with new methods for processing, transmitting and displaying data suggesting the need for paradigmatic shift in its perspectives on what constitutes information. Con conventionally, information design concentrates on measurable and objective data to be processed through people’s faculties of logic and reason. This may have been acceptable when objective data were viewed as superior to emotional information, but new knowledge in cognitive psychology and new methods of transmitting information challenge the old frameworks for understanding information processing. This chapter establishes the axioms and gaps in information design through the history, definitions and boundaries presented in information design publications. It discusses the preference in information design for simple, linear models of information processing, for objective data and the eschewing of affect. To note trends and general positions in the area, the chapter uses publications by the key information design theorists Edward Tufte, Colin Ware, Rune Pettersson and David Sless, and the contents of the Information Design Journal from 1998 to 2008. Papers by other authors contributed to definitions of information design and identified gaps in the area.

1.1 Uncertain definitions and boundaries

There is currently no single definition for information design and no common terminology to unite the area. Such ‘semantic fluidity’ allows information design to constantly evolve and redefine itself, but presents a challenge in sharing information across disciplines given the lack of a common

vocabulary. Some definitions of information design focus on its functionality, or why it is needed and what it does rather than what it is. Various definitions of information design include R.E. Horn’s statement that it is ‘The art and science of preparing information so that it can be used by human beings with efficiency and effectiveness.’ Jacobson defines information design as ‘The systematic arrangement and use of communication carriers, channels, and tokens to increase understanding of those participating in a specific conversation or discourse.’ Carliner represents it as ‘The defining, planning, and shaping of the contents of a message and the environments it is presented in with the intention of achieving particular objectives in relation to the needs of users.’ Pettersson defines information design by its goals, stating that ‘the main goal in information design is clarity of communication.’ Sless focuses on the actions of information designers, stating that they ‘create and manage the relationship between people and information so that the information is accessible and usable by people, and they provide evidence that the information is accessible and usable to an agreed high standard.’ Pettersson, however, also argues that information design is simply too broad a term to represent any specific set of functions.

Defining information design by its boundaries does not prove any easier than setting a strict definition of its nature, goals or functions. The boundaries of information design are open to dispute due to the multidisciplinary roots of the area. The looser the definition of information design, the more multidisciplinary it seems and the longer its history. Tufte represents information design in terms of an ongoing process of simplification, with each generation of designers working to make information more accessible and usable.

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40 Carliner, ‘Physical, Cognitive, and Affective: A three-part framework for information design’, p. 564.
43Pettersson, p. 9.
design as emerging between 1750 and 1800 with the visualisation of numerical quantities in the form of statistical graphs. He suggests that it was not until then that the various skills of artistry, statistics and mathematics were sufficiently developed to support abstract, non-representational imagery. Sless mostly concurs, arguing that industrialisation and the differentiation and specialisation of skills required to communicate information created an increasing need for information design. For instance, he argues that a book requires not just an author, but an ‘editor, illustrator, photographer, typesetter, platemaker, printer, binder, publisher and distributor’. Information design emerged to coordinate these range of skills and then evolved to become a specialist occupation in itself.

Beyond the coordination role of the information designer, many disciplines had their own tradition of designing information for communication. Stiff’s paper detailing the history of information design includes some of these non-design examples of information design, such as the work of mechanical engineers, army training manuals, the contribution of applied psychology, work by the plain language movement, which each incorporated examples of graphically designed information. The fact that so many disciplines have histories that include the design of information for communication sees various groups claiming to be primary stakeholders in the practice of information design, creating territorial disputes. For a long time graphic designers held the view that information design belonged to their field

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45 Sless, 2007.
46 D Sless. ‘What is information design?’ In *Designing information for people, Proceedings from the symposium*, 2nd ed., R Penman and D Sless (eds), Canberra, Communication Research Institute of Australia, 1994, pp. 1-3.
exclusively and required only graphic design skills. Pettersson, however, argues that information design is not a sub-category of graphic design, stating that from its inception information design was deliberately composited from knowledge from many different areas.

Currently, the literature of information design embraces the multidisciplinary nature of information design practice, accepting that its practice involves a broad range of skills and requires fresh viewpoints to meet the contemporary challenges of information. Pettersson describes information design as inherently interdisciplinary, being a ‘receiving’ discipline that ‘encompasses influences and facts from more than fifty established academic disciplines and established areas of research’. For Pettersson, any message design is rooted in language disciplines, aesthetic disciplines, information disciplines, communication disciplines, behavioural and cognitive disciplines, and business and media production technology disciplines, highlighting the range of factors and knowledge that can come together in individual information design projects. Reynolds goes further, arguing that information design requires a multi-disciplinary approach from designers themselves to create holistic information products in transcending the mere design of appearance or content.

Information design spans practice and research, while having roots that trace back to early human history as exemplified by 40,000 year-old lunar calendars etched on animal-bone. Stiff dates the emergence of information design as an academic field to Willard Cope Brinton’s 1908 lecture at Harvard University on

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51 Reynolds, p. 186.
52 Strand, p. 232; Pettersson, pp. 11–12.
53 Pettersson, pp. 11–12.
54 Reynolds, p. 186.
graphic methods for presenting facts.\textsuperscript{56} He argues that information design evolved through the needs of industry, government and the military in affluent Western nations in the 20\textsuperscript{th} century.\textsuperscript{57} Reynolds states that over time the term information design has expanded from graphic designers ‘making information look good’ to wider concerns of communicating empirical data with technical communicators recently adopting the title information designer.\textsuperscript{58} However, Carliner argues that it is the influence of technical communication that made information designers more concerned with layout and appearance rather than supporting the audience’s goals and needs.\textsuperscript{59}

Carliner advocates a return to the problem-solving approach of general design where designers can identify discrete and interrelated problems to achieve a design solution.\textsuperscript{60} This problem-solving approach differs from a cookbook approach that sets rules for text, colours and layout because it allows designers to see problems unique to the project and respond accordingly.\textsuperscript{61} Pettersson calls this flexible problem solving approach the ‘it depends’ approach to information design.\textsuperscript{62} In this approach the issues unique to the project, the goals of the design and the goals of the audience work together to form a context-driven approach to information design. This context-driven approach allows for broader considerations of information than a cookbook approach or discipline-based approach would. In a design outcome where affective states could aid in holistic understanding of the information, emotion could be considered one of the goals of the design process.

\textsuperscript{56} Stiff, p. 217.
\textsuperscript{57} Stiff, p. 217–218.
\textsuperscript{58} Reynolds, p. 186.
\textsuperscript{59} Carliner, 2000, p. 562.
\textsuperscript{60} Carliner, 2000, pp. 563–564.
\textsuperscript{61} Pettersson, p. 24.
\textsuperscript{62} Pettersson, pp. 24-25.
1.2 The evolution of information design to the exclusion of affect

Information design largely defines itself on the basis of its design material, information, rather than through reference to any particular media, which is both to its benefit and detriment.63 Concerning itself exclusively with information means that information itself needs to be defined, which is a difficult task. There is a philosophical view that information is only an abstract concept, suggesting that information itself cannot be designed, rather only the method of communication is designable.64 According to Dervin, ‘Information is a tool designed by human beings to make sense of a reality assumed to be both chaotic and orderly.’65 Considering information in such broad terms means there is no difference between information design and other types of design. Everything communicated is a type of information. The information design literature represents information design as an art and a science, but the field’s focus is largely on the science as a way of distinguishing the area from other types of communication design. The preference for pseudo-scientific validation is evident in the quest for universal laws of information design. This ‘scientific’ view adopts the idea that information describes facts about the objective world, whereas any emotional response to the world is purely subjective, outside the realm of information and hence outside the domain of information design.66 McLaughlin, for example, argues that in Western metaphysics objective facts of the world are made clear only by stripping away emotion.67 Over-reliance on a logic-only view of information results in overly-simplified information design frameworks, ignoring subjective and affective modes of processing information.

67 McLaughlin, p. 311.
There is some argument for universal information design principles, with people sharing biological foundations for perception and information processing. Tufte argues that ‘some universal cognitive tasks … are … so deep and profound that it is worthwhile to understand them in order to design our displays in accord with those tasks.’\textsuperscript{68} Ware contends that people share the same biological visual systems that have evolved to receive data in some ways, but not others. He suggests that understanding these mechanisms can create better examples of information visualisation.\textsuperscript{69} For Tufte, these intrinsic modes of analytical thinking are ‘understanding causality, multivariateness, and comparison’.\textsuperscript{70} He links them to ‘nature’s laws’, regarding them as ‘indifferent to language, culture, gender, or the particular mode of information that is provided’ and argues that they should form the foundations for information design principles.\textsuperscript{71}

The use of universal laws of human cognition casts information design as a science based on positivism. Ware, who writes on information visualisation, emphasises the importance of ‘fundamental truths’ in science as the foundation of new ways of thinking about a topic.\textsuperscript{72} A barrier to forming any underlying set of rules for information design is that different areas of information design are context-specific, geographic wayfinding for instance being inherently different to the design of charts and tables.\textsuperscript{73} Furthermore, biology is not the only influence on cognition. Culture has a significant impact on how people perceive and process information.\textsuperscript{74} Despite Tufte’s advocacy of universal principles of information design, he argues that such rules would not be ‘logically or mathematically certain’, commenting that

\begin{itemize}
\item \textsuperscript{69} C Ware. \textit{Information Visualization: Perception for design}. San Francisco, Morgan Kaufman, 2000, p. 27.
\item \textsuperscript{70} Zachry & Thralls, p. 453.
\item \textsuperscript{71} Zachry & Thralls, p. 453.
\item \textsuperscript{72} Ware, p. 393.
\item \textsuperscript{73} Jacobson, ‘Introduction: Why information design matters’, p. 5.
\item \textsuperscript{74} Ware, p. 17.
\end{itemize}
designers should ignore the rules when necessary.75 These views suggest that biology is the fundamental basis for perception and cognition, but culture and individual aesthetic preference can heavily influence how a piece of information design is received.

1.3 Objective and subjective forms of representation

The role of culture in information design is evident when considering the difference between sensory and arbitrary symbols. In visual communication, symbols are used to represent things other than themselves and form the basis for visual language. Sensory symbols directly represent the object they stand for, a picture of a toilet, for instance, indicating a toilet. In theory sensory symbols are completely objective. Arbitrary symbols are culturally determined, groups of people agreeing that a symbol stands for something through repeated use, as, for example, a stick figure of a man representing men’s toilets. Arbitrary symbols are both objective and subjective because their meanings may differ between groups of people although people in a group share the meanings. Traditionally, sensory symbols are classified as universal, being free of culture or language, but Ware argues that cultures can override sensory symbols and use them as arbitrary symbols for something else.76 For example, a picture of a man is a sensory symbol, but in the previous example the cultural meaning of men’s toilet has replaced the more literal meaning. Some people, however, may still see a stick figure man as meaning ‘man’ whereas others may see ‘toilet’, making it difficult to talk about universal symbols when such differences are present.

The line between arbitrary and sensory symbols is fuzzy, few symbols being purely arbitrary or sensory.77 Arbitrary symbols often borrow their imagery from abstracted sensory symbols. Sensory symbols often come with additional cultural meanings. Ware argues that despite the problems in identifying a

76 Ware, p. 14.
77 Ware, p. 17.
symbol as arbitrary or sensory, making distinctions between the two is essential to creating a consistent terminology in information design. This reliance on questionable terminology can produce errors in judgment. Tufte and Pettersson, for instance, claim that mathematical symbols are universal because they are not the domain of any one cultural group. However, that ignores the fact that mathematics is a culturally acquired body of knowledge. Mathematics is its own culture.

The use of arbitrary symbols is self-perpetuating. When a culture agrees on a set of meanings for a set of arbitrary symbols it becomes hard to shift that way of thinking. The use of these symbols necessitates a particular way of viewing and solving problems. Contour maps, for instance, are critical to how geologists visualise topography, Ware arguing that this leads geologists to resist colour-shaded maps that are not reflective of their customary problem solving approaches. Visual codes are not always easy to learn, nor do they always make a message easy to understand, but they can represent powerful languages such as mathematics and writing. A downside to this, as shown in the geology example, is that the use of standardised visual symbols makes people resistant to new ways of representing information. The conventions that bind the area of information design make it difficult for designers to break free and try new ways of presenting information.

1.4 The complexities of information processing

Information design seeks to explain how people process information. To make the process easy to understand for designers and easy to incorporate into design processes, information design represents complex systems as straightforward and linear. Data, information and knowledge are defined as discrete units within information design in an attempt to simplify the process of

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78 Ware, p. 27.
80 Ware, p. 16.
81 Ware, p. 17.
understanding. Shedroff and Marcus base information design on a scale of enlightenment: data, information, knowledge and wisdom. 82 Shedroff discusses these elements as being on ‘an ever-increasing value chain of understanding’ according to which each stage gains value, sophistication and context as the understanding moves from raw data to wisdom. 83 This idea of logical and linear progression represents rational thought as a straightforward, computational exercise where data is the input and wisdom is the output. In reality, information processing is far more nuanced. The simplification of the process makes it easier to design for, but this design is for a simplified, theoretical world that does not exist in reality, making its contribution to design knowledge ineffectual in some instances.

The broad consensus in information design is that knowledge is a type of meta-information, where additional information is known about the information, enabling a higher level of understanding. The meta-information leads to knowledge and in turn meta-knowledge, knowledge about the knowledge, leads on to wisdom. 84 The idea is that understanding reveals patterns and the ability to generalise and apply the information to new situations. 85 This meta-information view demonstrates the cumulative and holistic nature of knowledge acquisition, but approaches initial data in isolation. Shedroff, for instance, stresses that facts only become useful through interpretation. 86 A common view is that data is the smallest, simplest component of information, existing before interpretation turns it to information. 87 However, Ware

82 Shedroff, p. 34; A Marcus. ‘Dare We Define User-Interface Design?’, Interactions, vol. 9, no. 5, 2002, p. 23.
83 Shedroff, p. 34.
85 Shedroff, p. 48.
86 Shedroff, p. 37.
contends that ‘there is no such thing as raw data. Every data-gathering instrument embodies some particular interpretation in the way it is built.’

The significance of the terms and learning models found in information design is not whether they are right or wrong, but that they limit the development of the area. The reliance on a linear model of human cognition following outdated brain-as-computer theories has not been helpful for information design. Such models neglect affective processes, treating understanding as a logical process measured in precise steps rather than a balance of logic and emotion, where people constantly re-examine information to build new understandings. The terminology of information design is prone to using highly value-laden terms such as wisdom, its connotations of prudence, insight, common-sense and goodness typically being used to elevate the importance of what is a poorly recognised practice in the wider scheme of things. The use of such terminology reflects the perception in Western culture that rational knowledge is good, exposing the biases in information design, which typically resorts to simplistic learning models.

Relying on a linear view of information processing overlooks the fact that information designers do not know where any one member of the audience is on the continuum at any particular time. It may appear simple to design for people who are well-schooled in a particular area, with the assumption that they are progressing from knowledge to wisdom. However, if people are still struggling with concepts they may be further down the scale than expected and the piece of information design will be unfathomable to them.

Fortunately, the restrictive view of linear informing is not universal in information design and may be changing. Some writers represent data and information as only the beginning of meaning, information design being nothing without an audience to process it. Strand argues that the message

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88 Ware, p. 26.
changes from originator, through the information designer, design and communication medium until it is received and interpreted by people. The diversity of the people who comprise an audience, however, creates a significant hurdle for information designers. Adding affect into the information design process adds another element that designers cannot completely control. Incorporating affect into information processing frameworks is important though, because affect has considerable impact on how people process information, as is evidenced in literature from cognitive psychology.

A simplified view of information processing is reflected in the need to define information designs as right or wrong. Tufte, for instance, judges the success of information design on whether it leads end-users to make a correct decision. There is the overriding viewpoint that measurable, logical and correct decisions lead from measurable, logical and correct information designs. Tufte’s examples of successful information design in terms of decision-making include a map enabling the cause of a cholera epidemic to be identified and a chart that led NASA officials to think it was safe to proceed with the Challenger space shuttle’s doomed mission. Tufte claims that when a critical decision needs to be made the correct data needs to be communicated in the correct way, as in the case of prompting the removal of water pump handles where cholera infections were shown to be highest. Conversely, information design can be said to be incorrect when it informs an incorrect decision, such as the decision to launch the Challenger space shuttle on an abnormally cold morning when there were known problems with the O ring in these circumstances. In both cases, information design and decision-making faced ‘exacting reality tests’. Tufte’s arguments about the right and wrong ways to show data, which he describes as truthful and untruthful data

89 Strand, p. 231.
91 Tufte, 1997, p. 53.
displays, exemplify the pervasive stress on objectivity and absolutism in information design.\textsuperscript{92}

\subsection*{1.5 An emotionless model of logic}

The message that information design is logical to the exclusion of affect underpins concepts of correctness and incorrectness in information design outcomes. The notion of emotionless logic in information design is pervasive. Tufte is regarded as ‘the preeminent authority on data and statistical visualization’ and his views reflect the confusion in the area of information design with regard to the roles of affect and reason.\textsuperscript{93} Tufte prefers the term ‘analytic design’ to information design, revealing his preference for logical analysis over other methods of processing information.\textsuperscript{94} He separates the work of information design from other types of design such as marketing, propaganda and commercial design that rely on emotion, arguing that in information design, ‘graphics are instruments for reasoning’.\textsuperscript{95} Tufte’s work appeals to vocations that deal with quantitative measurements and numbers, being described as ‘bibles of design for thousands of engineers, computer designers, scientists and financial analysts’.\textsuperscript{96} The frequent use of the word ‘reason’ in his books reinforces the notion that information involves emotionless logic, but there are subtle contradictions in Tufte’s writing that are largely ignored by those who comment on his ideas.

Tufte writes about information design in surprisingly emotive terms. The title of his most recent book, \textit{Beautiful Evidence}, combines logical empiricism with an element of the affective. Inside the book he argues that, ‘The best designs... are intriguing and curiosity provoking, drawing the viewer into the wonder of the data’.\textsuperscript{97} Later he comments, ‘If the numbers are boring, then you've got the

\begin{itemize}
\item \textsuperscript{92} Tufte, 1997, p. 45.
\item \textsuperscript{93} Zachry & Thralls, p. 447.
\item \textsuperscript{94} Zachry & Thralls, p. 447.
\item \textsuperscript{95} Zachry & Thralls, p. 448.
\item \textsuperscript{97} Tufte, 2002, p. 121.
\end{itemize}
wrong numbers.' Indeed, part of the appeal of Tufte’s design examples is that they can stir strong aesthetic and emotional responses as well as imparting factual data. For instance, the Vietnam Veterans Memorial in Washington DC, which Tufte discusses in Envisioning Information, lists the war dead by date of death instead of surname, thus chronicling battles, friendships, platoons decimated and the escalating deaths as the war went on. Tufte rejects propaganda, but there are few designs that testify to the destructiveness of war more than the Vietnam Veterans Memorial that he champions as an example of great information design, even though it poses basic difficulties in locating the names of the dead.

To access specific information you need to know an individual’s date of death. Listing the dead by their death date charts the increasingly bloody war, showing entire platoons who died together and displaying the individual names of the dead in the context of a larger story. The display of names creates significant relationships, showing them in the context of the battles they fought, the platoons they fought in and the progress of the war, heightening emotional impact by effectively combining affect and information. The shift in Tufte’s work towards emotive influences on information design reveals how important affective states are to information processing, a view that is only starting to be accepted in information design publications.

These conflicting views on affect as both a support to and a distraction from logic have led to a wariness of new media in information design. New media allows for a multimodal, more naturalistic experience of information using platforms such as virtual reality, virtual worlds and 3D video. There was the concern that

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98 Martin, 1997, p. 3.
100 Tufte, 1990, pp. 43–44.
the main focus in multimedia was ‘affective rather than cognitive’ and that
information design should be about more than conveying a set of strong
feelings.102 However, interactivity provides new tools for shaping information.103
These multimodal ways of presenting information allow for enriched experi-
ences. The role of affect is more noticeable in new media information design. An
increased reliance on new media suggests that the influence of affect on infor-
mation processing should be more thoroughly investigated.

Belief in the superiority of empirical information over affective information
originates in the dualistic division of logic and emotion in Western thought
since the writings of Plato and Aristotle separated what they regarded as
animalistic reactions of the rudimentary soul from the reasoned responses of
the rational soul.104 This way of thinking continued in Western philosophy
through to the writings of Descarte (1596–1650), who spoke of ‘animal
spirits’ influencing the human soul, and up until the 20th century.105

Western philosophical discourse up to poststructuralism perpetuated this
view, arguing that rational thought separates humans from animals leading to
rationality being considered superior to feeling.106 This has led to external,
objective and measurable entities becoming the perceived basis of knowledge
in Western thought. The seemingly internal, subjective and private world of
emotion was largely discounted, being seen as impossible to quantify and thus
to study. The literature of information design perpetuates this dualism. To
distinguish itself from other forms of graphic design, information design
primarily engages with measurable data at the expense of affect and

102 R K Lowe. ‘Multimedia Presentation of Information: Communication solution or
communication problem?’, In Designing information for people, Proceedings from the
symposium, 2nd ed., R Penman and D Sless (eds), Communication Research Institute of
Australia, 1994, p. 104.
103 R Jacobson. ‘Designing for the Technologies of Information’, In Information Design, R
104 R W Buck, ‘The Epistemology of Reason and Affect.’ In The Neuropsychology of Emotion,
105 Buck, pp. 33–35.
106 Buck, pp. 33–35.
experiential methods of influencing understanding and decision-making. It is not so much that affect is expressly prohibited in information design, though there are warnings against relying on it at the expense of rational logic.\textsuperscript{107} Affect is rarely mentioned.

1.6 The emergence of affective information design

Presently, the scope of information design is changing. A handful of information designers discuss various roles affect can play in information design. Pettersson, for instance, talks about the ability of visual information design to stimulate affective as well as cognitive responses.\textsuperscript{108} However, these emerging discussions of affect do not fully encompass the strong role affective states play in every stage of information processing from memory formation to decision-making. Affect still challenges information designers because much of it belongs to the viewer, not the design. The role of the end-user in information design literature is that of a passive receiver who follows a predictable linear path in information processing to accept the messages invested in a design. If end-users understand a design and make right decisions, the information design is judged to be good, if they misunderstand it or make bad decisions, the information design is judged to be bad. In reality, people play a much more active role in their interaction with information design. An emerging discussion of affect in information design is beginning to address this. Hansen, for example, warns that information designers should be aware of information that arises internally in people, their perceptions, ideas and visualisations.\textsuperscript{109} Although she does not mention affective internal information specifically, taking subjective internally derived information into account sets the scene for considering other types of internal information.

\textsuperscript{107} Lowe, p. 104.
\textsuperscript{108} Pettersson, p. 11.
The role of affect in meaning-making and decision-making is starting to be noticed in ad hoc ways. Carliner argues that, ‘Affective design often poses some of the greatest challenges to technical communicators.’\textsuperscript{110} He discusses the importance of affect in influencing conscious thought processes, attention, motivation and cross-cultural communication.\textsuperscript{111} Carliner’s problem-solving model of information design incorporates three levels of engagement between information design and its audience: the physical, the cognitive and the affective. An audience encounters the information through the physical design, the cognitive is how the audience processes the information and the affective determines ‘the ability to feel comfortable with the presentation of the information’.\textsuperscript{112} However, this framework has limitations when dealing with information and affect, Carliner being more concerned with the degree of comfort a person feels with the presentation than their emotional response to the under-lying information itself.\textsuperscript{113} In his model, the role of affect is limited and is an assessment of the design of information, having little impact on the response to the information itself. The implication of affect in information design is greater than what this framework expresses.

In Andrews’ review of \textit{Experience Design 1} by Nathan Shedroff, Andrews criticises Shedroff’s omission of affect, arguing that ‘emotions affect one’s experience of information in so many ways, be they motivation to explore and try new things, how attention is focused, or what is remembered and learned.’\textsuperscript{114} Krahmer, van Dorst and Ummelen focus on the ability of moods to influence how persuasive a document design is in their 2004 paper ‘Mood, Persuasion and Information Presentation’.\textsuperscript{115}

\begin{thebibliography}{9}
\bibitem{110} Carliner, 2000, p. 569.
\bibitem{111} Carliner, 2000, p. 569.
\bibitem{112} Carliner, 2000, p. 564.
\bibitem{113} Carliner, 2000, p. 564.
\end{thebibliography}
influence the persuasiveness of a digital document. They created moods in 40 participants, male and female, aged between 20 and 27 by showing them five minute clips from two sources. They showed a clip from the television program *Friends* to the participants who were to be primed with a positive mood and one from *Animal Encounters*, a nature program, for those to be primed with a neutral mood. The two persuasive issues were genetic modification and a proposed railway line through the ‘green heart’ of the Netherlands. The experiment tested the participants’ existing opinions on these topics and presented them with the counter-viewpoint message. The documents were presented in one of two ways: ‘Content Only’, with text, only one colour and no additional design elements, and ‘Content Plus’, with additional design elements. After viewing the material participants were again tested on their attitudes to the two topics. The experiment found that mood and exposure time influenced the persuasiveness of the digital document, but exposure time alone did not. A positive mood was more likely to result in the participant being persuaded by the digital document and they were more likely to be influenced if they viewed the Content Plus document. The experiment demonstrated that mood combined with information design can make a message more persuasive.

**Concluding remarks**

The literature of information design has traditionally ignored issues of affect. This omission is not due to a deliberate prohibition. Rather, it is a combination of Western scholarly bias towards logic, a way of distinguishing information design from propaganda and an oversight of how important affect is to cognition. Designers avoiding affect for fear of polluting purely cognitive information design with emotion do themselves and their audiences a disservice. Affect can help an audience to feel more comfortable with information, it can draw attention to important facts and it can cause a viewer to accept or reject a

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116 Krahmer, van Dorst & Ummelen, p. 221.
117 Krahmer, van Dorst & Ummelen, p. 228.
design. Ignoring affect means ignoring preferences, not caring about user comfort, avoiding shock or surprise, denying pleasure in a design, all affective states that designers often strive for in information design.

The consideration of affect in information design is an emerging area with a handful of information designer writers exploring the role that affect plays in audience responses to information design. Ironically information design has a rich history of drawing on other disciplines yet it excluded issues of affect. Expanding information design into considerations of affect loosens the boundaries of information design further. Where some authors viewed information design as a sub-set of graphic design, focussed solely on presentation rather than content, others argue for a flexible problem-solving way of communicating information. In the past information design relied on cookbooks of rules to guide document designs, limiting designers’ responses to briefs and setting restrictive boundaries around the field of information design. New views on information design as a context-driven, problem-solving activity allow greater flexibility in responding to the goals of a design project, the message it seeks to convey and the goals of the audience.

In order to communicate information effectively, the problem-solving approach to information design takes into account the goals of the information design project and the needs of the audience. It is this shift to the needs of the audience that makes the role of affect so important to future information design research. Recent information design publications have already shown that a person’s mood can influence the effectiveness of information design, however these writings only begin to explore how vital affect is to information processing.

An affective information design approach offers flexibility and attends to the message to be communicated, as opposed to concentrating on the media or dry logic. Adopting a problem-solving rather than a disciplinary approach, affective information design is open to the interdisciplinarity that is at the core
of information design. It focuses on information design as a communication between audience and information designer, rather than focusing on a one-way authoritarian method of communication from experts. Multimodal, multisensory information processing supplants out-dated simplistic, linear models of information processing. By considering affective messages sent by the design, not just cognitive messages, affective information design communicates on multiple levels with viewers.

In Chapter 2, I expand on the role of affect in information processing through the literature of cognitive psychology. arguing why this knowledge should be a fundamental consideration in the theory and practice of information design.
Chapter 2
The role of affect in cognition

The information design literature barely discusses the role of affect in information processing. It frames cognition as a rational and integral process separate from emotional responses. This chapter discusses the role affect plays in cognition according to cognitive psychology and its consequences for information design. Cognitive psychology largely ignored the issues of affect until 1980 when the psychologist Robert B. Zajonc published a groundbreaking paper demonstrating the link between affect and cognition.118 Since then authors such as Damasio, Lazarus, Ortony, Schwarz and Clore have revealed how strongly affect and cognition influence each other. There is debate over exactly how affect and cognition influence each other. I note these disagreements where relevant, but overall I focus on the larger issue of the role of affect in information processing and how this might be recognised in information design.

There are key differences between the different affective states of mood, feeling and emotion, each having different purposes, functions and influences on cognition. Cognition is broadly defined as the process of knowing. Matlin describes cognition as mental activity ‘involving the acquisition, storage, transformation, and use of knowledge’.119 Zajonc, on the other hand, speaks of cognition as being a judgment of true or false.120 Outside psychology, definitions of cognition have changed over time, possibly due to increased awareness of the role of affect in cognition in cognitive psychology. In 1988, the Australian Pocket English Dictionary defined cognition as ‘knowing or perceiving or conceiving as an act or

faculty distinct from emotion and volition; result of this’.\textsuperscript{121} Today, the online version of the Oxford dictionary defines cognition as, ‘the mental action or process of acquiring knowledge and understanding through thought, experience, and the senses; a perception, sensation, idea, or intuition resulting from this’, no longer excluding the role of emotion.\textsuperscript{122}

It is difficult to create a single definition of cognition when discussing how affect influences cognition. On the one hand, there is growing acceptance that cognition does not exclude affect. On the other, it is difficult to discuss how affect influences the logic-processing aspects of cognition if they are not seen as separate processes. This explains why Zajonc refers to cognition as being true or false rather than a holistic sense-making process. From a biological viewpoint, affect is processed independently from cognitive thought, the two processes happening in different parts of the brain.\textsuperscript{123} According to Zajonc, affect is processed more directly by the brain; cognition requires more inputs.\textsuperscript{124} Although cognition and affect are distinct biological processes with different purposes and effects, they heavily influence each other. Zajonc argues that, ‘In nearly all cases ... feeling is not free of thought, nor is thought free of feelings.’\textsuperscript{125} The impact of cognition on affect is further blurred by the fact that the cognition doesn’t necessarily have to be conscious to have influence.\textsuperscript{126}

The function of affect is similar to cognition. Zajonc argues that where cognition determines judgements of true and false, affect refers to values, or good

\begin{footnotesize}
\begin{enumerate}
\item Zajonc, 1980, p. 151.
\item Zajonc, 1980, p. 154.
\end{enumerate}
\end{footnotesize}
and bad.\textsuperscript{127} Cognition can be tested for correctness as it represents true or false values, whereas affect is subjective and cannot be judged to be right or wrong. Take the comparison of buildings, for example. If a person declares one building to be taller than another, this statement can be tested and found to be true or false, whereas if they like one building more than another the preference is not true or false.\textsuperscript{128} Affect comprises two categories. These are affective dispositions, or preferences and attitudes, and affective states, or emotions and moods.\textsuperscript{129} Affective dispositions are predetermined ways in which people react to stimuli.\textsuperscript{130} According to Lazarus, affective dispositions occupy the gap between emotion and non-emotion.\textsuperscript{131} I concentrate on affective states in this thesis since they are more easily influenced by virtual environment design. Clore and Ortony define affective as being ‘anything evaluative’.\textsuperscript{132} The goal of affect is to determine whether a stimulus is positive or negative, attractive or aversive and whether the individual should approach or avoid the stimulus.\textsuperscript{133}

Cognition and affect in the form of judgement and evaluation allow people to process information and respond accordingly. Zajonc reasons that cognition represents the informative world around a person whereas affect determines how that person relates to the world.\textsuperscript{134} This relational aspect of affect helps the individual to understand their experiences. Schwarz claims that affective

\begin{itemize}
\item \textsuperscript{127} Zajonc, 1998, p. 591.
\item \textsuperscript{128} Zajonc, 1998, pp. 596–597.
\item \textsuperscript{131} Lazarus, p. 125.
\item \textsuperscript{133} Zajonc, 1998, pp. 596–597.
\item \textsuperscript{134} Zajonc, 1998, p. 613.
\end{itemize}
reactions exist to inform people of the nature of situations.\textsuperscript{135} For example, deciding if present circumstances are beneficial or detrimental to the person.\textsuperscript{136}

Affective states are divided into feelings, moods and emotions, with each assisting in evaluation in a different way. Feelings are the most basic type of affective response, acting as internal signals that consciously inform the self about unconscious processes.\textsuperscript{137} Moods are affective states that are not direct-ed at anything, or directed at the world in general rather than a specific object.\textsuperscript{138} Two examples of moods are general sadness and general happiness.\textsuperscript{139} Emotion is an appraisal of whether something is good or bad for the subject’s goals and concerns. Put simply, emotions are feelings directed at something.\textsuperscript{140} Three elements comprise emotions: bodily expressions, physiological disturbances and subjective analysis. According to Lazarus, all three components must be present for the affective state to qualify as an emotion.\textsuperscript{141} Emotions are represented across multiple bodily systems where all systems reflect the same state. Clore and Ortony define emotions as ‘cognitively elaborated affective states’.\textsuperscript{142} Emotion is a feeling towards something that the individual can identify and analyse by thinking about it.\textsuperscript{143} There is no clear-cut delineation between emotion and mood. They lie on a continuum depending on how much the affective state is directed at something in particular or the world in general.\textsuperscript{144} In this thesis, I take feeling as an internal signal alerting the individual to an experiential evaluation, a mood as an affective state not directed at anything and an emotion as an affective state directed at something.

\textsuperscript{135} Schwarz, p. 527.
\textsuperscript{137} Clore \textit{et al.}, p. 29.
\textsuperscript{139} Zajonc, 1998, pp. 596–597; Clore \textit{et al}, p. 29.
\textsuperscript{140} Clore \textit{et al.}, p. 29; Zajonc, 1998, pp. 596–597.
\textsuperscript{141} Lazarus, p. 125.
\textsuperscript{142} Clore & Ortony, p. 629.
\textsuperscript{143} Zajonc, 1998, pp. 596–597.
\textsuperscript{144} Clore \textit{et al.}, p. 29.
2.1 The neglect of affect in cognitive psychology

There are few social phenomena that do not involve affect. Interactions that exchange information regarding opinions, preferences and evaluations are all influenced by affect.\textsuperscript{145} Emotions can enrich experience or cause disruptions in judgement and performance.\textsuperscript{146} Given the importance of emotional processes, it is difficult to understand why psychology neglected affect for decades.\textsuperscript{147} Le Doux argues that the notion that cognitive science is the ‘new science of the mind’ is misleading, precisely because it ignores emotion. He contends that ‘minds without emotions are not really minds at all. They are souls on ice—cold, lifeless creatures devoid of any desires, fears, sorrow, pains, or pleasures.’\textsuperscript{148}

Western thought’s division of emotion and logic into two disparate realms is evident in the field of cognitive psychology. Before 1980, there was little mention of affect or any closely related term in the indices of any major work on cognition.\textsuperscript{149} Forgas suggests that the neglect of affect in psychology reflects an epistemic failure in Western academia traceable to the time of Aristotle. Aristotle separated passion and reason, arguing that reason was necessary to keep unruly passions under control.\textsuperscript{150} Plato likened emotions to wild horses that needed to be kept in check.\textsuperscript{151} Christianity equated many emotions with sin.\textsuperscript{152}

Other philosophers have followed suit through the ages, with Wolff (1714-1762) separating human thought into \textit{facultas cogniscivita} and \textit{facultas appetiva}, knowing and desire. Mendelssohn (1729-1789) identified three parts

\textsuperscript{145} Zajonc, 1980, p. 153.
\textsuperscript{146} Ortony, Clore & Collins, p. 3.
\textsuperscript{147} Zajonc, 1998, p. 594.
\textsuperscript{149} Zajonc, 1980, p. 152.
\textsuperscript{150} Zajonc, 2000, p. 31.
of the soul: understanding, feeling and will. Kant adopted this trifold categorisation of mental processes and called them cognition, affect and conation. Forgas argues that this artificial, unproven division continues to this day with paradigms in psychology treating affect, conation and cognition as fundamentally distinct faculties. The division has led to the two major extant canons of psychology: behaviourism, which is associated with conation, or impulse; and cognitivism, which is linked to cognition. Until recently neither branch of psychology dealt with affect in any great detail beyond basic acknowledgement that affect is a part of the mind, perhaps because emotion was considered a base, animal instinct where cognition was perceived as more evolved and human.

According to Zajonc, people share emotions with animals whereas, aside from very basic levels, cognition is purely human. The idea of baser emotions positively influencing advanced logic was anathema to many scholars. Boehner, de Paula, Dourish and Sengers hypothesise that one reason for the neglect of emotion in science is the perception of it as the opposite of cognition, which it is seen to lie beyond. As science views itself primarily as being logic-based, Boehner, de Paula, Dourish and Sengers argue that something that does not lie within the field of logic could not be studied. The belief that cognition was purely logical caused social psychology to co-opt the metaphor of computer processing into the cognitive process when psychologists, engineers, philosophers and mathematicians saw parallels between how computers and the brain work. According to one cognitive psychology textbook, cognitive psychology ‘is based on the idea that we are like a computer when processing information and have an input, storage and retrieval

function’.159 Such comments underscore why until the 1980s affect had not been emphasised in cognition.

2.2 Making affect quantitative

There were early attempts to bring logic and affect together. To bring emotion into the realm of science, scientists have sought to make it quantifiable and measurable. This quantification of affect both benefited and hindered the adoption of affect in cognitive psychology. Rather than look at emotion on its own subjective, affective terms, scientific enquiry has changed the notion of emotion to suit the limitations of scientific research. As Boehner, de Paula, Dourish and Sengers state, ‘emotion is not thought of as biological, measurable, and objectively present because scientists found it to exist in the world that way, but because 19th-century scientists could not imagine studying it scientifically any other way’.160 When science began studying emotion it did so on its own terms, viewing objective information as superior to subjective reflection and thus omitting a great deal of information about emotional interaction between people.161

According to Dror, physiologists did the earliest research into the quantification of emotions. Some noticed that the emotional state of animals they were studying had significant impact on the results of their experiments. They found that emotions—agitation or calmness—created measurable physiological responses in animals.162 This early scientific enquiry into how emotions create bodily responses set the scene for how science regarded emotions: measurable, physiological and animal. Somewhat ironically, this quantification makes emotion easier to measure than cognition since emotion influences multiple systems—verbal, facial expressions, physiological

160 Boehner, de Paula, Dourish, & Sengers, p. 277.
161 Boehner, de Paula, Dourish, & Sengers, p. 275.
response—all of which can be measured in some way. Cognition, on the other hand, with its storage, recall, tracing and representation, is comparatively hidden. Zajonc represents affect as more basic than cognition, arguing that there are an infinite number of different cognitions possible, whereas there are a relatively small number of different emotions. Zajonc states that there are accepted basic emotions, but no such basic cognitions. This drive for objectivity is now bringing affect to the fore in psychology. Measurement of neurochemical processes during emotion allow for greater empirical scrutiny of how people feel. However, although it can be said that emotion and reason are finally coming together, it is largely on reason’s terms. The move from subjective to objective measurements reveals an inherent problem in studying affect. Prior to the invention of objective measurements of emotions, the only way to record a person’s affective processes was for them to verbalise them, but this act requires the subject to reflect on the emotion to understand and verbalise it, shifting the action from affect to cognition and thus changing the nature of the responses being recorded.

2.3 Progress towards acceptance of affect

Despite the separation of cognition and affect in Western scholarly history, there is evidence that philosophers and scientists had some rudimentary concept that the two were linked. It is commonly thought that Descartes concentrated on reason to the exclusion of affect, but Zajonc claims that Descartes’s letters show that he had respect for the emotions, claiming that emotions could provide motivation where reason could not. Zajonc points out that although emotion and cognition have been divided since the time of Aristotle, some have questioned the separation of rationality and affect, concentrating on how logic can control emotions. The control of emotions by

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165 Buck, 2000, p. 31.
rational thought, called cognitive appraisal theory, perpetuates archaic notions where the untamed horses of emotion must be held in check by cool rationality.\(^{168}\) There is, however, truth in cognition strongly influencing affective responses. For example, if a person is hurt they become angry. However, if there is a justification to the pain, such as a medical procedure that will save the person’s life, then the pain does not lead to anger.\(^{169}\)

There is still much research left to do in understanding these responses and many conflicting theories of how and when emotions operate in regard to cognition. Investigations into the role of affect on cognition can help information designers harness affect as a tool for decision-making, or mitigate any harmful effects it may have on information processing. According to Damasio:

Knowing about the relevance of feelings in the processes of reason does not suggest that reason is less important than feelings, that it should take a backseat to them or that it should be less cultivated. On the contrary, taking stock of the pervasive role of feelings may give us a chance of enhancing their positive effects and reducing their potential harm.

Specifically, without diminishing the orienting value of normal feelings, one would want to protect reason from the weakness that abnormal feelings or the manipulation of normal feelings can introduce in the process of planning and deciding.\(^{170}\)

Zajonc argues that the study of emotions is immediately important to a diverse range of fields because human behaviour will never be fully understood without understanding the feelings that motivate them.\(^{171}\)

Information design shares cognitive psychology’s need to know more about the role of affect in information processing. If people are to understand

information and use it to make decisions then understanding how affective states may help or hinder these processes is vital.

2.4 The debate over the primacy of affect

There is continuing disagreement about how the processing of affect influences and compares to that of cognition. Zajonc accepts that theories of emotion are somewhat incoherent because they come from many different areas of psychology, thus having different goals and assumptions. In the early 1980s, Zajonc proposed that affect is processed before cognition. Lazarus countered, saying it was impossible to know which comes first because it is impossible to know how much affect is within a cognition or how much cognition is in any one affective state. Lazarus went on to contend that regardless of primacy the more interesting research was in the influence of cognition on affect. Lazarus and Zajonc conducted an ongoing philosophical argument over the nature and purpose of affect, with Lazarus labelling Zajonc a ‘neo-positivist’ and himself more of a constructivist.

The dispute between Lazarus and Zajonc on the primacy of affect or cognition has three fundamental planks: that cognition comes first, that affect sometimes comes first and that either argument can be true depending on the definition of cognition and affect used. Zajonc challenged the then widely held belief that affect follows cognition. He pointed out that experiments had shown that, ‘preferences, attitudes, impression formation, and decision making, as well as some clinical phenomena, suggest that affective judgments may be fairly independent of, and precede in time, the sorts of perceptual and cognitive operations commonly assumed to be the basis of these affective judgments’. His proposition conflicted with previous cognitive theories that

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175 Zajonc, 1980.
argued that cognition precedes affect, the premise of the previous theories being that before someone can like something they have to know something about it.\textsuperscript{177} Lazarus, by contrast, argued that cognition comes first, although Buck states that the difference of opinion results from differing definitions of the word ‘cognition’.\textsuperscript{178}

Zajonc defines cognition as requiring mental work. Lazarus sees it involving a primitive evaluative perception. Both thus agree that for affect to take place, the processing of sensory information is required although they disagree on the level of processing needed.\textsuperscript{179} LeDoux offers another solution. He and his colleagues, Iwata, Cicchetti and Reis, performed experiments on rats that involved creating lesions in the rats’ brains to disrupt emotional and behavioural responses. The results showed that there are two different channels in the brain that process sensory data, one processing behavioural responses and the other autonomic responses, with stimuli being sent quickly to the amygdala and more slowly to the neocortex.\textsuperscript{180} The amygdala creates a quick, instinctive, almost archetypal emotional response whereas the neocortex takes time to create an elaborate, intellectual reaction.\textsuperscript{181} If cognition is regarded as the slower process of representing an object in the brain then Zajonc is correct and affect comes first. However, if the initial appraisal is classified as cognitive then the faster message processed by the amygdala is a type of cognition, supporting Lazarus’s claim that cognition comes first. Since LeDoux’s findings, the argument over affective primacy has become less important than investigating the pathways and speed of the processes the brain uses to process information.

\textsuperscript{177} Zajonc, 1980, p. 151.
\textsuperscript{178} Buck, p. 43.
\textsuperscript{179} Buck, p. 43.
Regardless of whether affect or cognition comes first in mental processing, there is now wide acceptance that the two processes influence each other. Thoughts don’t just influence feelings, according to Zajonc thoughts enter feelings with him arguing that, ‘In nearly all cases … feeling is not free of thought, nor is thought free of feelings.’\footnote{Zajonc, 1980, p. 154.} Zajonc accepts that although his and Le Doux’s experiments show that affect can occur without cognitive input, cognition plays a major role in the creation of emotional episodes.\footnote{Zajonc, 1998, p. 607.} Lazarus argues that the most interesting investigations question what kinds of cognition can create affective responses.\footnote{Lazarus, p. 126.} Zajonc cites an experiment by Carroll and Russell where the context of a story caused subjects to misread the facial expressions of people in photographs.\footnote{Zajonc, 1998, p. 607.} Lazarus argues that the types of affective response that precede cognition are limited compared to emotions that are directly linked to cognition, such as anger, guilt, disappointment, relief and love.\footnote{Lazarus, p. 126.} He considers these types of emotions to be significant because they ‘arise from our changing functional relationships with the world.’\footnote{Lazarus, p. 126.}

### 2.5 Affect as information

Affect influences cognition as information in its own right and as a part of information processing. In 1983, Schwarz and Clore argued that subjective experiences are sources of information, a view consistent with phenomenological approaches to human experience.\footnote{N Schwarz and G L Clore, ‘Mood as Information: 20 years later’, \textit{Psychological Inquiry}, vol. 14, no. 3 & 4, 2003, p. 299.} This idea of feelings as information was controversial, specifically in terms of whether affect itself forms information or whether it is informative by providing a context for information processing. Like many debates in this area, the question of whether affect is information or a part of context depends on the

\begin{footnotesize}
\begin{itemize}
  \item Zajonc, 1980, p. 154.
  \item Zajonc, 1998, p. 607.
  \item Lazarus, p. 126.
  \item Zajonc, 1998, p. 607.
  \item Lazarus, p. 126.
  \item Lazarus, p. 126.
\end{itemize}
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terminology and criteria, in this case the criterion of judgment.189 In Human-
Computer Interaction (HCI), Boehner, de Paula, Dourish and Sengers take a
different approach, seeing emotion as a type of information processing
similar to cognition.190 They argue that emotion fits within the same
information processing frame as cognition, operating within the context of
cognitive behaviour.191

Both views are valid from an information design viewpoint and I will deal
with Schwarz and Clore’s affect-as-information hypothesis first. The affect-
as-information hypothesis holds that that ‘affective feelings influence judg-
ments when they are experienced as reactions to what is being judged.’192 The
information from affect is provided in feelings instead of words.193 These
feelings influence whatever is happening in the mind at that time. Clore, Wyer
Jr, Dienes, Gasper, Gohm and Isbell use the example of doing a task. If the
person has a feeling of happiness while doing it, they may think the task is
fun. If they are task focused, they may think they are very good at the task. If
they are self-focussed they may think they are good at the task. If they are
strategy-focussed they may think their approach to the task is good.194
Petzold’s study backs up the affect-as-information hypothesis, finding that
mood is a direct source of information to be incorporated into judgement with
other available information. In Petzold’s study, affect is not just a cue or
prime for processing other forms of information.195

Schwarz and Clore, reflecting on their theory of affect-as-information twenty
years after its publication, argue that their theories were ‘compatible with
phenomenological approaches’, though they were described in ‘nonphenom-

189 Schwarz & Clore, p. 299.
190 Boehner, de Paula, Dourish, & Sengers, p. 278.
191 Boehner, de Paula, Dourish, & Sengers, p. 275.
192 Clore et al., p. 29.
193 Clore et al., p. 29.
194 Clore et al., p. 29.
195 A Abele and P Petzold. ‘How Does Mood Operate in an Impression Formation Task? An
information integration approach’, European Journal of Social Psychology, vol. 24, no. 1,
enological terms’. However, Schwarz and Clore overlooked current experience in favour of cognitive representations of that experience, or reflective experience. I discuss the difference between these types of experience and their role in information design in Chapter 3.

2.6 Affect as interpretation
Affect plays a role in the interpretation of information, where affect comes directly into the realm of cognition. The moment affect is reflected on, analysed and reported it becomes part of cognition. Emotions and their physical expression are universal, but cognitive processes and languages are largely dependent on culture. Ortony, Clore and Collins state that, ‘cognitions are responsible for emotions, emotions being a result of how we interpret our experiences’. Here they specifically address emotions as opposed to the other affective states of moods and feelings. Emotions cross the divide between cognition and affect. Interpretation moves the processing of emotional information from purely affective into cognitive since the stimulus must be perceived, appraised and processed before a culturally appropriate response can arise.

Boehner, de Paula, Dourish and Sengers argue that emotion, as opposed to feeling or mood, is culturally created. Culturally grounded sets of meanings inspire and interpret emotion. Culture determines when anger is an appropriate response to a situation. This approach does not deny the physiological basis of emotion, as emotions are reflected in bodily systems, but argues that the manifestations of emotions are cultural constructs. The

196 Schwarz & Clore, p. 297.
197 Schwarz & Clore, p. 297.
200 Boehner, de Paula, Dourish, & Sengers, p. 280.
201 Boehner, de Paula, Dourish, & Sengers, p. 275.
202 Boehner, de Paula, Dourish, & Sengers, p. 279.
203 Boehner, de Paula, Dourish, & Sengers, p. 280.
204 Boehner, de Paula, Dourish, & Sengers, p. 280.
role of affect as interpretation is not just dependent on culture, but can also depend on the individual. The separation of cultural interpretation and individual interpretation in regards to affect is based on loose and constantly shifting boundaries, with Boehner, de Paula, Dourish and Sengers arguing that the individual and their surrounding culture are mutually constructive. When affect is part of a cultural interpretation, cognition influences the generation of affect.

Some argue that emotion can exist outside of a cultural context. Lazarus sees that in many instances, the cognitive impact of emotion occurs when the initial arousal has impact on an individual’s wellbeing. Entering a hot room creates a different set of emotions depending on whether the individual was already uncomfortably hot or if they were uncomfortably cold, for instance. This interpretation of the ramifications of the environmental change is not cultural, but an interpretation based on bodily needs. However, individual interpretation does not have to be physical. According to Lazarus, affect can be interpreted by an individual in respect to their goals, with the goal acting as the context in which the individual interprets their emotion. Relevance is another way an individual interprets information; Schwarz hypothesises that the impact of the affective state on a decision depends on whether the source of that state is relevant or irrelevant to the evaluation at hand. Affective interpretations are in a constant state of flux. According to Lazarus, emotion ‘extends from this relationship and constantly changes the relationship, causing the emotion to be challenged again in a never-ending cycle’. This is similar to how phenomenological psychologists picture the constantly shifting nature of an individual’s interpretations of the world, which I address in Chapter 3.

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205 Boehner, de Paula, Dourish, & Sengers, p. 280.
206 Boehner, de Paula, Dourish, & Sengers, p. 280.
207 Lazarus, p. 124.
208 Lazarus, p. 124.
209 Schwarz, p. 530.
210 Lazarus, p. 124.
With their background in HCI, Boehner, de Paula, Dourish and Sengers differ from Schwarz and Clore in regarding emotions as interactions, attributing two roles to emotions: transmission and interpretation. If an emotion read is the same as the originating emotion, they consider it has been successfully transmitted.\textsuperscript{211} They distinguish between emotion-as-interaction, where the recipient has a role to play in creating the emotion, and emotion-as-information, where the recipient interprets it.\textsuperscript{212} Information design requires interpretation on the part of the recipient. Consideration of the various roles emotions play in the interpretation of information may assist in the delivery of information design that appeals to particular cultural constructs or individual goals.

### 2.7 The impact of affect on information design

Affect influences how people react to the environment and to designs of all types. Zajonc cites Ittelson in supporting the idea that the first reaction to an environment is affective.\textsuperscript{213} Zajonc explains, “We do not just see “a house”: we see “a hand-some house,” “an ugly house,” or “a pretentious house.”\textsuperscript{214} These affective reactions may be subconscious, Shedroff pointing out that audiences can be emotionally affected by a design on many levels without consciously knowing why.\textsuperscript{215} Such affective reactions are a form of information to be processed, or may assist in the information processing, depending on their nature. This is as important to information design as it is to other areas of design. Zajonc claims that ‘emotion-producing products have a bigger market share than information-producing products’.\textsuperscript{216} The reason he gives for this is that worth is based on value, information is only worth something if the individual values it and ‘value judgments are affective’.\textsuperscript{217}

\begin{footnotesize}
\textsuperscript{211} Boehner, de Paula, Dourish, & Sengers, p. 287.
\textsuperscript{212} Boehner, de Paula, Dourish, & Sengers, p. 288.
\textsuperscript{213} Zajonc, 1980, p. 155.
\textsuperscript{214} Zajonc, 1980, p. 153.
\textsuperscript{215} Shedroff, p. 74.
\textsuperscript{216} Zajonc, 1998, p. 593.
\textsuperscript{217} Zajonc, 1998, p. 593.
\end{footnotesize}
This argument coming from the field of cognitive psychology demonstrates why affect is important in creating information design of any worth.

Many recent publications in cognitive psychology explain the important influence of affect on cognition, which the field of information design should take heed of. Affect impacts on information design in respect of information recall, evaluation and interpretation, problem solving and decision-making. Several authors in cognitive psychology point out that affect-related information is easier for an individual to access.218 Affect can influence memory in many ways. For instance, if an individual creates a memory at a time of strong emotion, they will remember central details more strongly and be weaker in their memory of background details.219 There are three general ways that affective states influence memory: the affective state contained in the memory itself, the affective state the person was in at the time of encoding and the affective state they were in at the time of retrieval. Each is independently significant, and they also work together to form new relationships between emotion and memory.220 Memories that contain affective states similar to the individual’s at the time of encoding, or at the time of remembering, are easier to recall.221

Affect plays a vital role in evaluation and interpretation. According to Zajonc, people are constantly evaluating while they process information.222 The individual evaluates information to determine how useful or important it is to them and how they can best interpret the information for their own purposes. Each of these judgments is affect-driven. Affective states can even influence the type of problem solving a person employs. A negative affective state is

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220 Parrott & Spackman, p. 478.
221 Parrott & Spackman, pp. 479–480.
more likely to cause arduous, detailed analytical strategies whereas positive states would prompt less strenuous strategies. Understanding likely affective states, or deliberately inducing them, might predict the type of problem solving strategies that the individual will use when encountering information design.

As already discussed, Tufte argues that correct information design can be evidenced by correct decision-making based on that design. According to Damasio, affect is an important factor in evaluating information to make decisions. Being able to evaluate information according to bodily needs and personal goals provides motivation in decision-making. Damasio gives the example of a patient rendered effectively emotionless by ventromedial prefrontal damage. Asked to choose one of two dates for a subsequent appointment, the patient agonised over the arguments for and against each date—if he had prior commitments, if the date was too close to other commitments, possible problems with the weather—rationalising for nearly half an hour in a detailed cost-benefit analysis which date would be better. Damasio noted, ‘It took enormous discipline to listen to all of this without pounding on the table and telling him to stop.’ The patient used reason meticulously, but lacked the emotion to gauge that the decision was relatively unimportant, that others were being frustrated by his dithering and that he should be embarrassed at being observed undergoing this tiresome ritual.

Affect helps build patterns of information and enables individuals to act on those patterns. Damasio reports on experiments in which people play a game turning cards, winning or losing depending on the value of the card that was turned. When connected to a skin-conductance machine both frontally dam-

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225 Damasio, pp. 191–196.
226 Damasio, p. 193.
227 Damasio, pp. 192–194.
aged patients and normal subjects would show affective responses to winning or losing, however over time the normal subjects would anticipate the card showing an affective response based on the expectation of a bad card appearing. Frontally damaged patients showed no such ability to predict future negative outcomes. Hence, affective responses can be predictive and not just based on information available at the moment.

**Concluding remarks**

Since the early 1980s, cognitive psychology has been slowly developing an understanding of how affect influences cognition with research into affect now growing considerably. Affect plays an important role in information processing, influencing how people form memories, how they access those memories, how they evaluate information and how they make decisions. Awareness of this new knowledge is just beginning to filter through to information design, with a few studies considering the influence of mood on information processing.

Information design can incorporate the cognitive psychological approach to affect in a number of ways. Information designers can view affect as a type of information that viewers incorporate with other information to gain knowledge. Adding affective information to a design could help viewers come to appropriate decisions based on the design. Affect could also be viewed as a type of information processing, influencing how a viewer interprets a design. An awareness of how affect influences information processing will help designers think about their designs more holistically, considering the affective state of the person at the time they view the design.

228 Damasio, pp. 220–221.
To incorporate issues of affect into information design this thesis examines the holistic and natural ways in which people process information and emotion in Chapter 3, drawing again on the knowledge from the discipline of psychology in the form of phenomenological psychology.
Chapter 3
Phenomenological psychology and the experience of information

Where information design neglects the affective dimensions of the experience of designed artefacts, experience design embraces affect as being integral to their experience. Where information design still focuses on two dimensional representations of information produced as printed matter, experience design embraces new media and the evolution of information into forms including interactive visualisations, linear video narratives, multimedia presentations and physical and virtual environments. The consideration of new media in experience design is so profuse that experience design is sometimes seen as only comprising digital media and no other areas.229

The flood of digital media products on the market makes new media experiences ubiquitous in society, changing the nature of human experience.230 In saturating the market with interactive technology, corporations seek to use experience design to gain a competitive edge over one another.231 Companies such as Apple, IBM and Microsoft all engage in the dialogue of experience.232 The surge of commercial interest in experience design means that the needs of technology and business often outweigh research into experience design.233 However, these commercial factors have been beneficial in fuelling interest in the role of affect in human experience. Today, there is wide recognition that feelings are as important as actions in a design experience. In business, there is growing awareness that emotional experiences are as relevant as practical

229 Shedroff, p. 2.
231 McClelland, p. 1096.
needs to consumers. Consumers are seen as the ‘emotional-volitional’ element of the market and any consideration of the customer requires reflection on their affective responses. Commercial interests both drive and restrict affective investigations into experience with much of the research addressing only positive emotions, since pleasurable emotions are linked with customer loyalty and spending, with little attention being paid to negative affective responses to designs.

In 1932, John Dewey sparked broad interest in emotion by arguing in his book *Art as Experience* that the aesthetic quality that completes an experience is emotional. More recently, emotion has come to occupy the forefront of experience design research. In 1999, Khaslavsky and Shedroff highlighted the emotional factors in seductive experiences. Norman’s 2004 book *Emotional Design* focuses entirely on the importance of emotion in people’s mental and physical interaction with designed objects. Experience design acknowledges that experiences are inherently emotional and that emotions form a necessary part of human-to-human communication. Forlizzi and Battarbee argue that design may create a product, but emotion forms the link

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235 McCarthy & Wright, p. 11.
between the product and those who use it, determining their expectations, actions and evaluations. 242

The affective and informative elements of a design provide the link between experience design and information design. Physical interaction between a person and a product in a design experience provides information about the product, while emotional interaction informs the experiential relationship. 243 This view, however, presents product information and affect as separate elements of the design experience, not considering that emotion is also informative. Although affect is a central concern of experience design research, it is studied in only two ways: as a by-product of the design experience, or as an emotional state that occurs before and influences the experience with the design. 244 In including affect as a type of information in information design, a third view is possible, where affect and the designed experience form a virtuous circle. The information from the design creates an affective response in a person, which in turn provides further information to the person about the design.

3.1 The history and nature of experience design

Experience design is difficult to define, with amorphous boundaries and no unified body of knowledge. The discussion of the role of experience in design extends across varied fields, including HCI and product design, bringing diverse knowledge, skills and approaches to the area. However, this disparity results in divergent terminologies and viewpoints that confuse many of the key issues in experience design. I use the term experience design as a synonym for the discipline-specific terms that appear across the composite areas. The fields of HCI and interaction design prefer the term User-

242 Forlizzi & Battarbee, p. 263; Wensveen, Overbeeke, Djajadiningrat & Kyffin, p. 60.
243 Wensveen, Overbeeke, Djajadiningrat & Kyffin, p. 60.
Experience (UX) to describe experience design. The term User-Experience reflects the recent shift of attention in design from product to user in design research. However, the term assumes a relationship between a person and the design that may not exist.

People populate the world, not users. The word ‘user’ implies that there is something to be used. In focusing attention on designed object and away from the person, this suggests that the act of using a design is what defines people. The word ‘use’ suggests a specific set of actions and responses, which was adequate for older technology such as word processing programs where actions were limited, but is insufficient for ambient or immersive technologies. Battarbee and Koskinen argue that the term user-experience is very broad and applied in very different ways with no single theoretical definition. The term product-experience promotes products over people. McCarthy and Wright argue that the term experience design places the agency of the experience in the hands of HCI designers rather than the people experiencing the design. In this thesis, I use the term experience design in a phenomenological sense on the basis that it does not assign roles of object and subject to designs or people, unlike the terms product-experience or user-experience. Rather, experience design focuses attention on the holistic experience of a design, involving people, designed objects, environments and context.

It is a challenge to define the boundaries, purpose and nature of experience design. Experience is all-encompassing, which McCarthy and Wright argue
stops anyone from standing outside it to define what it is and what it is not.\textsuperscript{251} When authors try to narrow down what experience is, it is often along disciplinary lines that may not be applicable to all types of designs. Alben, writing from an HCI perspective, describes experience as ‘all the aspects of how people use an interactive product’.\textsuperscript{252} Hekkert and Schifferstein define product experience as ‘the research area that develops an understanding of people’s subjective experiences that result from interacting with products’.\textsuperscript{253} Definitions are restricted to product designs that have a utilitarian purpose, excluding artistic objects that exist purely for their aesthetic or emotional impact.\textsuperscript{254} Rather than merge various discipline-specific concepts of experience design, I address experience design as an approach where the end goal is an experience.

HCI and its sub-area of interaction design currently support the bulk of the writings on experience design.\textsuperscript{255} At first, HCI concentrated on action and cognition with emotion being a more recent topic of investigation.\textsuperscript{256} In HCI, experience design emerged as a countermovement to the usability design movement, which focused on actions and tasks rather than emotions and relationships.\textsuperscript{257} Initially, HCI writers saw experience as a fuzzy concept, neglecting consideration of the user’s experience.\textsuperscript{258} Now HCI researchers investigate emotional responses to interactive design with the rigour previously shown in response to usability or learning.\textsuperscript{259}

Despite the experience design literature’s gravitation towards HCI, the area of experience design is multidisciplinary in its history and practice. The

\begin{thebibliography}{9}
\bibitem{251} McCarthy & Wright, p. 15.
\bibitem{252} Alben, p. 12.
\bibitem{254} Hekkert & Schifferstein, p. 1.
\bibitem{256} McCarthy & Wright, pp. 5, 9; Wensveen, Overbeeke, Djaadjaringrat & Kyffin, p. 60.
\bibitem{257} Hassenzahl & Tractinsky, p. 91.
\bibitem{258} McCarthy & Wright, p. 1.
\bibitem{259} Blythe, Hassenzahl & Wright, p. 37.
\end{thebibliography}
emergent field of experience design research combines knowledge from diverse areas, including artificial intelligence, communications, economics, e-commerce, psychology, sociology, theatre and virtual reality. However, these contributing areas are recent additions to the history of experience design, which McLellan argues extends back to the first human rituals. Experience has been studied for many years by non-design fields such as anthropology, business, cognitive science, drama, philosophy, psychology and social science, which have long histories of interest in human experience. Experience design absorbs this wealth of ideas and knowledge from other fields into its theoretical foundation. The blending of many non-design viewpoints benefits experience design in allowing designers to consider experience from new perspectives that challenge design assumptions, but such diversity often serves to confuse rather than clarify, fragmenting rather than unifying the understanding of experience design. Forlizzi and Battarbee recommend understanding how different theories relate to one another, rather than adding to the diversity. In this thesis, I extend phenomenology, an existing theoretical foundation of experience design in order to examine the role of experience in information processing. This chapter uses phenomenological psychology to respond to issues raised in both information and experience design, exploring how experience can serve as information and information can serve as experience.

Embracing the broad history of experience design admits theories of experience that do not focus on computers. Although HCI has informed and driven recent interest in experience design, the ubiquity of digital data in people’s lives means, somewhat ironically, that technology is no longer the central focus of a new media experience. Technology is disappearing from people’s conscious awareness to become extensions of people, the environment and the

261 McLellan, p. 59.
262 Forlizzi & Battarbee, p. 262; McCarthy & Wright, p. 51; Jordan, p. 7; McLellan, pp. 63–64.
263 Forlizzi & Battarbee, p. 261.
experience. \cite{streitz2005}

There is now a concept of ‘cyborg-intentionality’ where human experience is mediated through information and communication technology. \cite{selinger2008}

Like the humming of an air-conditioner, new media technologies have become the background to other experiences, or mediators of experience, like eyeglasses. \cite{verbeek2008}

Investigating other aspects of people’s experiences, such as people, their environments, culture, context, emotion, cognition and the relationships that these elements form with one another provides a more holistic view of the new media experience. Phenomenological psychology addresses how these elements allow people to gain information from experience, recommending it for this study.

### 3.2 Phenomenological psychology and informational experience

A number of writers in experience design look to phenomenology to understand how people experience the world. Phenomenology as a philosophy was first developed by Edmund Husserl around the year 1900. \cite{langdridge2007}

Cupchik and Hilscher see phenomenology as offering holistic perspectives that account for people’s relationships with design artefacts. \cite{cupchik2008}

According to Robertson, phenomenology reveals the nature of the construction of meaning in a shared world of objects and people, potentially providing a theoretical foundation for technology designers who want to empower users. \cite{robertson2002}

Winograd and Flores incorporate Heidegger’s philosophical phenomenology as a basis for their

\begin{flushleft}
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\cite{streitz2005}
\cite{selinger2008}
\cite{verbeek2008}
\cite{langdridge2007}
\cite{cupchik2008}
\cite{robertson2002}
\end{flushleft}
exploration of how people experience computers, using phenomenology as a counterpoint to the pervasive rationalist approach previously applied in HCI.\textsuperscript{270}

Phenomenological psychology examines how people make meanings from their experiences. It provides critical knowledge to experience and information design. For information design, phenomenological psychology highlights how information is no longer just on the page, but surrounds people in all of their experiences. In the context of experience design, phenomenological psychology addresses the holistic relationships between elements of experience. The phenomenologist Seamon states:

Any object, event, situation or experience that a person can see, hear, touch, smell, taste, feel, intuit, know, understand, or live through is a legitimate topic for phenomenological investigation. There can be a phenomenology of light, of color, of architecture, of landscape, of place, of home, of travel, of seeing, of learning, of blindness, of jealousy, of change, of relationship, of friendship, of power, of economy, of sociability, and so forth.\textsuperscript{271}

Design artefacts rely on the senses that Seamon describes, being seen, touched, smelled, heard and tasted. They invite people to feel them, understand them, interact with them and experience them. The experiential and sensorial nature of design recommends a phenomenology of design.

Phenomenology spans phenomenological psychology and phenomenological philosophy. The two sub-areas share terminologies and key concepts. Historically, they are deeply intertwined, but intrinsically different. Phenomenology


is a philosophy and psychology is a natural science.\textsuperscript{272} The difference between phenomenological psychology and phenomenological philosophy rests in their aims. Phenomenological philosophy seeks to define pure consciousness and expose transcendental subjectivity; phenomenological psychology uses empirical approaches to understand the intention in lived experience.\textsuperscript{273} Phenomenological psychology investigates the variables of experience and their function in perception and interpretation, whereas Husserl’s original philosophical role for it was stripping away the variables of human experience to understand the essence of the phenomenon.\textsuperscript{274}

Phenomenological psychology is more interested in how people create meaning from experiences than in questioning the underlying nature of the phenomena of the experience. The empirical approaches of phenomenological psychology and its focus on meaning-making rather than the mechanics of consciousness and the world, make it an appropriate approach for experience design investigations. Although it may expand design philosophy to philosophically question the essence of a design, the philosophical nature of designed objects lies outside the scope of this thesis. Understanding how people make meaning out of their experience of a designed artefact and using that knowledge in the design process to create a holistic informational experience is the key challenge in designing the experience of information.

Phenomenological psychology illuminates the practice of experience design in addressing perception and understanding in the context of lived experience. It concentrates on how people arrive at unique interpretations of the world to better understand which interpretations people share, which are biological in


\textsuperscript{274} Spinelli, p. 19; Seamon, 2000, p. 159.
derivation and which are culturally derived. Phenomenological psychology approaches the meaning-making process of experiences as relational, where the self, things, the world, perceptions, interpretations, cultural meaning, species meaning and individual meaning all have a role to play. It examines the relationship between external reality and the subjective thoughts people have about it. Dating to the early 20th century, the literature of phenomenological psychology provides insight into many of the questions raised in the experience design literature. These questions include whether experiences are objective or subjective, how meaning is built over repeated experiences of a phenomenon, how the relationship between things builds meaning and the role that sensations play in experience. A range of other fields use aspects of phenomenological psychology, which has many distinct viewpoints that researchers and practitioners can draw on. Empirical evidence from phenomenological psychology provides perspectives on the nature of individual experience to inform the design process.

There is debate over how phenomenology can best be applied to cross-disciplinary investigations. For Spinelli, phenomenological psychology is an approach rather than a school of thought or a set of rules and can be applied across disciplines. Some authors within phenomenology argue that widening the scope of phenomenology benefits other disciplines and phenomenology. Halling, for instance, argues that it is important to make phenomenology more accessible to boosts its theoretical usefulness to other disciplines.

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275 Spinelli, p. 4.
276 Spinelli, p. 31.
278 Spinelli, p. 7.
3.3 Interpreting experiences through their phenomena

Phenomenological psychology argues that the experienced world is made up of phenomena and that people experience the world as it presents itself to them. These presentations are called phenomena.280 People do not encounter the underlying reality of a chair. They know the chair through how the chair looks, smells, feels and the chair’s relationships with other objects in the world. Phenomena provide information to the individual about the environment around them. According to Rowlands, this information is ubiquitous. All phenomena carry some form of information about themselves and their relationships with the world.281

The human mind constructs meaning by reaching out to the world and perceiving and interpreting these phenomena. The meanings people create are not arbitrary, they are conversations between the object and the person.282 In phenomenology, this act of reaching out to create meaning is known as intentionality.283 The active nature of intentionality answers issues in experience design about whether a person can experience a design passively or not. McLellan argues that participation can range from passive to active, but McCarthy and Wright take the view that the user’s participation is always active as they ‘complete the experience for themselves’.284 People’s active

281 M Rowlands. ‘Understanding the ‘Active’ in ‘Enactive’’, *Phenomenology and the Cognitive Sciences*, vol. 6, no. 4, 2007, p. 428.
284 McLellan, p. 61; McCarthy & Wright, p. 11.
participation in creating their own experience through interpretation and meaning-making blurs the line between experience designer and end-user.285

Intentionality is dual-directional. The human mind reaches out from the person and the phenomena reach out from the object, meaning being created in between them. This concept of dual-directional intentionality gives further insight into discussions in experience design about whether an object’s meaning dwells solely in people’s minds.286 In the area of product design, Hekkert and Leder argue that some of the meanings of a product exist in the person’s mind and not in the product itself, with familiarity, novelty and strangeness being qualities assigned by the audience.287 Other meanings dwell in the object. The phenomenologist Fuller states, the ‘roseness of a rose’ is contained in the rose itself. Its colour, its smell, its feel are all qualities of the phenomena projected, not constructs of the mind. A rose does not acquire its ‘roseness’ through interpretation.288 Designers can control the qualities of a designed artefact and partly influence the exchange between the person and the artefact, but the mind of those who perceive it filters what designers put into a design. Phenomenological psychology offers designers the potential for developing a greater understanding of the person-based side of interpretation, suggesting the potential variables a design might encounter.

Intentionality and interpretation of phenomena form a relationship between the object and the person. The act of creating meaning removes an object from its own contextual history and adds it to the person’s contextual history, creating a relationship between the object and the person.289 Relationships between a person and an object, the object and other objects, and the object,

285 Fiore, Wright & Edwards, p. 130.
288 Fuller, pp. 127–128.
289 Fiore, Wright & Edwards, p. 130.
the person and the world create meaning through phenomena, interpretations and intentionality.\textsuperscript{290} These relationships blur the roles of subject and object, since people reach out to phenomena to understand them and phenomena reach out to communicate about their object, suggesting their roles should be approached holistically.\textsuperscript{291} This reflects an argument in experience design, that all aspects of an experience form relationships as they interact and modify each other to form the holistic experience.\textsuperscript{292} These aspects can include characteristics of a design, a person’s internal state, expectations, moods and needs, and the environment in which the experience takes place.\textsuperscript{293} The relationship between a person and a design assists in creating meaning, with the experience designer Shedroff stating, ‘It’s important to design experiences so that audiences or participants can find meaning in them by making connections to their own lives and values’.\textsuperscript{294} These relationships between elements can be designed around a theme, assisting the organisation of data and creating narrative impact.\textsuperscript{295}

3.4 Affect as a form of meaning-making

Phenomenological psychology’s concept of intentionality assists designers in approaching affect. In phenomenological psychology, affect is a form of intentionality, reaching out to make sense of the world and creating meaning between objects, people and the world in general.\textsuperscript{296} Affective meanings alter a person’s self and their worldview.\textsuperscript{297} The act of reaching out with affect blurs the lines between feeling, mood and emotion as defined in cognitive psychology. Cognitive psychology regards mood as an affective state with no

\textsuperscript{290} Fuller, p. 29.
\textsuperscript{291} Giorgi, 1997, p. 237.
\textsuperscript{292} Hassenzahl & Tractinsky, p. 94.
\textsuperscript{293} Hassenzahl & Tractinsky, p. 95.
\textsuperscript{294} Shedroff, p. 122.
\textsuperscript{295} McLellan, p. 62.
\textsuperscript{297} Fuller, p. 175.
focus; in phenomenological psychology the very act of reaching out in
intentionality means something has to be the focus.298 According to phenom-
enological psychology, the focus of an affective state can be the person’s
own body, an object or the world in general.299 There is limited mention of
affect as a meaning-making act in experience design. In his book Experience
Design 1, Shedroff comments that meaning is often built from emotional
experiences.300 This is countered by arguments that experiences are not
purely affective, cognition playing a large part in their processing. Gupta and
Vajic argue that experience is ‘socially produced’ and ‘context specific’,
making it cognitive.301 Hekkert and Schifferstein see it as debatable whether
the psychological effects of experience are always affective.302 The inten-
tionality of affect suggests the scope to design for affect. As a sense-making
act, affect can be thought of as a conversation between a person and the
world. Since the purpose of information design is to design sense-making
material, a phenomenological approach demands that the parameters of
information design encompass affective responses.

The intentionality of affect provides insight into a key question in the experi-
ence design literature; whether affect is wholly subjective in nature. One view
is that the emotions arising from experience are not purely subjective because
they cannot be totally separated from a design and the context in which it is
being experienced.303 The complementary view in experience design is that
emotions are the result of many situational variables that HCI and product des-
designers cannot control. This combination of factors makes the whole of each

298 Battarbee & Koskinen, p. 12; P Goldie. ‘Emotions, Feelings and Intentionality’,
299 Goldie, p. 235.
300 Shedroff, p. 122.
301 S Gupta and M Vajic. ‘The Contextual and Dialectical Nature of Experiences’, In New
Service Development: Creating memorable experiences, J A Fitzsimmons and
302 Hekkert & Schifferstein, p. 2.
303 McCarthy & Wright, p. 15.
emotion unique and thereby subjective, suggesting that designers can only design the context for the emotion rather than the emotion itself.304

Affect in experience design is not entirely subjective, but not wholly objective either. There is recognition that some emotions are biologically programmed, such as the fear caused by the picture of a spider or snake, making such emotions almost universal and hence objective.305 An emotional response to a flag or the image of a swastika, by contrast, is culturally programmed, objective in that the feeling may be shared across a culture, but subjective in that it may not be shared by people from other cultures.306 The intentionality of affect supports arguments that affect is not totally subjective, but some of this debate depends on the definition of subjectivity. Some define subjectivity as active self-determination using knowledge about the self to create an identity, making emotions appear to be subjective attitudes.307 However, if affect is viewed as an evaluation of the phenomena of the world, judging the phenomena on their inherent characteristics and relationships, then the act is based on objective criteria.308 This sense-making relationship that affect makes with the objective world means that it cannot be totally subjective.309 For instance, Cabestan argues that loving someone is an interpretation of lovability in that person, which motivates the person in love to behave in a certain way.310 However, love may not be an evaluation of the other person's lovable qualities, but a feeling of love could be an interpretation of a physical response, the explanation itself giving cause to make the individual believe they are in love.311

304 Hassenzahl & Tractinsky, p. 94.
306 Blythe, p. 41.
310 Cabestan, p. 84.
Context appears to determine where the affective state sits on the continuum from somewhat-subjective to somewhat-objective.

In phenomenological psychology, the line between affect and cognition is unclear. McLaren argues that the act of intentionality makes affect cognitive, because the emotions are consciously directed at something.\textsuperscript{312} He depicts emotions as judgemental, based on character, commitments, interests, aspirations, needs and beliefs, affording emotions a goal, purpose and logic.\textsuperscript{313} Sometimes, however, affect is split from cognition, such as when someone cannot explain what emotion they are feeling, or when people hold one view intellectually, but have strong opposing feelings when confronted with its implications.\textsuperscript{314} Harrist argues that conflicting emotions, rather than indicating a lack of logic, are an important part of human experience.\textsuperscript{315} Some affective states are not conscious, however, having purely biological origins that leave a person not knowing why they are subject to particular emotions.\textsuperscript{316} In cases where feelings are not conscious, they are not considered intentional.\textsuperscript{317} Conflicting and non-intentional affective states challenge experience designers, as they do not arise from the person reaching out to the design to make sense of it.

3.5 The subjectivity of a designed experience

Experience design puts forward many arguments that experiences are subjective. Experience resides in the mind of the people having the experience, making it difficult to design.\textsuperscript{318} Experience is based on gender, age, expertise and background, qualities that vary from person to person, meaning

\begin{itemize}
\item[\textsuperscript{312}] McLaren, p. 2.
\item[\textsuperscript{313}] McLaren, p. 3.
\item[\textsuperscript{314}] McLaren, pp. 4–5.
\item[\textsuperscript{316}] Colombetti, p. 534–535.
\item[\textsuperscript{317}] Cabestan, p. 81.
\end{itemize}
that no two experiences are alike.\textsuperscript{319} To believe that experience can be completely designed ignores the agency of people.\textsuperscript{320} Experiences don’t arrive at the user ready-made, they require input from the individual and that input is based on past experience, personal disposition and expectations.\textsuperscript{321} Experiences depend on personal goals and emotions that differ between people.\textsuperscript{322}

Within experience design, there is acknowledgement that some aspects of experience are less subjective. Culture can determine how people interpret a scene.\textsuperscript{323} Hekkert and Leder argue that human evolution explains many of the similarities in aesthetics between cultures.\textsuperscript{324} Although there are similarities between aesthetic values, perceived novelty, typicality and people’s exposure to different objects means that universal principles do not necessarily lead to universal agreement on aesthetics.\textsuperscript{325}

According to phenomenological psychology, experience is not completely subjective. The phenomena of the world are presentations of their underlying objective reality, providing an objective shared basis for interpretation.\textsuperscript{326} Experience is a blend of objective reality and thought. Thought is not purely subjective either, since a great deal of interpretation is built on species shared or culturally primed information.\textsuperscript{327} Species shared interpretations reflect human biological mechanisms that make people perceive the world in similar ways. It is why people understand the unknown material stimuli of the world as things and see them as wholes rather than as their composite parts.\textsuperscript{328}

\begin{footnotes}
\footnotetext[319]{Hekkert & Schifferstein, p. 7.}
\footnotetext[320]{McCarthy & Wright, pp. 9–10.}
\footnotetext[321]{McCarthy & Wright, p. 105.}
\footnotetext[322]{Khaslavsy & Shredorff, p. 46.}
\footnotetext[323]{Hekkert & Leder, p. 278.}
\footnotetext[324]{Hekkert & Leder, p. 273.}
\footnotetext[325]{Hekkert & Leder, p. 277.}
\footnotetext[327]{Spinelli, p. 41.}
\footnotetext[328]{Spinelli, pp. 31, 41.}
\end{footnotes}
Culturally primed interpretations come about because a person does not live in isolation, they build meanings with other people over time to arrive at common understandings of phenomena.\(^{329}\) For instance, space takes on different meanings in different cultures. Only the West and Japan have a Cartesian view of space. In western culture, space is the measurable void between objects. In Indian culture, space includes the substances of ritual space, mental space, physical space and consciousness.\(^{330}\) These shared social and cultural influences provide people with mental frameworks, or schemata, to set boundaries around experience.\(^{331}\) Interpretations of phenomena are not completely objective as different cultures potentially have different views of the same phenomena, but they are not completely subjective either since groups of people form collective agreements about them. Although objectivity may underlie a great deal of experience, there are sufficient unique variables to ensure that no two experiences are identical. When analysed holistically, each experience is fundamentally singular.\(^{332}\) Although this means that experience designers cannot create identical experiences, by understanding species and culturally shared invariants of experience, overall meaning can be consistent.

### 3.6 The different types of experience

Much of the experience design literature divides experience into everyday and special experiences.\(^{333}\) Dewey uses the terms ‘experience’ and ‘an experience’ to differentiate between these two types of experience, experience being the continuous interaction of a person with their surroundings and an experience being a self-contained, satisfactorily finished experience within

\(^{329}\) Fuller, p. 50; Spinelli, p. 8.


\(^{331}\) Spinelli, p. 31.

\(^{332}\) Spinelli, p. 31.

\(^{333}\) McCarthy & Wright, p. 18.
the broader, continual experience. Forlizzi and Battarbee describe these two types of experience as schematised experiences with beginnings, middles and ends, and the self-talk of everyday activities. Hekkert and Schifferstein point out that this division is not unique to experience design, the languages of German and Dutch distinguish between these two types of experience and afford them different names. Much of the writing on experience design concentrates on special experiences that are noticeably different from their surroundings, or are extraordinary experiences of high emotional intensity.

Phenomenological psychology divides experience into straightforward and reflective experience, challenging the often assumed unitary nature of experience. It holds that an explanation of the experience and the experience itself represent two distinct events. Straightforward experience and reflective experience cannot occur simultaneously; explanation can only happen after the experience takes place. Explanation of an experience will never equal the experience, there being too much stimuli present in any experience for an individual to perceive, process and communicate.

Straightforward experience is what people live through constantly, being the constant barrage of innumerable stimuli surrounding a person from moment to moment. Straightforward experience is timeless, always occurring in the present. It is ineffable because to try to describe it invariably brings in the element of time. The individual disappears into straightforward experience, ‘I’ only existing on reflection in reflective experience. Reflective experience is always in the past, even if only by a second or two, and involves a person consciously reflecting on an experience. Reflective experience can only communicate a fraction of what the individual experiences in a straightforward experience.

335 Forlizzi & Battarbee, p. 263.
336 Hekkert & Schifferstein, p. 2.
337 Shedroff, p. 4; Pullman & Gross, p. 553.
339 Spinelli, p. 27.
340 Spinelli, p. 28.
Reflective experience is distanced from the immediate experience. Time allows a person to analyse their experience to establish significance and hierarchies of meaning and to eliminate unimportant factors that are unnecessary to understanding the experience or which are uncommunicable because the words or mental frameworks to explain them do not exist. Both types of experience are a part of conscious experience whether the experience is special or mundane.

The different nature of straightforward and reflective experience makes it difficult to conduct testing on experience with people, something that has been mentioned in experience design publications. Fiore, Wright and Edwards argue that there is a pre-cognitive and immediate aspect to experience, but also reflection, enabling the person to describe and make sense of an experience. The differences between the two types of experience means there is no way to qualitatively record a straightforward experience. For Hassenzahl and Tractinsky, ‘Judgements about experiences and the experiences themselves are related, but not identical.’ To report on an experience, a person first has to exit the experience to reflect on it, which is problematic when trying to research immediate experience, especially when it is possible to have a pre-linguistic, immediate, sensual response to an experience.

Facets of an experience and its character are inevitably lost or misconstrued in the transformation from straightforward experience to reflection. Even in the case of talk-aloud protocols used in HCI, the person is reflecting on what they are doing, transforming the straightforward experience into a reflective experience even if within moments of the first, straightforward experience. It is possible to test for quantitative information about experiences, which has been done with HCI investigations in the past, where objective measurements can

341 Spinelli, p. 27.
342 Spinelli, p. 27.
343 Fiore, Wright & Edwards, p. 130.
344 Hassenzahl & Tractinsky, p. 95.
345 Fiore, Wright & Edwards, p. 130.
include passage of time or mouse clicks within a time period.\textsuperscript{346} Given the enormous amount of variables involved in an experience these results are limited. There is the possibility of measuring neurological and physiological responses, but these methods produce large data sets that make significant events difficult to determine; the natural variations between people confuses the results and different mental states can produce similar biological reactions, making results difficult to analyse.\textsuperscript{347}

Hekkert and Schifferstein see it as possible to correlate objective measurements with subjective self-reporting to allow for cross-checking of results.\textsuperscript{348} Combining reflective experience in the form of self-reporting with direct objective measurements of neurological responses to straightforward experience may produce the most correct set of data, but it would never capture all available variables about the full and immediate sensorial stimuli of a straightforward experience. For design experiences that seek to harness affective states, the inability to test all variables of an experience challenges the accuracy of user research and product testing with people. For example, there is currently difficulty in testing for presence in virtual environments.\textsuperscript{349} This difficulty arises because presence is a part of straightforward experience, resisting interrogation as reflective experience. These issues are intrinsic to the nature of experiences, but the thesis does not seek to resolve them. Rather, it considers the limitations associated with straightforward and reflective experiences in regards to the affective dimensions of information experiences in new media contexts.

\textsuperscript{346} Bardzell et al., p. 3664.
\textsuperscript{347} Bardzell et al., p. 3665.
\textsuperscript{348} Hekkert & Schifferstein, p. 5.
3.7 The phenomenology of virtual environments

Phenomenological psychology offers very useful insights into the design of virtual environments. Virtual environments differ materially and spatially from real-world environments. Virtual space occupies a unique space when it comes to its physicality. The physical world has dimensions. Imaginary space exists in the mind, but virtual space occupies a position between the two.\textsuperscript{350} The difference between phenomenological and Cartesian space is a challenge to designing a phenomenological virtual environment. Phenomenological space is in front of the person, under them, stretching out, forming a relationship between the person and the objects around them and adding meaning to the experience.\textsuperscript{351} In phenomenology space is relative and changes depending on how a person interprets it in relation to everything else.\textsuperscript{352} People can feel claustrophobic and closeted in a space, or can feel time fly if they are having fun.\textsuperscript{353} The framework for modelling 3D digital environments depends on Cartesian space; it is mathematical and invariable. A metre is a metre, Cartesian points are set and time flows in a steady stream.\textsuperscript{354} Arguably, the phenomenological perspective of human space fundamentally opposes the positivist, mathematical precision of 3D modelling software.\textsuperscript{355}

Phenomenological psychology differs from phenomenological philosophy in that it does not question the essence of the phenomena. Phenomenological psychology is the science of human experience, looking at how phenomena appear to people, the relationships they represent and their meanings, regardless of whether the phenomena in those experiences represent reality or not.\textsuperscript{356} People do not perceive objects as they are, but how they appear. As a result,

\begin{footnotesize}
\begin{itemize}
\item \textsuperscript{351} Flynn, p. 359–360; Fuller, p. 63.
\item \textsuperscript{352} Fuller, p. 76.
\item \textsuperscript{353} McCarthy & Wright, p. 91.
\item \textsuperscript{354} McCarthy & Wright, p. 91.
\item \textsuperscript{355} Flynn, p. 351.
\end{itemize}
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phenomena can be mental, physical or any combination of the two.\textsuperscript{357} For example, in phenomenological psychology hallucinations, thoughts, ideas or false memories all count as phenomena that can be investigated.\textsuperscript{358} In the case of virtual environments, their underlying nature may be digital ones and zeroes, but the phenomena they present to people carry far more meaning than simple binary data. The phenomena in a virtual environment present themselves in a similar fashion to the phenomena of a real-world environment; according to phenomenological psychology the brain processes phenomena the same way regardless of their essential reality, creating a phenomenological experience out of a virtual space.\textsuperscript{359} Although writers have argued that virtual environments resist phenomenological space, phenomenological psychology suggests that the fundamental materiality and construction of the space is less important than how people psychologically perceive and interpret the space. Since human perceptions are relative rather than Cartesian, any perception of a virtual space is going to be phenomenological regardless of whether it is physical or virtual.

The challenge in creating a real-world-like experience in virtual heritage lies not in its Cartesian origins, but in the realism of the phenomena it offers. This concern has been noted in experience design, Shedroff stating that many designers of virtual environments seek to create a completely immersive experience that emulates real life, forgetting that the real world is so sensually stimulating that it is impossible to design anything that could come close.\textsuperscript{360} Although people screen out a great deal of phenomena in their reflective experiences, straightforward experience is rich in phenomena stimulating the senses. Even phenomena that are not the focus of attention help shape

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\textsuperscript{357} Spinelli, pp. 31–32.
\textsuperscript{358} Giorgi, 1997, pp. 236–237.
\textsuperscript{359} Velmans, p. 57.
\textsuperscript{360} Shedroff, p. 284.
\end{flushleft}
meaning in an experience, with unattended stimuli creating a context for the attended stimuli.361

It is beyond the capabilities of current technology to offer a truly realistic, straightforward experience given the enormous amount of phenomena that would be required. A lack of sufficient phenomena in the virtual environment is accompanied by too many phenomena existing outside it. Exposure to real-world phenomena while participating in a virtual experience reminds people that a virtual experience is not real. Even the use of fully immersive technology such as virtual reality helmets does not allow HCI designers to cleave a virtual environment from its relationship with the world. Knowledge that the environment is virtual and its relationship to the computer, the person and other objects combine to inform the person that the virtual environment is not real. Affect can be used to override this knowledge to an extent. It reaches out intentionally as a sense-making activity in the world, forming its own meanings based on attraction and aversion.362 If enough phenomena in a virtual environment attract people’s awareness, distracting them from the mediating technology and the world around them, this sets up the conditions for a feeling called ‘presence’, where a person feels as if they are really in the virtual environment.363

The role of the body is important to experience design when bodily engagement in an experience is considered more rewarding than simply observing.364 Phenomenological psychology frames bodily experience as the zero point of intentionality since the body is neither subject nor object; it acts on the world

362 Colombetti & Torrance, p. 507; Slaby, p. 431.
364 Shedroff, p. 50.
and the world acts on it. However, a person cannot take their body with them into a virtual space and virtual space does not share the same materiality as the human body, presenting a challenge in recreating a bodily experience in a virtual environment. Rather than presenting an insoluble problem in virtual environments, this issue demonstrates the importance of presence. When experiencing presence, a person feels like they are really in the virtual environment. The feeling of presence provides a connection to the body while the person mentally occupies the virtual environment. Mind and body are inseparable to phenomenological psychology. If feeling and thinking appear to originate in a virtual environment, the person will feel that their body is there with them. As the centre of the experience, the body determines how a person interacts with an environment, creating feelings to reflect changes happening to the body, setting parameters for experience, limiting the perceptual field and creating a body schema by which a person operates. Height, weight, shape and physical ability set the framework of a person’s experience in the world. To create a life-like experience of presence in a virtual environment, the environment needs to support a person’s body schema. In many virtual environments this is difficult since there is only one viewpoint and only one way of moving around. Greater personalisation of movement and relative space in a virtual environment would allow a person to tailor the experience to reflect their real-world body schema.

Beyond creating limitations and parameters for movement and viewpoint in a space, the body provides feedback through the senses. Sight and sound are commonly engaged in a virtual environment, but smell, taste and touch are not as easily supported. Writers in both experience design and phenomenological psychology discuss the importance of kinaesthetic support. Kinaesthetic

366 Robertson, pp. 308–309.
367 Fuller, pp. 66–68.
368 Slaby, pp. 430, 436; Cabestan, p. 91; Goldie, p. 236; Colombetti, p. 528.
awareness plays a supporting role by reinforcing other phenomena of the experience. For instance, if the body became numb, or the feelings did not match what would be expected during an action, the individual would stop doing the activity in question.\textsuperscript{369} When a typist sees words appearing on a screen, they are pre-reflectively aware of their fingers on the keyboard even if that is not the focal point of their awareness.\textsuperscript{370} Physical sensations, though remaining below the threshold of awareness, should support, or at least not contradict, the other sensations in a virtual environment.

Without the use of haptic interfaces, or devices that provide tactile feedback from a virtual object, this is a challenge to designers of virtual environments. The person in a virtual environment will not feel the virtual paving stones beneath their feet or touch the rough, granite walls of the virtual temple. Providing stimulation for some senses, but not others has the potential to disorient the audience. In the literature of virtual heritage, Kenderdine gives an example of a perfect, but still and silent image of an 18\textsuperscript{th} century panorama of the bustling city of London. Rather than create a lifelike feeling of ‘being there’, the panorama disoriented the audience by providing dense data in only one dimension.\textsuperscript{371} In virtual environments, the kinaesthetic feedback is an interaction with the mediating technology and it contradicts the other senses that are receiving feedback from the virtual environment. Fortunately, most people are used to interacting with such technology through computer games, avoiding disorientation, but an awareness of kinaesthetic feedback may remind the audience that they are not really there. Provided the individual uses familiar input devices in familiar ways, it is possible they will put such mediating technologies into the back of their minds, much like the computer monitor they are viewing a virtual environment through. Ignoring the

\textsuperscript{370} Colombetti, p. 531.  
mediating technology is one of the conditions for presence, so a strong feeling of presence should mitigate the lack of kinaesthetic support.

Bodily experience of the world does not begin and end within the experience being designed for. A person’s journey to a site creates a relationship between that place and other places and it creates expectation in the mind of the person. The relative location of the body in space gives an experience context, for example, the struggle up a hill to visit the tomb of an ancestor that makes the occasion even more momentous.\textsuperscript{372} Travelling between places creates narratives that link people, places, experiences and identity.\textsuperscript{373} Forcing certain perspectives and controlling the order and timing at which elements are revealed can help shape the context of a virtual experience.\textsuperscript{374} Previously, virtual environments had artificially and instantly teleported their audience to the virtual environment. Not only does this ignore the importance of the journey in creating the experience of a place, it emphasises the artificial nature of the visit to the virtual environment, further removing it from real-world experiences and separating it from any relative context. Providing a virtual journey provides more information about the virtual environment and creates relationships between the virtual environment, other environments and the person involved in the experience.

3.8 A virtual environment as a lifeworld

Phenomenology’s concept of gestalt and its relationship to the lifeworld highlights a key barrier to creating a life-like experience in a virtual world. In phenomenological psychology, a gestalt is a measure of the completeness of an object. Rather than representing the sum of its parts, a gestalt forms a new whole.\textsuperscript{375} A gestalt has its own meaning different to those of its constituent

\textsuperscript{372} J Brück. ‘Experiencing the Past? The development of a phenomenological archaeology in British prehistory’, \textit{Archaeological Dialogues}, vol. 12, no. 1, 2005, p. 47.
\textsuperscript{373} Brück, p. 47.
\textsuperscript{375} Fuller, p. 82.
For instance, a tree comprises branches, leaves and a trunk, but has its own separate qualities of treeness that go beyond a collection of the parts. Phenomenological psychology calls these whole characteristics ‘gestalt qualities’. An understanding of gestalt helps to explain what elements of a design, whether information design or experience design, are necessary to make the design whole. Leaves on a tree depend on branches, but branches do not depend on leaves. Branches depend on a trunk, but a trunk does not depend on branches. Branches and leaves with no trunk do not make a tree. The parts form the logic of the gestalt, with each part playing a role determined by the other parts within the whole. A gestalt unit is a segregate whole with self-definition and boundaries that separate it from other objects. Each gestalt then reaches out into the world to form relationships with other gestalts.

The concept of gestalt is drawn from the human tendency to see meaningful wholes before seeing collections of smaller details. Pre-attentively processing whole scenes comes at a lower cognitive cost than searching out and identifying composite parts, making it the easiest way to view the world. Gestalt theory identifies four tendencies in perception. There is similarity, where people group elements that are alike. There is proximity, where people group objects that are near one another. There is continuity, where people mentally deny the existence of a break in the pattern and there is closure, where people complete an incomplete pattern. Gestalt theory proposes a holistic approach to perception based on phenomenological

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376 Fuller, p. 97.
377 Fuller, p. 86.
378 Fuller, p. 89.
379 Fuller, p. 94.
380 Fuller, pp. 82–83.
381 Fuller, pp. 47, 83.
383 Hoffman, Kim, Winkler, Walrath & Emmerman, p. 36.
384 Spinelli, pp. 42–43.
method.\textsuperscript{385} Gestalt rules are used extensively in graphic design to create meaningful visual patterns and image compositions. The concept of the gestalt whole is important to physical and virtual environments that seek to convey transcendent information.

A virtual environment is a gestalt in that it is a collection of parts that forms a whole that has new meaning, has boundaries and has relationships with other objects, or other gestalts. For instance, a virtual environment is separate from the computer, the keyboard and the chair the person is sitting on. By contrast, the lifeworld is the background of the world, serving as the framework in which entities are suspended, helping to define them.\textsuperscript{386} The lifeworld is not a gestalt because gestalt objects have relationships with other gestalt objects. The lifeworld, by contrast, is everything because there is nothing outside of it with which to interact.\textsuperscript{387} To create a feeling of presence, a design is, in essence, trying to create a feeling of the lifeworld in the virtual environment. A virtual environment that exists as a complete lifeworld is impossible because virtual environments exist as gestalts within the lifeworld. However, dreams provide an example of people mistaking imaginary environments for the lifeworld. This suggests it is possible to trick a person’s consciousness into believing they are in the lifeworld when they are experiencing a virtual environment. The feeling of presence demonstrates this affective deception.

\textbf{3.9 Phenomenological method in the design of virtual environments}

Experience designers face the challenge of how to investigate individual elements of experience when experience is essentially holistic.\textsuperscript{388} The sheer number of variables involved in experience means that any in-depth investigation can only concentrate on one or two factors, ignoring the holistic

\textsuperscript{385} Spinelli, pp. 176–177.
\textsuperscript{386} Fuller, p. 84.
\textsuperscript{387} Fuller, p. 86.
nature of the experience. Phenomenological psychology offers a way of looking at the composite parts of the holistic experience while not forgetting the broader experience, approaching experience as comprising individual, but related, phenomena. Rather than casting people and designs as existing in a conventional subject-object relationship, phenomenological psychology provides a means of placing the emphasis on the relationships that designs form with the person, with other objects and with the world in general.

Phenomenological psychologists use phenomenological method to analyse conscious phenomena using people’s descriptions of their experience.\footnote{Giorgi, p. 354; A Giorgi. ‘Rehearing Old Voices’, In Rethinking Psychology, J A Smith, R Harré and L Van Langenhove (eds), London, SAGE, 1995, p. 39.} Researchers use phenomenological method to investigate the role of the phenomena, or data, of experience in the creation of meaning.\footnote{Spinelli, p. 6.} Since its inception, phenomenological psychology has blended philosophy with the gathering of empirical evidence.\footnote{N Depraz and S Gallagher. ‘Phenomenology and the Cognitive Sciences: Editorial introduction’, Phenomenology and the Cognitive Sciences, vol. 1, no. 1, 2002, p. 3.} Husserl initially created the method with the aim that philosophy could become as rigorous as the sciences, his goal being to apply phenomenological approaches to psychological investigations.\footnote{Spinelli, p. 32.} Psychologists use phenomenological method to gain greater understanding of the psychology of experiences. Psychologists, and other disciplines that adopt phenomenology, use phenomenological method for different reasons to philosophers. Philosophers seek to strip away the variables of experience to understand the invariables that lie beneath. Psychologists seek to isolate the variables so that they can be better controlled during psychological studies.\footnote{Spinelli, p. 19.}

Phenomenologists propose a radical empiricism that differs significantly from the classical positivist empiricism of the sciences.\footnote{Seamon, 2000, pp. 163–164.} Phenomenological
method differs from positivist approaches in being totally qualitative and descriptive, considering ‘what’ and ‘how’ rather than ‘why’.\textsuperscript{395} Researchers use the method to obtain evidence that is repeatable and verifiable, but only in regards to experience.\textsuperscript{396} They use phenomenological method in an attempt to strip away biases and preconceptions when viewing the world, taking a step back to view phenomena and their relationships with fresh eyes, seeing them as they present themselves rather than as researchers expect them to be.\textsuperscript{397}

Researchers in fields including nursing, healthcare and psychology use phenomenological method to systematically observe, describe and analyse people’s experiences. Topics vary greatly, from how people deal with psychosis, consumer experience while buying and feelings of divine presence in near-death experiences to the structure of thinking when playing chess.\textsuperscript{398} A number of practitioners in psychotherapy, occupational therapy and clinical social work apply phenomenological method in their clinical work.\textsuperscript{399}

The broad range of applications of phenomenological method presents a challenge to academic rigour, with Giorgi warning that there is currently no consensus on how to apply the phenomenological method and that not all

\begin{footnotes}
\item[395] Seamon, 1982, p. 123.
\item[396] Seamon, 1982, p. 123.
\item[397] Fuller, p. 27.
\end{footnotes}
recommended procedures are appropriate. Many researchers use phenomenological method across disciplines with no modification, effecting a philosophical analysis of a non-philosophical field. Nurses performing qualitative research have been criticised for misreading key philosophical concepts of phenomenology. The nurses, however, were not doing philosophy and never claimed to be doing so. Likewise, Giorgi argues, Husserl never claimed to be doing empirical science. Giorgi contends that to apply phenomenological method to another discipline, a disciplinary attitude needs to be adopted. For HCI, experience or information designers, the method demands a design attitude.

Researchers continue to be attracted to the phenomenological method, applying it across a range of disciplines. The validity of phenomenological method comes out of its usefulness to researchers and practitioners in a range of fields rather than existing a priori. Design can involve any number of products and media, creating a diverse range of design research topics, but a common link between the different types of design is the human experience. Although there is no discussion of using phenomenological method for design in the literature of phenomenological psychology, this thesis argues that the usefulness of this method across disciplines suggests that designers could likewise adapt the phenomenological method to their discipline. As such the use of the term design or designers in using the phenomenological method in the following pages is a suggestion by the thesis author, drawing on more generalised instructions for phenomenological method by writers in phenomenological psychology, the phenomenological psychology authors did not use the term design.

401 Giorgi, p. 354.
Designers can use phenomenological method to study their own experience in relation to a design as an empathetic indication of how others might respond to it, or they could use it to examine other people’s descriptions of their experiences relevant to design.\textsuperscript{404} Phenomenological method fits well with philosophies of user-centred design in supporting designers to reflect on their role in design; how they are interacting with user-centred research volunteers, how they are feeling about each stage of the process, how they are dealing with any conflicts or problems in the design process. Conversely, designers could employ phenomenological method to gather data from people involved in user-centred research workshops, using it to document and analyse people’s experiences.

Although holistic experiences are unique to the individual, there are shared components within experience. Individual interpretation of these components may differ from person to person, but analysing similar experiences of different people could show designers underlying patterns of meaning-making based on these components. Designers could take these patterns into account when designing information and experiences to try to convey similar meanings to different people in an audience.

\textbf{3.10 The steps of phenomenological method}

Designers using phenomenology method start with phenomenological reduction, where they set aside their prior beliefs, knowledge and expectations of the experience in question.\textsuperscript{405} People normally take the existence and nature of things for granted, adopting what is called a ‘natural attitude’; phenomenological reduction seeks to break this.\textsuperscript{406} In phenomenological reduction, designers bracket their assumptions so that they can observe the experiential data with an open mind.\textsuperscript{407} This involves putting all prior

\begin{footnotesize}
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\bibitem{404} Willig, p. 53.
\bibitem{405} Spinelli, p. 20.
\bibitem{406} Giorgi, 1997, p. 239.
\bibitem{407} Giorgi, 2006, p. 355; Giorgi & Giorgi, p. 33.
\end{footnotesize}
knowledge about the phenomenon being investigated out of the mind to describe the phenomenon exactly as they are experiencing it at that moment. By setting aside established understandings and expectations, designers can devote their full attention to the instance of the phenomenon as it presents itself. Phenomenological reduction means taking the phenomena at face-value. Designers should not question the nature of the object behind the phenomenon, but simply report the phenomenon as they encounter it.

Phenomenologists, however, debate the extent to which people can successfully bracket past knowledge. Giorgi cautions that few researchers apply this step of phenomenological reduction correctly, some researchers omitting the bracketing, others leaving out taking phenomena at face value, and some omit both. Spinelli accepts that phenomenological reduction cannot completely eliminate all biases, but notes that awareness of the existence of the bias at least mitigates its impact on interpretation. Willig echoes this measured approach, arguing that although few phenomenologists believe preconceptions can be completely eliminated, an awareness of bias may help researchers respond reflexively in their research.

In the light of this debate, phenomenological reduction appears easier in theory than in practice. Giorgi stresses, however, that it remains a vital part of the phenomenological method based on Husserl’s approach. Designers could perhaps use phenomenological reduction as a reminder of what they should be aiming for in phenomenological method: focusing on the elements of experience as they present themselves at that moment and accepting the appearance of those elements without argument.

408 von Eckartsberg, p. 6; Giorgi & Giorgi, p. 33.
412 Spinelli, p. 20.
413 Willig, p. 53.
3.11 Describing the experience

The second step of phenomenological method is the narrative description of the experience. The person describing the experience reports it without trying to explain it, noting the elements, or phenomena, of the event as they presented themselves at the time.415 This creates a transcript of the experience as the person remembered it occurring, so that designers can analyse it with as little prior interpretation as possible. However, people have difficulty describing without any trace of explanation, creating a conflict between theory and application. Spinelli argues that an awareness of the difference between description and explanation could help minimise its influence even if a complete separation of the two is impossible.416

Description of an experience could be based on the ‘think-aloud’ technique where a person maintains a constant narrative of everything they are experiencing moment to moment.417 Designers often use this technique in usability testing. An alternative is for a person to narrate, or write down, the memory of a past experience as it presented itself to them. Or, if the experience is based on secondary material such as photographs, people could record their experience of looking at each photograph.418 Designers then transcribe the description of the experience into text so that they can analyse it. As description only occurs in reflective experience, designers do not get access to the phenomena of a straightforward experience through this method.419 However, the description gives evidence of what the person consciously found significant in their experience.

I use an example from the psychologists Giorgi and Giorgi to demonstrate the steps of the phenomenological method in practice. The thesis adapts their

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415 Spinelli, pp. 20–21.
416 Spinelli, p. 21.
417 Giorgi & Giorgi, p. 32.
418 Seamon, 2000, p. 7.
version of the phenomenological method for use in design. Giorgi and Giorgi are credited with formalising phenomenological methods for psychology. They use the example of people’s learning experiences to demonstrate the method, showing how it reveals many perspectives on learning, including the failure to learn.420

During a workshop people were asked ‘Please describe for me a situation in which you failed to learn.’421 A portion of the response of one of the participants follows:

I was about 10 years old when I first attempted to ride a bike. We only had one. My older brothers had learned long before, so I thought I would. We had a large backyard where I lived with small hills or grades in it, so you’d think it would be easy for me to learn but for me it was a disaster. I’d try and fall over. I’d try again and use the brake too soon. Always something, and between fear of getting hurt and not catching on at how to do it, it was very frustrating.422

Designers using the phenomenological method would firstly get a sense of the whole of the participant’s experience by reading the entire transcript of the description of the experience, most descriptions being much longer than the example given above. Then they perform a slower and more thorough reading, indicating where the meaning changes in respect to the ideas being investigated.423 Designers would add slashes to indicate shifts of meaning in the description, breaking the description into smaller parts in preparation for analysis.424 Different designers may add the slashes in different places

420 Giorgi & Giorgi, pp. 28–29.
421 Giorgi & Giorgi, p. 29.
424 Giorgi & Giorgi, p. 34.
depending on how they interpret the source material. The separate meaning units each representing a single, defined and discrete aspect of the experience focused around the theme of the design investigation. By breaking the description into smaller units designers equalise the experience, ensuring that no part of the experience is more important than another.

I was about 10 years old when I first attempted to ride a bike. We only had one. My older brothers had learned long before, so I thought I would. We had a large backyard where I lived with small hills or grades in it, so you’d think it would be easy for me to learn but for me it was a disaster. I’d try and fall over. I’d try again and use the brake too soon. Always something, and between fear of getting hurt and not catching on at how to do it, it was very frustrating.

Designers using cognitive methods of analysis break up experience descriptions like this differently, creating divisions where pauses occur in the verbal description, arguing that these are natural breaks that occur for cognitive and linguistic reasons. Designers using the cognitive method of breaking up a description argue that a benefit of using these natural breaks is that different people tend to divide the same text in the same way, giving uniformity to the application of the technique. Designers using phenomenological method, on the other hand, could use this step to begin looking for meanings in the description based on their design goals. Cognitive methods of breaking up the text aim to be objective where phenomenological method accepts its subjectivity.

425 Giorgi & Giorgi, p. 35.
426 von Eckartsberg, pp. 40–41.
427 Spinelli, p. 21.
430 Van Someren, Barnard & Sandberg, pp. 119–120.
Designers using the cognitive approach to talk-aloud technique code the segments based on predetermined categories of types of statements. In usability testing, designers seek to identify where people made decisions and use heuristic evaluation to assess the design against a set of criteria. Other methods of analysis include counting the times certain words appear, giving a quantitative analysis. In contrast, designers using phenomenological method follow a different series of steps, the next of which is to translate the meaning units into discipline-specific terminology, using design terminology to gain greater insight into the meanings behind each part of the experience. Designers would use design goals to establish meaning units and identify the deeper relationships between the different meaning units.

In the case where Giorgi and Giorgi were investigating a failure to learn, they asked what learning is in the experience description, how this learning was achieved and what each meaning unit was saying about learning. The psychologists re-wrote the meaning units to focus on the themes and remove any redundant text. They left the next level of transformation black where the meaning unit had nothing to say about the theme of the investigation.

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431 Van Someren, Barnard & Sandberg, p. 122.
433 Giorgi & Giorgi, p. 34.
434 von Eckartsberg, p. 41.
435 von Eckartsberg, p. 41.
This table is unable to be reproduced online. Please consult print copy held in the Swinburne Library.

Table 3.1: Phenomenological analysis of participant data.\textsuperscript{436}

\textsuperscript{436} Giorgi & Giorgi, 2008, pp. 40–41.
In analysing the relationships between meaning units for emergent patterns, designers could analyse a single experience, compare a person’s different experiences or compare the experiences of different people. In the case of psychology, some measure of generalisation takes place in the transformation of meaning units, riding a bike becomes ‘acquiring a skill’. This may not be appropriate in some applications in design. For instance, if a designer were investigating what visual elements are linked to certain feelings, a more generalised description of ‘a large building provoked a positive mood’ would not aid in generating a specific design to cause particular affective responses. An appropriate level of abstraction can be ensured by following a disciplinary mind-set when interpreting the meaning units and by interrogating each meaning unit according to need.

Rather than use the various levels of textual transformation for psychological insight, designers could adapt the phenomenological method to analyse different relationships between the elements reported in people’s experience. For instance, designers often use talk-aloud protocols to see how people use the information on a webpage. Designers could ask people to talk aloud while using the webpage for a series of tasks. After documenting a person’s commentary, they could ask the person to describe their memory of the experience, this step filtering out what the person thought was unimportant and highlighting more important memories. Designers could break the two transcripts of experience into meaning units based on the purpose of the usability testing, for instance breaking a unit when someone reported a change in motivation, a sense of frustration or once they achieved a goal. Designers could then translate each meaning unit into terminology that provided consistency across different experience descriptions and gave discipline-specific insight to designers. For instance, ‘I’m not sure where to click’ could translate to ‘The user could not find an appropriate hyperlink.’ By looking for patterns through all of the meaning units, either in a table or by printing them and

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437 Giorgi & Giorgi, p. 44.
cutting them out to move around, designers could find patterns where people had difficulty in navigating the site. Other patterns in the analysis could show what was causing these problems.

### 3.12 A framework for a phenomenological method for design

Designers could use the following framework of phenomenological method in the design process. The framework is similar to that used by psychologists, but is specific to the needs of designers.

1. Decide on the design questions. They will direct the interview to gather appropriate data.

2. Decide on the criteria for the meaning units, for instance, visual appearance and affective states. Each time a shift in meaning occurs in regards to how things look or how the person feels indicate a break in meaning with a slash.

3. Transcribe the interview and break it up into meaning units.

4. Conduct an analysis of the meaning units in two stages. First, transform the meaning unit into a disciplinary appropriate form by translating it into design-appropriate terminology. Then step back and find greater meaning in the meaning unit by looking for a larger theme involved.

5. Look for patterns in the second state analyses. See where themes coincide and what they derive from.

6. Challenge the patterns according to the context of the design project. For instance, if the design project is to create a virtual environment ask how the relevant meaning units can impact on particular design choices for the virtual environment.

7. Incorporate the findings into the design process by using them as directives for design choices.
Step 1: Decide on design questions

Step 2: Establish the criteria for breaking the transcript into meaning units.

Step 3: Transcribe the data and break it up into meaning units.

Step 4: Conduct an analysis of the meaning units in two stages.

Step 5: Look for patterns in the second state analyses.

Step 6: Challenge the patterns according to the context of the design project.

Step 7: Incorporate the findings into the design process by using them as directives for design choices.

Figure 3.1: Diagram of the phenomenological method for design
By studying a person’s experience holistically, designers could understand the experiential elements that make for a richer, more compelling and more informative design experience. They could apply phenomenological method to the design processes to generate design ideas, or to test a design. As a generative approach, designers could use phenomenological method to analyse a person’s experience to find what elements should be included in a design to create a desired message, meaning and experience. In the testing phase, designers could record and analyse a person’s experience of the design, finding out what creates a memorable experience and what doesn’t.

Designers could use phenomenological method across a variety of situations. If they are investigating people’s past experience, they can analyse a transcript of their recollection of the original experience. Designers could use secondary material such as photographs and videos to investigate an object or site in instances where it would be impossible for them to have direct experience.

**Concluding remarks**

Phenomenological psychology and phenomenological method offer new ways of incorporating affect and information into experience design. Currently experience design focuses on a small number of experiential elements at a time, holistic experiences containing too many variables to study at once through traditional methods. Phenomenological psychology acknowledges the multivariate nature of experiences and uses the phenomenological method to look for meaning units and patterns within those experiences.

Phenomenological method offers designers a way to document and analyse experience. By breaking up an experience and looking for patterns, broader themes become evident that can provide information for the design process. Each experience is unique and through thorough analysis it would be possible to find new information each time a designer uses phenomenological method to interrogate their own or a viewer’s experience.
Designers cannot obtain all information about an experience from phenomenological method, however, straightforward experience having too much information for a person to record accurately. Although a complete experience is beyond transcription, the act of describing an experience could single out the most important elements of an experience for a person.

Phenomenological psychologists offer a view of experience that could be used to address current concerns in experience design. They argue that experience is made up of information and interpretation, where all phenomena contain information about themselves and their relationships, and every conscious act is a way of interpreting those phenomena. Their concept of intentionality, or the act of reaching out through the consciousness to make sense of the world, brings affect and cognition together as sense-making acts. Designers viewing affect as a sense-making act could transform it from a completely subjective internal state to an objective act based on the phenomena of the world. Viewing experience as a meaning-making act requiring information and interpretation exposes experience design as a natural extension of information design. Chapter 4 explains how the area of virtual heritage brings information and experience together to inform people through cognition and affect, discussing the phenomenology of virtual heritage environments.
Chapter 4
Virtual heritage and the feeling of presence

Virtual heritage is an example of information design that incorporates affect and experience. Virtual heritage is the digital 3D representation of cultural heritage sites and objects. It relies on physical data about the original site or object, the site or object’s historical context, interpretation of these facts, people’s interactive experience and people’s emotional responses to the experience. Chapter 4 uses virtual heritage as an example of the presentation and experience of information in contemporary society, which demonstrates the importance of combining logic with affect in information design projects. Considering issues of information design in virtual heritage demonstrates the flexibility of information design in its application to new areas. Previous chapters discussed theoretical issues of information and experience design. Contextualising these issues in an area of design practice identifies real-world, context-driven issues that arise when designing information experiences. As information design is a problem-solving approach to communicating information the problems that need to be solved depend on the purpose and context of the information design. Contextualising information design in virtual heritage provides digital designers with clear sets of issues to which to respond.

4.1 Merging cultural heritage with digital 3D

Roussou and Drettakis define virtual heritage as ‘the synthesis, conservation, reproduction, representation, digital reprocessing, and display of cultural evidence with the use of advanced imaging technology’. Virtual heritage is similar to virtual archaeology, which Roussou defines as, ‘the use of three dimensional computer models of ancient buildings and artefacts visualized through digital interface technologies that offer some degree of immersion.}

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and/or interaction with the content’. The term virtual heritage should not be confused with digital heritage, which describes any digitising of cultural heritage, for instance a database of details of objects or a text-based website. Virtual heritage is a sub-area of digital heritage, relating specifically to the 3D visualisation of digitised cultural heritage. Virtual heritage can be divided in further categories depending on its purpose. It can involve documentation from site surveys to point cloud scans, representation from digital reconstruction to visualisation, and dissemination from immersive virtual worlds to augmented reality displays. The varying purposes of virtual heritage have impact on what sort of information needs to be communicated, the demographic of the expected audience, the communication media involved, the level and type of interactivity needed and the kinds of emotional response required.

The use of virtual heritage in museums is increasing as the capability of technology grows, enabling ever more sophisticated interactive, virtual reality and augmented reality displays. Museums can use virtual heritage to augment physical museum space and create whole virtual museums. Heritage experts look to virtual heritage to document, disseminate and pre-serve heritage information and to educate the public in innovative ways. The variety of purposes virtual heritage can serve in a museum accounts for its increased use, these purposes including accurate documentation for restoration or reconstruction of damaged artefacts and sites, disseminating models for

442 Chittaro, Ieronutti & Ranon, p. 31.
educational purposes, virtual tourism and scholarly analysis. Archaeologists use virtual heritage to visualise their research data in 3D, to show alternative perspectives on the nature of a site and to explore changes that might have occurred to a site over history. Heritage experts are now embracing virtual heritage due to its superiority as a medium over traditional documentation for scientific purposes.

In the past, museums saw virtual heritage as both a solution and a problem, leading to reservations about the use of virtual heritage and the irregular and incomplete application of virtual elements to exhibitions. Museums worried about the commercialisation of their collections and the tendency of new technology to distract from the physical objects in museum collections. Schweibenz argues, somewhat hopefully given the escalating power of digital 3D technology, that virtual heritage will never steal audiences away from an original object given their aura; rather virtual heritage provides aspects and ideas to extend the museum experience. Cultural heritage experts initially viewed the popularity of virtual heritage with suspicion, regarding the virtualisation of heritage vulgar and a form of entertainment.

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447 Pujol, p. 4.
448 Sanders, 2001, p. 238.
worthy only of videogames. The benefits of virtual heritage have helped to ease some of these concerns.

Virtual heritage offers many benefits to audiences and museums. Engaging with virtual heritage artefacts can be cheaper and more accessible than visiting actual sites or object. Like virtual tourism, virtual heritage is not subject to seasonality and is less dangerous, especially to certain destinations. The ease of online access allows museums to exhibit more of their collections, overcoming space constraints and attracting a potentially much broader audience than can physically attend an exhibit. Virtual interaction prevents damage to delicate sites and artefacts, allowing visitors access to objects and sites such as Stonehenge that would otherwise be restricted due to concerns about damage. Virtual heritage provides a response to questions regarding whether a site should be physically restored to a past appearance or not, potentially creating virtual copies of the site in a range of past states. The International Council on Monuments and Sites (ICOMOS) recommends using virtual heritage in place of physical restoration where possible. When virtual heritage involves an alternative to visiting the original cultural heritage site it becomes an example of virtual tourism. The literature on virtual tourism argues additional benefits that extend beyond the protection of the physical site. Tourism can affect an area’s culture, development, economy,

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employment and environment in both obvious and subtle ways. Virtual tourism preserves the region around a site and does not directly influence local culture. This helps minimise the impact of tourism on an area, but also mitigates any financial benefits from tourism.

Despite the benefits to both audiences and museums, there remains a debate over whose needs virtual heritage projects should serve. Some writers argue that scientific accuracy is paramount while others strive for artistry and the maximisation of audience experience. This debate reflects the logic/emotion divide that permeates Western society, where the non-emotive factual representation of virtual heritage is seen to be at odds with emotive audience experiences.

4.2 The development of virtual heritage

Virtual heritage was first proposed in the 1970s, first attempted in the 1980s, refined in the 1990s and embraced by the cultural heritage community in the 2000s. Its origins lie in military applications, the technology for virtual heritage being created by the US military in two projects, ARPAnet, the forerunner of the Internet, and the less known Aspen Movie Map. ARPAnet came online with four host computers connected to the network in 1969. The Aspen Movie Map, also funded by the Advanced Research Projects Agency (ARPA) an agency of the United States Department of Defense, was the first virtual simulation. Users could virtually navigate through Aspen using movie footage that was transferred to a computer. The idea behind this project was to create simulated environments and situations for military training in terrorist

456 Bristow, p. 220.
457 Pujol, p. 7; Frischer, Nicolucci, Ryan & Barceló, p. 10.
458 Frischer, Niccolucci, Ryan & Barceló, p. 3.
460 Frischer, Niccolucci, Ryan & Barceló, p. 15.
situations across the world. The technology has since evolved into simulated flight training, virtual reality, virtual tourism and virtual heritage.

Heritage experts were quick to consider the advantages that networked computing and virtual simulations could offer their field. At the first Annual Conference of Computer and Quantitative Methods in Archaeology (CAA) in 1973, J.D. Wilcock predicted the future reconstruction of archaeological sites using computers. The technological capabilities required for doing this, however, took a long time to develop. In 1985, the first paper on 3D capture for archaeology appeared in the CAA Proceedings. The first paper on 3D modelling in the CAA Proceedings followed in 1989. Early practical experiments in virtual heritage in the early 1990s failed to enable accurate documentation or an authentic or entertaining experience due to the low level of visual realism. Satisfying these needs required a product that was portable, low cost and with a high level of accuracy, automation and photorealism. For a long time there was no technical system capable of delivering all these things, fostering the perception that the technology did not reflect its promise.

Renfrew, Forte and Siliotti published the first book on virtual archaeology in 1996, Virtual Archaeology: Great discoveries brought to life through virtual reality. Although impressive in demonstrating the potential for virtual archaeology and virtual heritage, Koller, Frischer and Humphreys point out that private companies developed each of the projects in it without the involvement of archaeologists. The divide between the desire of industry to show off their abilities and the need of experts for accurate models created a

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461 Frischer, Niccolucci, Ryan & Barcelô, p. 15.
462 Koller, Frischer & Humphreys, p. 7:2.
463 Koller, Frischer & Humphreys, p. 7:2.
464 Koller, Frischer & Humphreys, p. 7:2.
465 Addison, p.22.
distrust of virtual heritage within archaeology and cultural heritage circles. With advancing technology and dropping prices, this situation changed by the late 1990s, giving archaeological teams and museums the ability to create their own digital models.468

The literature on virtual heritage reveals divided loyalty among experts. Frischer, Niccolucci, Ryan, Barceló and Sanders argue that before 2000, cultural heritage experts had been wary of virtual heritage due to the cost of producing it, the unreliable technology and the lack of consultation with archaeologists leading to inaccuracy.469 Sanders claims that initially museums were ambivalent about the use of virtual reality.470 However, Schnädelbach, Koleva, Paxton, Twidale, Benford and Anastasi claim that museums immediately embraced new interface technology to enhance displays and visitor engagement.471 Despite these opposing viewpoints, no author disputes the fact that the progressive resolution of issues with technology has seen virtual heritage become increasingly popular among museums, heritage experts and audiences. By contrast to its early application, by 2010 virtual heritage was represented as a cost-effective method of content production for museums and heritage organisations.472

Recent advances in capturing techniques and modelling capabilities enable more accurate virtual heritage models.473 Nevertheless, completely accurate and fully immersive virtual environments are still difficult and expensive to produce and the content has to balance the needs of both experts and audiences. The remaining compromises in the presentation of virtual heritage content have not reduced enthusiasm for virtual heritage and there are many

468 Koller, Frischer & Humphreys, p. 7:3.
469 Frischer, Niccolucci, Ryan & Barceló, p. 11; D H Sanders. ‘Virtual Archaeology and Museums: Where are the exhibits?’, In Proceedings of the VAST Euroconference, F Niccolucci (ed.), Archaeopress, 2002, p. 188.
472 Sylaioua, Mania, Karoulis & White, p. 244.
473 Koller, Frischer & Humphreys, p. 7:1.
satisfactory examples of simple 3D recreations of artefacts, human settlements and landscapes available over the World Wide Web. There are also more substantial technologies such as iCinema, Cave Automatic Virtual Environment (CAVE) or Advanced Visualisation and Interaction Environment (AVIE), each of which provide immersive experiences for museum visitors.

4.3 The role of information in virtual heritage

Virtual heritage conveys information in a number of ways, including cloud scans of heritage objects, video and digital 3D reconstructions of cultural sites and objects, providing a diversity of experiences for the audience. The information comprises factual data about the site involving issues such as selection of what to display, level of detail, availability of different viewpoints and methods of display.

The selection of a site to document in digital 3D conveys information about the site’s importance. Selecting one site over another creates a hierarchy of importance that reflects the priorities of the design team. When repeated across many projects it indicates the ideals of the wider cultural heritage community. Before the 1990s, the World Heritage List of sites of outstanding universal significance was heavily biased towards European and elite cultural heritage sites such as castles, cathedrals and palaces. Notions of heritage were skewed towards monumental heritage. Virtual heritage also reflected this bias towards certain types of heritage, with some highly revered works such as the Sphinx and Michelangelo’s ‘David’ receiving disproportionate attention, taking attention away from worthy, but lesser known sites and wasting resources.

The hierarchy of importance was skewed by nationalistic goals, virtual heritage sparking a cultural ‘arms race’ where nations highlighted their own

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475 Addison, p.25.
heritage over that of others, striving to create more than other countries.\textsuperscript{476} Even in representing less known sites and objects there is a danger of digital cultural imperialism that asserts dominant cultural views of remote sites at the expense of the viewpoint of the site’s local community.\textsuperscript{477} The skewed representation of cultural heritage incorporated a bias towards tangible heritage—the physicality of cultural objects and sites—all but ignoring intangible heritage like the stories, ceremonies and human connections in cultural heritage.\textsuperscript{478} This reflects what cultural heritage experts found important rather than what audiences desired. Most virtual heritage concentrates on sites and objects, where audiences are more often interested in people, how they lived in a site and used it.\textsuperscript{479}

Attitudes towards intangible heritage have changed since the 1994 Nara Conference, where forty-five participants from twenty-eight countries discussed how to define and assess authenticity in cultural heritage resulting in the Nara Document on Authenticity.\textsuperscript{480} The conference participants recommended broader definitions of authenticity to reflect the values of the societies virtual heritage models represent. The findings of the conference recommended an interactive matrix based on cultural and physical properties and cultural and property differences, placing more emphases on values and society than previous definitions of heritage.\textsuperscript{481} Cultural context is more important than presenting ‘single monuments in isolation’, heritage being as much about living and evolving sites, their people and environment, as it is about the representation of decontextualised, atemporal, physical entities.\textsuperscript{482} Brück, an interpretive archaeologist, argues that when virtual

\textsuperscript{476} Frischer, p. 169.
\textsuperscript{477} Addison, p.25.
\textsuperscript{478} Munjeri, p. 16.
\textsuperscript{481} Munjeri, p. 16.
\textsuperscript{482} Munjeri, p. 17; Addison, p.25.
modelling removes the contextual information of social and sensory meaning the resulting view of the site is just as distorted as when physical elements are stripped away. This is significant for virtual heritage designers as creating cultural context requires information to which they may not have access. Without knowledge of the socio-cultural nature of a site—a body of knowledge provided by anthropology, history or archaeology—designers risk producing naïve virtual reconstructions of heritage sites. The need for context and intangible heritage information reinforces the need for production teams comprised of a range of disciplinary experts in the development of virtual heritage projects rather than the lone designer trying to recreate a lost building or site.

4.4 Accuracy of information in virtual heritage

The accuracy of information has long been a concern in virtual heritage. For instance, in 2000 Addison noted that the vast majority of virtual Pompeii in existence were too inaccurate to be of any value. This issue is still relevant because complete accuracy of information is impossible in virtual heritage. Not all elements of a site can be included in a 3D model, the site being only available in a reduced form. In many cases a virtual reproduction of a site is based on incomplete information. This leads to the dilemma of how to represent a heritage site in digital 3D when not all facts are known about the site. There are two options, to base parts of the virtual environment on reasonable conjecture or to leave unknown sections blank. If parts of the environment are based on conjecture there is a risk that people will assume that the entire scene is factual. Mosaker uses the example of a virtual reconstruction of Bologna’s town centre by Nu.M.E. (Nuovo Museo

483 J Brück, p. 54.
484 Munjeri, p. 17.
485 Mosaker, p. 21, 24.
486 Addison, p.25.
487 Mosaker, p. 21.
488 Roberts & Ryan, p. 179.
489 Mosaker, pp. 17, 21.
Electronico) that uses blank walls in the construction where facts were unknown, thus ensuring that the audience is not misled, but resulting in a virtual model lacking in realism.\textsuperscript{490} However, omitting an item from a scene can be as misleading as including something not based on evidence.\textsuperscript{491} When a person fills in gaps with their imagination, there is far less ‘quality control’ over what results.\textsuperscript{492} The use of a blank wall where information is not available may leave people thinking that the site really includes such a wall. As long as total accuracy in virtual heritage remains elusive, there is the risk of misleading people because they tend to suspend disbelief when engaging with virtual heritage.\textsuperscript{493}

In virtual heritage, accuracy is inextricably linked with representation of information. There is a preference for photorealism as a way of making the model as realistic, or factual, as possible. However, it is often this photorealism that leads audiences to see a conjecture as fact.\textsuperscript{494} Photorealism can interfere with the message virtual heritage models need to communicate.\textsuperscript{495} For instance, the quest for photorealism can lead virtual heritage designers to ignore other information about the site, such as sound, interactivity and touch. In ignoring other senses that can contribute to believable and accurate virtual environments, the over-reliance on photorealism can paradoxically harm the perception of realism.\textsuperscript{496} Some information needed for a believable environment may not be accurate or historic, such as dust, dirt, leaves and other messy elements of the real world.\textsuperscript{497} However, the designers of virtual

\begin{itemize}
\item \textsuperscript{490} Mosaker, p. 17.
\item \textsuperscript{492} D Arnold. ‘Computer Graphics and Archaeology: Realism and symbiosis’, In \textit{Symbiosis, 2000, ACM SIGGRAPH and EUROGRAPHICS: Interpreting the past, Preconference proceedings}, 2000, p. 15.
\item \textsuperscript{493} Kenderdine. ‘Speaking in Rama’, p. 315.
\item \textsuperscript{494} Richards, p. 342; Mosaker, p. 21.
\item \textsuperscript{495} E Champion. ‘When Windmills Turn into Giants: The conundrum of virtual places’, \textit{Techné: Research in philosophy and technology}, vol. 10, no. 3, 2007, p. 2.
\item \textsuperscript{496} Roussou & Drettakis, p. 1.
\item \textsuperscript{497} Mosaker, p. 21.
\end{itemize}
heritage continue to strive for photorealism simply because audiences prefer photorealism to other types of display as a ‘window to the past’.  

4.5 The interpretation of virtual heritage

People need to interpret information before they can make use of it. This is true in virtual heritage as much as any other area of design. Interpretation is not a one step process. Digital designers and experts interpret the data of the site to create the virtual heritage environment then the audience interprets the work again during the virtual heritage experience. The resulting subjective interpretations differ from the meaning of the original site. This difference of interpretations is because meaning is built through interaction, and interacting with a virtual environment adds layers of meaning that do not exist in the original site because the modes of interaction are inherently different to one another. The fact that interpretations of the virtual environment cannot be the same as the physical environment presents a challenge to virtual heritage designers when trying to give an audience insight into how others used and interpreted the site. Champion and Dave recommend that the perspective offered to the audience should be that of the historical inhabitants of the site, though inevitably filtered through the interpretation of heritage experts like archaeologists, anthropologists and historians. Providing perspectives and meanings from other groups, especially previously marginalised perspectives, gives people new insight into the site. Simply creating the site as accurately as possible in digital 3D is not going to create the same interpretation that the

498 Masuch et al.; Roussou & Drettakis, p. 10; Addison, p. 22.
499 Mosaker, p. 25.
500 Mosaker, p. 16.
original inhabitants had. People require more information to assist them in creating cross-cultural interpretations.

Despite the fact that a virtual heritage site cannot replicate the same meaning as a physical site, the virtual environment can offer additional information to the original site that can be useful in forming new understandings. An audience can see how the site appeared in times past, or view sites or objects that no longer exist, showing how geomorphology, vegetation and architecture have changed over time. Virtual modelling can produce an experience of a site closer to its original state through the removal of modern buildings that would otherwise impose on the visual perception of a site.

The interactive nature of virtual heritage gives people control over information, enabling the choice of information and the order and the time in which they perceive it. This is in comparison with the traditional presentation of information, which was often static, fragmented, authoritarian, one-sided and lacking in the expert interpretation required to form clear messages. The interactive presentation of information provides multiple possibilities of experience because the audience does not necessarily take up information in the order that the narrator provides it. The freedom to move around the model provides audiences with multiple experiences of the place that might otherwise be unavailable. From an information design viewpoint being able to move around the site unhindered is beneficial, however from an experience design viewpoint it can raise issues of whether completely free movement is appropriate. Areas of a site may be restricted for cultural reasons, out of respect for

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504 Mosaker, p. 25; Brück, p. 52.
505 Brück, p. 52.
508 Mosaker, p. 20.
509 Brück, p. 52.
the dead or due to social taboos. In these instances, freedom of movement may provide insight into physical facts of the site, but in doing so it may ignore, or even violate, the site’s underlying cultural meaning.510

4.6 The role of experience in virtual heritage

Experience is an important factor in virtual heritage, with people experiencing the information of virtual heritage in a number of ways, from passive viewing of digital video to active participation in an interactive virtual experience, point-and-click interactions with heritage websites on a personal computer through to immersive virtual reality experiences requiring an installation such as a CAVE or AVIE platform, or using helmet mounted displays. People’s experiences in virtual heritage environments emulate the way they experience physical places, people and objects.511 This ability to simulate real-world experience offers realism at the same time as it offers escapism, providing greater entertainment than traditional media.512

The promise of realism and entertainment can lead people to expect more from virtual heritage projects than development teams are capable of delivering, with people comparing virtual heritage with the increasing sophistication of movie special effects, computer games and computer-graphics-based thrill rides.513 Prior to 2000, audiences were frequently disappointed with virtual heritage models. Limited technological capabilities meant that many virtual heritage projects provided sterile environments, lacking populations or significant purpose.514 Visitors to the Hellenic Cosmos exhibition, which presented a virtual reconstruction of the ancient town of Miletus using CAVE technology, complained that ‘there weren’t things

511 Masuch, Freudenberg, Ludowici, Kreiker & Strothotte.
512 Frischer, Niccolucci, Ryan & Barcelò, p. 11.
513 Sanders, 2001, p. 244.
514 Arnold, pp. 11-12.
coming quickly towards you so you had to jump,’ and that they couldn’t sit in the chairs and they were ‘just’ standing in a room. Yet Mosaker argues that the people were not disappointed by a lack of interactivity; they would probably have been very happy to watch a 2D film where there was no interaction as long as the experience offered was ‘special’ and they felt privileged to take part in it. Farouk, El-Rifai, El-Tayar, El-Shishiny, Hosny, El-Rayes, Gomes, Giordano, Rushmeier, Bernardini and Magerlein support the argument that a special experience is more important than interactivity in virtual heritage in finding that audiences prefer a more passive form of learning, referred to as ‘less clicking, more watching’. This passive viewing turns information into narrative and history into pleasure, taking up the legacy of theatre, film, paintings, sculpture and storytelling. An argument for the benefit of passive viewing over interaction is that although computer games rely on immersion through interaction, virtual heritage rarely offers unlimited choices of interaction, even if the technology allows it. Interaction usually needs to be contained within the context and characteristics of the original site, or the meaning of the place will be lost. A person’s own culture drives any interaction with a virtual heritage site, rather than the person’s actions being motivated by the culture of the original inhabitants. The way that a person interacts with a space helps shape the social reality in which the person is taking part. People imposing their own cultural expectations on the virtual heritage experience can overwhelm the original message of the site. Conversely, if the framework of motivation and action is alien to a person, they will not understand the actions required of them, requiring designers to

515 Mosaker, p. 23.
516 Mosaker, p. 23.
deliver a cultural perspective that is narrowly constrained and not reflective of reality to get a user to interact in a specific way.\footnote{Champion, 2007, p. 2.}

A benefit of experiential virtual heritage over traditional media is that it can be tailored for group or individual experiences. Platforms such as AVIE or CAVE allow for group interactions, the argument being that when people interact with one another as well as the installation this further enhances the enjoyment of the experience.\footnote{Pujol, p. 5.} Other types of virtual heritage, such as online 3D visualisations, are designed for solitary viewing. Although solitary viewing removes the enjoyable shared-meaning creation of group experiences, it can protect the user from the embarrassing social situations stemming from a lack of understanding of local customs.\footnote{B Brown. ‘Working the Problems of Tourism’, \textit{Annals of Tourism Research}, vol. 34, no. 2, 2007, p. 369.}

Virtual heritage is emotional and multisensory. One of the primary appeals of virtual heritage to audiences is enjoyment, virtual heritage being both fun and novel.\footnote{Sylaioua, Mania, Karoulis & White; Frischer, Niccolucci, Ryan & Barceló.} Part of this novelty comes from the use of new, interactive and navigable technology in virtual environments.\footnote{Z Hendricks, J Tangkuampien and K Malan.‘Virtual Galleries: Is 3D better?’, In \textit{Proceedings of the 2nd International Conference on Computer Graphics, Virtual Reality, Visualisation and Interaction in Africa, Cape Town, South Africa}, ACM, 2003, p. 21; Sylaioua, Mania, Karoulis & White, p. 244.} The emphasis on enjoyment and entertainment in virtual heritage makes it a productive area for experience design research.\footnote{Mosaker, p. 18.} Virtual heritage stimulates additional senses to traditional information media, creating richer experiences and calling on different parts of mental processing, satisfying the conscious and unconscious mind, thought and feelings.\footnote{Mosaker, pp. 18–19.} It brings cognition and affect into the design process, providing a germane area for investigations into the role of affect in the experiential dimension of information design.
4.7 Presence

The affective state most often mentioned in virtual heritage writing is that of presence. Presence is the psychological state or subjective perception that allows an individual experiencing a technologically mediated environment to seemingly overlook the role of technology in the experience, resulting in what is broadly described as a feeling of actually being there. Presence is used in virtual heritage to enhance learning experiences, increase audience enjoyment, focus attention and intensify motivation. Presence reinforces the credibility and persuasive ability of a message. In designing virtual environments to deliver information, developing a feeling of presence provides additional information about a site. Moreover, in the virtual heritage literature, the goal of presence becomes elevated because entertainment is often regarded as being as important as the educational value of an experience. Biocca explains that the term presence emerged from the field of HCI in which the earlier idea of ‘telepresence’ represented ‘the illusion of being present in a distant location’. Initially, the term telepresence referred to the use of robotic systems as a proxy for the user where the user would interact with a distant environment by sharing the sensations of the robot. Since then writers have generalised the term telepresence to mean the feeling of being somewhere else through some type of mediating technology, or as Biocca puts it ‘the illusion of “being there” whether or not “there” exists in physical space’. In this thesis I use the term presence to distinguish the affective state in question from the narrower, earlier term of telepresence.

529 Biocca, p. 19.
530 Lee, 2004, p. 496.
531 Biocca, p. 18.
532 Biocca, p. 18.
4.8 The sources of presence

Presence research has an extensive literature that broadly debates the causes and categories of presence. Biocca describes presence as a basic state of consciousness, an awareness of self, the perception of immediate stimulus and an understanding of our place in our environment.\(^{533}\) Lee describes presence as ‘a psychological state in which the virtuality of experience is unnoticed’.\(^{534}\) Lombard and Ditton describe presence as a ‘perceptual illusion of non-mediation’ that psychologically transports an audience from here to there.\(^{535}\) Steuer characterizes presence as ‘the sense of being in an environment’.\(^{536}\)

There are many theories regarding the derivation and experience of presence within virtual environments. Most writers in the area of presence agree that presence requires the audience to focus on the mediated content in a digital environment, disregarding the mediating technology. Biocca uses the analogy of people wearing glasses to better perceive their surroundings and quickly becoming unaware of the apparatus that allows them to do so.\(^{537}\) In virtual environments, individuals may come to ignore mediating technology such as the head mounted display equipment, the computer monitor or television screen responsible for what they are experiencing, mentally creating possibilities of action from stimuli within the virtual environment.

Writers define presence as a type of mental transportation, a departure from the non-mediated environment and arrival at the mediated environment. Departure requires the audience to ignore the mediating elements, arrival at a virtual place depends on audience involvement in that place.\(^{538}\) There is also the type of transportation where the virtual site or object is delivered to the audience rather

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533 Biocca, p. 19.
534 Lee, p. 494.
535 M Lombard & T Ditton.
537 Biocca, p. 18.
538 Lombard & Ditton.
than the other way around. Lombard and Ditton use the example of television, where a person is less likely to feel they are being taken to the site and more that the site is being brought into their physical context.\textsuperscript{539}

There are many components to presence. The extent and fidelity of useful information combined with the richness of the mediated environment are important to the occurrence of the phenomenon of presence.\textsuperscript{540} Social richness creates a warm, intimate environment welcoming of social interaction with others.\textsuperscript{541} Realism creates a virtual environment that appears accurate in comparison to its real world equivalent.\textsuperscript{542} There is immersive presence, where the environment submerges the perceptions of the user.\textsuperscript{543} There is social presence, with actors within the media and the reaction of the users to other people—real or virtual—within the environment.\textsuperscript{544} There is also social presence with the medium as actor, where the user responds socially to cues within the environment itself.\textsuperscript{545} The psychological phenomenon of presence is comprised of various component parts.\textsuperscript{546}

Schubert, Friedmann and Regenbrecht identify these as spatial presence, involvement and realness.\textsuperscript{547} IJsselsteijn, de Ridder, Freeman and Avons broadly identify content factors such as objects, actors and events as affording interaction with the virtual environment.\textsuperscript{548}

\begin{thebibliography}{9}
\bibitem{539} Lombard & Ditton.
\bibitem{540} W A IJsselsteijn, H de Ridder, J Freeman and S E Avons. ‘Presence: Concept, determinants and measurement’, In \textit{SPIE, Human Vision and Electronic Imaging V}, SPIE, 2000, p. 3.
\bibitem{542} Riva, p. 90.
\bibitem{543} Riva, p. 90.
\bibitem{544} Riva, p. 90.
\bibitem{545} Riva, p. 90.
\bibitem{548} IJsselsteijn, Ridder, Freeman & Avons, p. 2.
\end{thebibliography}
Although there is the one term ‘presence’, writers argue that it refers to several distinct phenomena. Klimmt and Vorderer divide presence into spatial presence, or the illusion of being in a mediated space and social presence, or the illusion of being with a mediated person. There is overlap between the two categories, something that Klimmt and Vorderer describe as co-presence, or the illusion of being in a mediated space with a mediated person. An example is Second Life where users interact with one another in a virtual environment. Herrera, Jordan and Vera nominate an additional category that they call ‘imaginary presence’, which is also referred to in the presence research as ‘the book problem’. Here the audience does not feel themselves to be present in a real or even artificial world, but in a purely imaginative realm. Film, for example, sits on the borderline of ‘real’ and ‘imaginary’ presence, sensory data being provided from an external source, but the audience’s imagination doing most of the work of mental projection. Herrera, Jordan and Vera argue that the more an experience relies on imagination, the less robust and consistent the experience of presence. The obstruction of imagination in other categories of presence could explain why other researchers do not often include this category. Imagination is clearly important in any experiential design, but it is regarded as posing a hazard to the sense of presence. Heeter, for instance, specifically argues that the act of imagining requires the audience to engage with their surroundings while simultaneously slightly withdrawing their consciousness from their immediate stimuli. This withdrawal of consciousness from the environment diminishes the feeling of presence in that environment.

549 IJsselsteijn, Ridder, Freeman & Avons, p.2.
551 Klimmt & Vorderer, p. 346.
552 IJsselsteijn, Ridder, Freeman & Avons, p.2.
553 Herrera, Jordan & Vera, p. 545.
554 Herrera, Jordan & Vera,p. 545.
Despite the available list of definitions, categories and components attributed to presence, the nature of presence is still largely unexplained.\footnote{Lee, p. 496.} The most commonly held view among experts is that presence results from a ‘willing-suspension of disbelief’, although Lee cites studies that show people accept the reality of a virtual environment automatically and not through volition.\footnote{Lee, p. 496.} Lee argues that evolutionary psychology has resulted in human acceptance of the virtual as real. When the primitive brain saw a large predator it responded as if there were an immediate danger. Over generations, survival has depended on people believing what they see without questioning its reality, an effect we now carry into all situations, virtual or real, since the primitive brain, which manages the flight or fight response, is not sophisticated enough to separate a tiger from a simulation of a tiger.\footnote{Lee, p. 497.} This supports arguments from phenomenological psychology that people process virtual phenomena in the same way that they process physical phenomena, as explained in Chapter 3.

Floridi, however, argues that presence is a result of epistemic failure. He identifies presence as a type of misperception. The brain interprets what it perceives and puts it into the context of an experience. The perception in question overlooks the artificial mediation that is behind the experience, which results in an inability to distinguish reality from unreality.\footnote{Floridi, pp. 657–658.} However, Lombard and Ditton point out that if asked, anyone experiencing a mediated environment would accurately respond that they are using a medium. They may feel they are there, but they do not think they are there.\footnote{Lombart & Ditton.} If presence is due to misperception, it does not occur at a cognitive level.

Another view on the nature of presence is that it is a special case of involvement.\footnote{Klimmt & Vorderer, p. 348.} Klimmt and Vorderer argue that the audience focuses on the
information being mechanically delivered to them and avoids any stimulus that is outside that experience, such as their own thought processes and any external cues that could undermine the experience.\textsuperscript{562} They divide this involvement into involuntary involvement, which is automatic, and voluntary involvement, which is directed and controlled.\textsuperscript{563} From this perspective, presence can be achieved through motivational factors such as absorption, enjoyment and fascination and high states of involvement that result in people being emotionally and cognitively occupied by the experience.\textsuperscript{564} Klimmt and Vorderer criticise current presence research for looking at the wrong psychological aspects when focusing on audience perception, trying to trick or force the user into ignoring reality where the use of motivational processes can result in an audience willingly ignoring reality. The use of involvement has the advantage in that it can only be done with the audience’s consent, whereas perception can be tricked to create a feeling of presence.\textsuperscript{565}

Lombard and Ditton classify involvement as a type of immersion.\textsuperscript{566} They divide immersion into psychological immersion and perceptual immersion. According to Lombard and Ditton, psychological immersion requires the user to be involved, engaged and engrossed by a mediated environment, whereas perceptual immersion involves the physical removal of distracting sensations to encourage the user to accept the sights and sounds of the mediated environment.\textsuperscript{567} An example here would be the role of a Virtual Reality (VR) Head Mounted Display and headphones. Schubert, Friedmann and Regenbrecht, on the other hand, classify immersion as being purely the mechanical aspect of virtual heritage, framing both immersion and content as an effect of presentation and presence, or psychological experience.\textsuperscript{568} Schubert, Friedmann and Regenbrecht point out that there is no empirical

\begin{itemize}
\item \textsuperscript{562} Klimmt & Vorderer, p. 348.
\item \textsuperscript{563} Klimmt & Vorderer, p. 349.
\item \textsuperscript{564} Klimmt & Vorderer, p. 349.
\item \textsuperscript{565} Klimmt & Vorderer, p. 349.
\item \textsuperscript{566} Lombard & Ditton, 1997.
\item \textsuperscript{567} Lombard & Ditton, 1997.
\item \textsuperscript{568} Schubert, Friedmann & Regenbrecht, ‘Embodied Presence in Virtual Environments’, p. 269.
\end{itemize}
evidence to show the distinction between presence, the feeling of ‘being there’, and immersion, which is traditionally defined as the ability of the technology to immerse the user.\textsuperscript{569}

Many of the definitions of presence stress its psychological basis, but Heeter notes that presence research concentrates on ‘engineering the senses more strongly than it has engineered the mind’.\textsuperscript{570} Several authors point out that the psychology of presence is more important than the technology of presence.\textsuperscript{571} Technology is merely a tool to create and deliver experiences.\textsuperscript{572} Presence is caused by the user’s psychological response to an experience and is not purely governed by stimuli in the virtual environment.\textsuperscript{573} To this end, Heeter argues that a realistic simulation is not necessarily sufficient to create a sense of presence, since reality itself does not always produce this strong a sensation. She uses the example of climbing around a space shuttle at Space Camp when she was young. Even though she could physically touch the space shuttle, see it and smell it, the experience did not give a complete sense of ‘being there’.\textsuperscript{574} This suggests that the context of an experience extends beyond the immediate sensory details of the experience. For Heeter, an ex-astronaut would probably get a greater feeling of presence than she did, as the former astronaut could compare the experience to their real prior experiences on the same or a similar craft. In being unable to draw on that background, the space shuttle remained a sterile environment, devoid of the emotional resonance and meaning that create presence.\textsuperscript{575} That is not to say that technology has no place in creating a feeling of presence. Herrera, Jordan and Vera argue that although presence is not determined totally by the design of a virtual environ-

\textsuperscript{569} Schubert, Friedmann & Regenbrecht, ‘Decomposing the Sense of Presence’, p. 2.
\textsuperscript{570} Heeter, p. 335.
\textsuperscript{571} Klimmt & Vorderer, p. 355; Heeter, p. 344; Schubert, Friedmann & Regenbrecht, ‘Embodied Presence in Virtual Environments’, p. 269.
\textsuperscript{572} Heeter, p. 344.
\textsuperscript{573} Klimmt & Vorderer, p. 355; Schubert, Friedmann & Regenbrecht, ‘Embodied Presence in Virtual Environments’, p. 269.
\textsuperscript{574} Heeter, p. 336.
\textsuperscript{575} Heeter, p. 336.
ment, it does not arise entirely within the individual either. Rather, they argue that, ‘Agency and presence cannot be understood fully by paying attention solely to the environment or to the individual; it is necessary to consider the relationship between them.’

When it comes to the role of the environment in creating presence, Biocca argues that presence oscillates between three places: the physical environment, the virtual environment and the imaginary environment. Which domain the audience is in at any moment depends on what place they are mentally modelling and the origin of the cues that they are responding to. If they are thinking about the virtual space and responding to stimuli within that environment, presence occurs in the virtual environment. When someone is distracted by outside stimuli, such as a telephone ringing, and they think about answering it, the feeling of presence diminishes in the virtual world and the audience feels more present in their physical environment. Presence is thus constantly occurring, but it is the relevant environment that changes. Riva, however, argues that imaginary presence and virtual presence are not necessarily separate categories. He contends that for presence to work there must be a correlation between virtual and imaginary presence. The illusion created by virtual reality is thus strongest where the action required of the user in the virtual environment is the same as the action they predict in their mental model of the environment. If someone expects that a door will open when they turn a door handle, the feeling of presence is greater when the virtual environment meets that expectation. Supporting this, Schubert, Friedmann and Regenbrecht argue that the closer mediated stimuli follow expected constraints, the easier it is for audience members to construct a mental model of the virtual world, since the feeling of embodied action that creates the phenomenon of presence draws on real memory. When the physical environment, the virtual environment

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576 Herrera, Jordan & Vera, p. 541.
577 Biocca, p. 21.
578 Riva, p. 88.
and the mental environment support one another there is less potential for external distractions to disrupt the feeling of presence.

Experts argue that causes of presence do not apply equally in all situations. The feeling of presence depends on the individual, varying according to the person’s perceptual, cognitive and motor abilities, their prior experience with virtual environments, how attentive they are and their expectations of the experience.\textsuperscript{580} Some people cannot suspend disbelief to become immersed in a virtual environment, but for others situations and experiences can become too real; some people seek immersion, others avoid it as much as possible.\textsuperscript{581} Each person has their own set of accumulated life experiences and different conceptual systems, so identical stimuli can create very different responses.\textsuperscript{582} Champion argues that designing for presence is a challenge in that there is no way designers can know whether a camera angle triggers a place memory for the audience; there is not even a guarantee that the audience is looking at a particular area within the camera view when something happens there.\textsuperscript{583} Herrera, Jordan and Vera argue that these issues make presence a completely subjective and mercurial phenomenon.\textsuperscript{584} This individuality of the feeling of presence coincides with the uniqueness of experience described by phenomenological psychology, suggesting that variable phenomena of experience are as important as invariable phenomena in creating a feeling of presence.

Virtual heritage designers who seek to design an experience that affects all members of an audience thus face clear challenges, especially since presence may vary from moment to moment for any one individual as well as from person to person. Klimmt and Vorderer, using media psychology to understand the role of presence in virtual heritage, note that people move between

\textsuperscript{580} IJsselsteijn, Ridder, Freeman & Avons, pp. 2–3.
\textsuperscript{581} Heeter, p. 339.
\textsuperscript{582} Herrera, Jordan & Vera, p. 548.
\textsuperscript{583} Champion, 2007, p. 6.
\textsuperscript{584} Herrera, Jordan & Vera, p. 548.
‘analytical’ and ‘involved’ states of reception. Someone seeking to evaluate the design is more likely to adopt an analytical stance, remaining distant and uninvolved to better study what is going on, whereas people willing to be emotionally involved are more likely to be totally immersed in an experience. Lombard and Ditton, however, believe that presence does not occur by degrees; it either occurs or does not occur at any given point of someone’s experience. The level of presence experienced is an accumulation of those moments during the time spent in the mediated environment. The belief that presence has no degrees may stem from methods of testing the state of presence. Typically a participant is put through an extended mediated experience that can last from minutes to hours and then asked how present they felt. Such testing methods overlook a person’s changing state of presence during an experience and explains why much of the presence literature treats presence as a binary: off or on, with no shades of grey in between.

4.9 Interacting with a virtual world

Presence literature observes that interaction is an important factor in presence. Schubert, Friedmann and Regenbrecht argue that meanings are determined by potential actions within the virtual environment. Herrera, Jordan and Vera contend that presence can occur without actual interactivity, or at least the perception of possible interactivity. They argue that people’s perception of agency is the important factor here, not the act of interacting itself. However, they add that presence is partially rooted in agency so variables associated with agency can be manipulated to study the effect on the overall presence. Murray defines agency as ‘the satisfying power to take

586 Klimmt & Vorderer, pp. 347–348.
587 Lombard & Ditton.
588 Heeter, p. 339.
590 Herrera, Jordan & Vera,p. 548.
591 Herrera, Jordan & Vera,p. 548.
meaningful action and see the results of our decisions and choices’. When
agency serves as a factor to support a feeling of presence, the idea that we
have the power to take action, not the action itself, is what comes into action.

Interaction in a virtual world implies the existence of a virtual body with
which to take action. Embodied presence is the representation of bodily
navigation as a possible action in a virtual environment where a person
perceives their environment not because of its qualities, but because their
body is present in that environment, there being no perception without a
present body. Here, Brück argues that, ‘because the body is always already
in the world, it has no existence apart from the world, and the world itself can
only be realized through embodied experience’. The visual representation
of the body is not necessary to experience bodily presence in a virtual
environment, although Klimmt and Vorderer argue that avatars can help to
create an empathy that draws the person into a virtual environment. The
main feature of bodily presence that affects understanding in an environment
is viewpoint, these providing the person with a subjective visual perspective
of the environment.

4.10 Making place out of space

An important part of presence in a virtual environment is the creation of a
sense of place. The creation of place out of space demonstrates the bringing
together of information and emotional meaning. Place and space refer to
distinct ideas in virtual heritage literature. The meanings are sometimes inter-
changeable, however in this thesis I rely on Kenderdine’s description, where
place is produced by culture and space in a virtual model as the product of
user interaction. Place is space plus meaning. People interact with digital

592 Murray, J H. *Hamlet on the Holodeck: The future of narrative in cyberspace*, New York,
594 Brück, p. 47.
595 Klimmt & Verderer, p. 351.
596 Kenderdine, ‘Speaking in Rama’, p. 314.
spaces to create context and meaning, turning the space into place. In the creation of a new place, questions of whether virtual heritage is real or merely a copy of the physical site become moot. Cameron reasons that because digital objects have a unique set of properties they are just as real as physical objects, with digital objects being cultural constructs that influence people’s culture as much as analogue cultural constructs.597 According to this reasoning, virtual space is no longer a simulation of the real, it is a real place in itself, even though it is wholly digital. Further to this, if the concept of reality means an object can be acted on by an agent, then many digital objects can legitimately claim to be real, interaction between user and virtual object creating meaning in the real world.

This new reality of the virtual space means that the meaning and meaning-fulness of such digital reconstructions are arguably more important than the precision and detail of their representation. Authenticity comes not from mimicking the geometry or look of a site, but from reconstructing the experience of the original site.598 Visual accuracy is often insufficient to convey the ‘placeness’ of a location so, as Roussou and Drettakis argue when discussing non-photorealistic ways to create believability, more intangible qualities also need to be present.599 Champion and Dave argue that these additional qualities are typically cultural and can be introduced through audio and interactive elements. For instance, knowledge of space is potentially created through activity within that space.600

Champion describes several characteristics for creating a feeling of place that are rarely addressed in virtual heritage projects. Places change over time as a result of patterns of human interaction, Champion pointing out that in the

597 F Cameron, pp. 49–75.
598 Champion & Dave, p. 333.
599 Roussou & Drettakis, p. 1.
600 Champion & Dave, p. 336.
real world people leave clear marks of occupation and use. Nature causes a site to change as well. Different times of day and weather patterns affect real places in positive and negative ways. Yet in virtual heritage projects, negative aspects of weather and time changes are rarely included. The wind never drowns out conversation. Storms never prevent people from meeting or walking around. Natural erosion does not occur to the point where the landscape is slowly worn away. Incorporating such elements would enhance the sense of reality of a reconstruction, although at the expense of irritation caused to the audience. Virtual heritage designers have limited control over negative aspects of the design since people are astute to atmospheric manipulation and may simply turn their speakers down, sabotaging the designer’s work.

Dealing with place creation one element at a time may still be insufficient to creating a sense of place. Champion contends that in the physical world places are experienced as a gestalt, not as individual fragments of experience. This makes it difficult to predict how an individual will process the whole comprised of the components of a virtual environment, meaning that the closer a virtual environment gets to being a place the more variable the experience will be for the audience. People’s evaluation of that place will depend more and more on their own past experiences, knowledge, expectations and intentions. From a phenomenological point of view, it is not just that a virtual environment is a gestalt in itself, as was explained in Chapter 3, it is that all experiences are relational. The phenomena of the experience relate to each other and form relationships with a person’s prior experiences. The deeper and more complex these relationships become, the more intense the experience, but the more unpredictable it will be.

604 Champion, 2007, p. 5.
605 Champion, 2007, p. 5.
To create a sense of place in a virtual environment, people must be able to interact with the space, but to preserve authenticity that interaction needs to be limited to what is known of the original inhabitants’ interactions with a site. A place creates a physical framework within which activities must be conducted. This keeps everything localised and eventually creates a community. According to Champion, to create a sense of place under these circumstances the visitor must be constrained rather than liberated, with their choices limited through the complex interactions others have had at the site before them. Ideally, the audience and the place should form a cultural feedback loop, each influencing the other. This can be difficult to achieve with a contemporary audience that is not part of the culture that determined the original use of the site. Audiences interact in their own way with a site to create new, unintended meanings perhaps not perceived by designers of the virtual heritage application. Designing a sense of place becomes even more difficult given that places contain references to other places, whether it is the same place in a previous time or through links to other related places, through the interaction of people and artefacts.

Champion argues that not all of these criteria are needed to create a sense of place, but most sites must possess at least a few. He cautions virtual heritage designers against including every possible place feature since this can overload an audience. This leads to the question of how designers could choose what criteria to include. Using phenomenological psychology and the phenomenological framework proposed in Chapter 3 is an effective way to establish which elements will create an affective response and a feeling of presence and place in a virtual environment.

607 Champion & Dave, p. 337.
**Concluding remarks**

Virtual heritage brings concrete facts and affective states together to inform and entertain people. In creating virtual heritage museums impart a feeling of authenticity on the designed product. There is the implication of correctness that an audience believes. The virtual heritage designer has an obligation to the viewers to communicate the environment as factually as possible. When this is not possible, through the lack of information or conflicting information, it creates a challenge for the designer. Making things up misleads an audience and leaving areas blank disappoints them instead.

Affect plays a strong role in virtual heritage. The feeling of presence increases the authenticity and believability of the virtual environment and the concrete facts of the architectural, geographic and cultural elements of the site inform the audience. Presenting the information in a 3D interactive digital form allows people to control their own experience of the information and see the site from multiple viewpoints. Affect and information combine to create an information experience with a feeling of presence being the ultimate affective goal.

Chapter 5 examines a case study that combined affect and information in the design process, demonstrating the use of phenomenological method as a design tool to bring the two types of information together in a design and its use in user-testing to evaluate if the design was successful.
Chapter 5

The Virtual Vitthala Temple case study

This chapter demonstrates the use of knowledge from phenomenological psychology within the design process for an information design experience. Chapter 4 discussed how museums and designers bring information and experience together in virtual heritage projects, explaining the benefits and challenges of presenting information as an affective and intellectual experience for audiences. Chapter 5 describes a case study that applies knowledge from information design, experience design and phenomenological psychology to a virtual heritage project, demonstrating how this knowledge can aid the design process. The case study uses the literature from virtual heritage, information design and experience design to determine what information is important to add to the virtual heritage environment. It uses phenomenological method from phenomenological psychology to analyse the designer’s experience and as a tool for user-testing.

Chapter 4 contextualised issues of designing information and experience in an area that uses designed experience for education and entertainment. Chapter 5 demonstrates the application of theory to practice. Applying the theory acquired in previous chapters to an applied project is the next step in the process of transforming knowledge from abstract to concrete, demonstrating the usefulness of the acquired knowledge for practising designers. Design is a vocation and an action, the praxis of design research adapting theoretical knowledge to hands-on practice. Pettersson, for example, argues that the partnership between theory and practice is a foundation for information design.611 Applied projects challenge abstract theoretical frameworks, testing if they hold up under practical use. Contextualising theory in practice transforms non-disciplinary theory into applied, disciplinary knowledge.

611 Pettersson, p. 10.
Case studies document the application of knowledge to practice.\textsuperscript{612} All disciplines incorporate practice as well as theory, seeing the increasing use of case studies by educators to describe the activities, events and problems of professional practice.\textsuperscript{613} This case study shows the use of the theoretical concepts from the interdisciplinary enquiry in the context of practice.\textsuperscript{614} The thesis questions the neglect of affect in information design and suggests that interdisciplinary knowledge produced from the confluence of experience design, cognitive psychology and phenomenological psychology offers ways to respond to this omission. This results in multiple variables in a complex contextual enquiry, rather than a single issue to investigate on its own in laboratory conditions, making the topic suitable for a case study approach.\textsuperscript{615}

The case study question asked how designers could use this interdisciplinary knowledge to combine affect and information in a new media design. The case study is a virtual heritage project, the Virtual Vitthala Temple, developed with the Place-Hampi website, which informed people about a touring exhibition and gave them the feeling of ‘being there’ at the Vitthala Temple. This chapter discusses the design methods used to create the virtual environment, explaining how these methods related to an interdisciplinary weaving of knowledge and ideas about information, experience and affect.

The CD that accompanies this thesis includes 3D models of the Virtual Vitthala Temple, videos showing rendered animations of walking through the Virtual Vitthala Temple and the Place-Hampi website. The 3D models are available in X3D and Unity. X3D is a standard mark-up language for the display of 3D over the World Wide Web.\textsuperscript{616} Unity is proprietary 3D game development software.

\textsuperscript{612} Breslin & Buchanan, p. 36.
\textsuperscript{614} Carroll & Rosson, p. 298.
\textsuperscript{615} R K Yin. \textit{Applications of Case Study Research}, L Bickman and D J Rog (eds), Thousand Oaks, SAGE, 2003, p. xi.
engine software. The virtual environment and videos can also be viewed online at www.dekruiff.com/hampi/. To view the X3D file, requires an X3D plugin or viewer. I recommend downloading and installing BitManagement’s BS Contact from www.bitmanagement.com, or Flux Player from http://mediamachines.wordpress.com/flux-player-and-flux-studio. These plugins support the viewing of X3D files in either a separate viewer, or embedded in a webpage and they support multi-texturing, which is needed to see the textures and normal (bump) maps. Unity Player is available from http://unity3d.com/webplayer/ for both Windows and Mac platforms. The video walk-throughs are available online as Flash Video files. You will need Adobe Flash installed on your computer to view them. The videos on the CD are MP4 files, viewable using QuickTime Player, which can be downloaded for free at the Apple website http://www.apple.com/quicktime/download/.

5.1 History of the Vitthala Temple

The Vitthala Temple is one of the temple complexes at Hampi, a cultural site and tourist attraction in the southern Indian state of Karnataka (see figures 5.1 and 5.2).\(^{617}\) Hampi contains over 500 monuments in its 25 square kilometre area, making it significant to Indian archaeological, architectural and cultural heritage.\(^{618}\) The surviving monuments are carved from granite and are famous for their intricate carvings. The use of the local granite in buildings in Karnataka gave the area the name ‘the cradle of stone architecture in India’.\(^{619}\)


\(^{618}\) Filliozat & Filliozat, p. 3.

Figure 5.1: The location of Hampi in India. The green shaded area shows the spread of the Vijayanagara Empire.\textsuperscript{620}

Figure 5.2: The location of Hampi in Karnataka State.\textsuperscript{621}


The site sits on the banks of the Tungabhadra River in the Bellary District, 350 km from Bangalore, bordered by bouldered hills that are popular with rock climbers and tourists. The area is renowned for its eroded rocky landscape strewn with boulders and intricately carved granite monuments that serve as mementos of a once glorious empire (see figure 5.3). Geologically, these hills result from a formation of granite gneiss that is common in the Deccan plateau across most of southern India, though it is particularly striking in Hampi.622

![Figure 5.3: The landscape of Hampi. Photograph © Hde2003.](image)

Tourists and pilgrims have visited the site since the beginning of the 16th century, featuring the area in descriptions of their travels and detailed maps of India and Asia, giving it fame first as the centre of a thriving empire and later of spectacular ruins.624

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622 Filliozat & Filliozat, p.3.
624 Filliozat & Filliozat, pp. vii-viii.
Local tradition provides a colourful story explaining the boulders’ origins. According to these stories, Hampi is at the heart of Kishkinda, the monkey-people kingdom mentioned in the Hindu text the Ramayana. The Ramayana narrates the tale of Rama, an avatar of Vishnu and the prince of Ayodhya. The demon-king Ravanna kidnapped Rama’s wife, Sita, taking her to the mythical island fortress of Lanka. To rescue her, the monkey-people serving Rama constructed a bridge from India to Lanka. When the bridge was finished, the monkeys left the remaining boulders in Hampi. These boulders have played an important role in the history of Hampi, providing building material for the temples.

Historically, Hampi was the location of the imperial city of Vijayanagara. The naming conventions of the area are confusing, with town names extending to cover entire areas. Hampi was once the name of a town near the Virupaksha Temple, but is now used for the local area. Vijayanagara is the name shared by the medieval Hindu empire and its capital, located in the Hampi area. The city of Vijayanagara no longer exists, but the name often interchanges with Hampi to describe the area. I use the name Hampi to describe the area and Vijayanagara for the capital city of the Vijayanagara Empire.

The brothers Bukka and Harihara Sangama founded the capital of the Vijayanagara Empire in the mid 14th Century CE. It is believed that they began as local chiefs who gained power following the deaths of other rulers. The brothers used the religious beliefs of the Hampi region to consolidate and

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627 Filliozat & Filliozat, p. 3.
628 Filliozat & Filliozat, p. 3.
629 Filliozat & Filliozat, p. 6.
630 Filliozat & Filliozat, p. 7.
631 Filliozat & Filliozat, pp. 3.
legitimise their kinghood. The Vijayanagara became the heart of a powerful empire that at its height was the centre of art and knowledge in South India.

The towers and temples of Hampi reinforced the kings’ power and generated religious devotion, drawing pilgrims from across southern India. Hampi has a long history as a religious site, with the first historic reference mentioning it as a site of pilgrimages being dated 690 CE. The site was originally known as Pampa-tirtha, named for the river goddess Pampa. She was likely a local river goddess before elevation to a goddess of the whole site, the name Hampi being derived from her name Pampa. Pampa’s status increased further when she became the wife of Virupaksha, an incarnation of Shiva whose cult was centred at Hampi by the 12th Century CE. Virupaksha was the patron deity of the early Vijayanagara kings, with the kings even signing documents using the deity's name. By exalting Shiva, in the form of Virupaksha, and Vishnu, the kings could establish a link between themselves and Rama, ‘the ideal king’ in Hinduism. The Virupaksha Temple is still a pilgrimage site, hosting a yearly festival for pilgrims and locals. Today, worship of Pampa now only occurs in one small shrine in the Virupaksha temple compound.

634 Filliozat & Filliozat, p. vii.
635 Mack, 2004, p. 64.
636 Wagoner, p. 13.
637 Wagoner, p. 13.
638 Filliozat & Filliozat, p. 7.
641 Filliozat & Filliozat, vii.
There are a number of temples at Hampi, including the temples of Vitthala, Virupaksha and Krishna (figure 5.4). Towns formed around the temples, creating urban centres that mixed secular and religious activities. These towns were called ‘pura’ during the time of the Vijayanagara Empire and ‘puram’ in modern Sanskrit. The urban centres took on the names of their local temple: Virupakshapura surrounded the Temple of Virupaksha, Vitthalapura surrounded the Temple of Vitthala and so on. The puras contained bazaars, housing, water tanks and minor shrines, supporting

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644 Filliozat & Filliozat, p. 6.
647 Filliozat & Filliozat, p. 6.
religious and secular activities for pilgrims and locals.\textsuperscript{648} There is little remaining of the secular buildings in Hampi. The people of Hampi constructed their secular buildings with earthen walls and their temples from stone. Most original secular buildings have disappeared, with the remaining ancient structures being religious temples.\textsuperscript{649}

Vitthalapura, the township surrounding the Vitthala Temple, was one of the larger, more elaborate towns of Hampi.\textsuperscript{650} Clear pathways separated public and private areas, with residential pathways being more restricted than public pathways, keeping pilgrims away from the personal dwellings of local inhabitants.\textsuperscript{651} The exact boundaries of Vitthalapura are unknown and may have been defined conceptually by its residents, or with boundary markers.\textsuperscript{652} There are geographic boundaries that suggest the limits of the town. The Tungabhadra River forms a natural boundary 100 metres west of the temple, granite ridges run along the north and south of the Vitthala Temple complex, gateways sit between the ridges and the river to the north and south, and an ornate festival mandapa, or pillared pavilion, sits at the end of a long colonnaded street to the east.\textsuperscript{653}

\begin{flushright}
\textsuperscript{648} Mack, 2001, pp. 25, 36. \\
\textsuperscript{649} Filliozat & Filliozat, \textit{pp.} 5–6. \\
\textsuperscript{650} Mack, 2001, p. 25. \\
\textsuperscript{651} Mack, 2001, pp. 36-37; Mack, 2004, p. 71. \\
\textsuperscript{652} Mack, 2004, p. 66. \\
\textsuperscript{653} Mack, 2001, p. 25; Mack, 2004, p. 66. \\
\end{flushright}
The Vitthala temple complex is one of the largest at Hampi, representing the height of artistry of the Tuluva dynasty (1491–1570). There are various spellings of Vitthala in Sanskrit, including Vithala, Vitthala and Vitala.

The Vitthala Temple was built as a palace of a god, but the identity of the god in question remains open to conjecture. The inner sanctum would normally hold a statue of the god, but the statue in the Vitthala Temple was removed and lost many years ago. Even the source of the name ‘Vitthala’ is open to debate. Popular etymology associates vita with brick, suggesting that it is dedicated to a god who stands on a brick. Various derivations of the name Vishnu in Karnataka suggest that the temple name was derived from Vishnu. An example of such derivation is Bittideva, which is derived from Vishnu-

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656 Filliozat & Filliozat, p. 21.
657 Filliozat & Filliozat, p. 19.
658 Filliozat & Filliozat, pp. 21, 22.
659 Filliozat & Filliozat, p. 21.
Current belief is that the deity Vitthala is an incarnation of Vishnu, and a form of the young god Krishna. In other temples, a young boy, in some instances naked, represents Vitthala, so it is possible that the original statue of the Temple of Vitthala was that of a young boy. Vitthala is now associated with Krishna and Vishnu, but it is possible that he was worshipped as a tribal cattle god prior to the Vijayanagara Empire.

Although the Vitthala Temple is an important temple at Hampi, the cult of Vitthala is based at Pandharpur in southern Maharashtra. This has led to the hypothesis that the Vitthala Temple statue was initially taken from a temple in Pandharpur as war booty. The Vijayanagara king Krishnadevaraya gained control over the Pandharpur region after defeating Ismail Adil Shah, Sultan of Bijapur. The Vitthala temple at Hampi would have been under construction at the time, so it is possible that Krishnadevaraya took the statue for his new temple. The looting of images was common in that time. Mediaeval Indian kings often appropriated images and goods after winning wars, viewing such actions as victory rather than theft.

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660 Filliozat & Filliozat, p. 21.
661 Filliozat & Filliozat, p. 21.
662 Filliozat & Filliozat, pp. 21–22.
666 Davis, pp. 26–30.
The exact date of the founding of the Vitthala Temple is unknown; its monuments date from different stages, being constructed from the mid 14th Century to 1554. A compound wall with three gopuras, or early style gates, surrounds the complex, forming entrances to the site from the north, south and east (figure 5.6). The gopuras have eroded over time and are no longer as impressive as they once were. There is a long galley, now in a state of ruin,
running along the northern street. Secondary shrines occupy the north-west and south-west of the Vitthala Temple complex. Who they are dedicated to is unknown. To the south, a large pavilion with 108 pillars interrupts the southern gallery. This 108 pillar pavilion is partly enclosed by walls with a large opening to the east and a smaller one to the north. The pavilion bears a foundation inscription of the date 1516. To the south-east, is an open, square pavilion echoed in the north-east by a hypostyle pavilion built to the same design. The double-stored colonnade in the south-east corner may have been a kitchen to provide food to pilgrims.

The central monument of the Vitthala Temple comprises a cella, or inner chamber, and antechambers designed to shelter the statue of the deity. A brick

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671 Filliozat & Filliozat, p. 19.
672 Filliozat & Filliozat, p. 27.
673 Filliozat & Filliozat, p. 27.
tower rises above the cella. There is a pavilion to the east, the stage pavilion, which is enclosed by walls. To the east of the enclosed area is an open 56 pillar pavilion, the dolotsava-mamtpa. Its presumed purpose is as a site of performances and to act as a swing pavilion for the popular and colourful swing festival.676 This 56 pillar pavilion was consecrated in 1554.677

The swing pavilion is famous for its musical columns (figure 5.8). This musicality is not a result of craftsmanship, but rather a feature of the local granite that causes it to reverberate for longer when struck than other types of bedrock.679 The musical nature of the columns is a fairly recent discovery,

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677 Filliozat & Filliozat, p. 28.
679 Filliozat & Filliozat, p. 4.
with no historic texts making any mention of this characteristic. \(^{680}\) Sadly, this discovery has caused preservation problems at the Vitthala Temple, with modern tourists tapping on the colonnettes with stones or metal, causing damage over time. \(^{681}\)

To the east of the central monument is the Garuda Shrine, popularly known as the stone chariot (figure 5.9). It comprises a cella, but no antechamber. \(^{683}\) It resembles a chariot, being a structure on wheels, but this appearance is coincidental. The Garuda Shrine represents the kite that serves as a vehicle to the god; the wheels are simply a reminder that a god’s house in the heavens is mobile. \(^{684}\) Originally, the wheels did turn, despite the shrine being stationary, but were blocked in recent years to prevent further damage to the worn

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\(^{680}\) Filliozat & Filliozat, p. 4.
\(^{681}\) Filliozat & Filliozat, p. 4.
\(^{683}\) Filliozat & Filliozat, p. 27.
axles. Once, a brick tower topped the Garuda Shrine, similar to the one that rises from the cella of the central monument. The Collector of Bellary demolished the brick tower at the end of the 19th Century in a somewhat paradoxical attempt at preservation, the collector believing that the weight of the brick tower was causing cracking in the lower sections of the monument.686

The golden age of the Vijayanagara Empire ended in January 1565 when four sultanates of the northern Decca joined forces and defeated the army of Vijayanagara at the battle of Talikota. The conquering armies spent the next six months sacking the cities and temples of Hampi, during which time the temple of Vitthala was largely abandoned. At the Vitthala Temple, the invaders concentrated on the central monument, where they damaged the construction along its central axis leading to the cella and removed the deity statue. Filliozat and Filliozat argue that this damage implies the deliberate desecration of the temple by invaders of a competing faith. However, the looting of the central statue could have simply been the armies taking the spoils of war. Davis notes that looted images from the period received the respect due to religious artefacts, with no reports of defilement and few cases of public mutilation of the images. Parts of the complex have collapsed through erosion of the brittle local granite.

The decline of the Vijayanagara Empire led to the gradual abandonment of the towns and temples of Hampi. The kings provided much of the funding for

685 Filliozat & Filliozat, p. 27.
688 Filliozat & Filliozat, p. 29; ‘Group Monuments at Hampi’; Eaton, p. 95; Mack, 2004, p. 60.
689 Filliozat & Filliozat, p. 95.
690 Filliozat & Filliozat, p. 29.
691 Davis, p. 29.
692 Filliozat & Filliozat, p. 4.
construction and renovation of the temples.\textsuperscript{693} Without funding, the buildings fell into disrepair. People still live on the site, with locals now using parts of Hampi for agriculture and housing. There is even a hydro-electric project there.\textsuperscript{694} Descendants of the original inhabitants continue their inherited roles such as ferrying people across the river and distributing food during annual festivals.\textsuperscript{695} Hampi remains an important cultural site and tourist destination. To preserve the site, in 1981, the Karnataka Directorate created the Hampi Resurrection Project. In 1987, Hampi became one of 16 cultural sites in India to be inscribed on UNESCO’s (United Nations Educational, Scientific and Cultural Organization) World Heritage List.\textsuperscript{696}

\textbf{5.2 Ancient Hampi: The Hindu Kingdom Brought to Life}

The design project consists of two parts, an applied real-world project in conjunction with Museum Victoria in the form of a museum exhibition website and a 3D digital reconstruction of an Indian temple. The website accompanied a touring exhibition, ‘Ancient Hampi: The Hindu Kingdom Brought to Life’, which ran at the Melbourne Immigration Museum from November 2007 to February 2009. The Ancient Hampi exhibition included Place-Hampi, a modular interactive cinema experience where a stereographic virtual landscape is projected onto a panoramic display system showing the various archaeological, sacred and historical locations around the site. This display used the Advanced Visualisation and Interaction Environment (AVIE), a 360 degree, stereoscopic, immersive interactive visualisation environment (see figure 5.3).\textsuperscript{697} Place-Hampi was a collaborative project involving Museum Victoria and the iCinema Centre for Interactive Cinema.

\textsuperscript{693} Mack, 2004, p. 63.
\textsuperscript{694} Filliozat & Filliozat, p. 5.
\textsuperscript{695} Filliozat & Filliozat, p. vii.
Research. The Place-Hampi display premiered to great acclaim at the France-India festival in Lille in October 2006, with people from a diverse range of fields, including Bollywood stars and Indian academics lauding the project.698

Figure 5.10: A diagram of the Place-Hampi platform. The person on the central platform controls the projector movement as other people in the installation share the experience.699

The Place-Hampi display uses panoramic video of the locations and virtual avatars to narrate and interact with the audience (see figures 5.4 and 5.5).700 The interactive display allows the audience to navigate through locations in Hampi and explore and interact with the environment. In the next stage of the project, Demonstrator Two, display motion tracking software allows a main user to navigate the site. Other audience members can share in this experience as a result of their presence in the viewing space, but have no control over navigation and interaction.701

700 Kenderdine et al., 2006.
According to its main creator, Sarah Kenderdine, Place-Hampi endeavours to provide a ‘co-evolution of a narrative between people and things’. It looks to the related fields of interpretive archaeology and symmetrical archaeology in which the involvement and interpretation of the audience contributes to their own understanding of the overall story of the archaeological site or object. Interpretive archaeology requires a ‘never-ending process of making sense’ through learning experiences and individual interpretation, allowing the audience and the 3D character to respond to the actions of the other, the story and meaning of the site emerging as a co-creation of both observer and 3D character.

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Place-Hampi forms a cultural experience. It brings together images of current scenery with 3D avatars of Hindu gods, narrating events specific to the site and emulating the imaginative experience of a present day pilgrimage (see figure 5.5). The draws on a living and evolving heritage; local people still interact with Hampi as a cultural and religious site, adding to its meaning. Sensitivity to culture and religion plays a strong role in the Place-Hampi installation. Hindu mythology involves a mutual interaction between the gods and the people with worshippers expecting their gods to acknowledge their presence. The interaction, co-presence and mutual development of storylines that exist between the audience and the 3D representation of the deity aims to support and respect local cultural traditions. At the same time, non-Hindus are not alienated, being able to respond to the interactive scenes as an art experience. Since culture influences engagement, ensuring that a virtual environment appeals to the perspectives of audiences with different cultural

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backgrounds is vital to ensuring audiences feel included and to creating a feeling of presence.\textsuperscript{710}

5.3 The Place-Hampi website

Online virtual heritage projects harness the ease with which the World Wide Web disseminates information. Museums use the World Wide Web to inform the public about exhibitions. Using an exhibition website for virtual heritage creates a two tiered experience, with the website acting as a promotion for the physical exhibition and as a replacement experience for those who cannot visit the exhibition. Virtual heritage, indeed all forms of 3D, on the World Wide Web are still in their infancy. Hardware and bandwidths, although improved over time, are still not sufficient to offer highly complex 3D models.\textsuperscript{711} Johansson, the core technology developer at Opera, predicts that it will take ten years for 3D to be embraced on the World Wide Web, but when it does, it will be as prevalent as video is today.\textsuperscript{712} The applied project identified deficiencies in technology that interdisciplinary knowledge answered, but Chapter 5 addresses issues that transcend those of current technology and which will persist when 3D on the World Wide Web is more technologically proficient than in 2011.

Sarah Kenderdine directed the design and development of the Place-Hampi website, providing text, images, video, photographs and PDFs from previous research. I designed and coded the website and constructed the interactive multimedia assets. The website (figure 5.13) publicises the exhibition, providing a glimpse of the material on display, disseminating background research behind the Place-Hampi digital reconstruction and informing the public and experts about the technology and research underpinning the exhibition. People learn about the exhibition through text, interactive media and video. The target audience was people with at least a ninth grade second-

\begin{thebibliography}{9}
\bibitem{711} S Ortiz, Jr. ‘Is 3D Finally Ready for the Web?’, \textit{Computer}, 2010, p. 16.
\bibitem{712} Ortiz Jr., p. 16.
\end{thebibliography}
ary school education. By using various media to carry information, people can select a preferred way to learn, or they can use the additional modes of communication to supplement their experience, gain deeper learning or establish different perspectives on the information at hand.

Providing information in multiple ways through text, photographs, video and interactive maps and panoramas is beneficial to audience understanding and participation. Multimodal dissemination of information allows viewers to choose a method that suits their preferences and learning styles. Accessing information from different media allows viewers to compare and contrast different viewpoints, facilitating the formation of new knowledge. The

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interactive Flash map with panoramic photographs (figures 5.14, 5.15 and 5.16) gives an alternative viewpoint to the spatial information of the Virtual Vitthala Temple. Interacting with this map, the viewer starts on an overview of the Hampi site where different numbers indicate different monument locations. Clicking on the numbers magnifies the location and provides additional information about the monument. Viewers can load an interactive panoramic photograph, shot at Hampi by John Gollings, Sarah Kenderdine and Jeffrey Shaw, to see a 360 degree view of the location.

Figure 5.14: The interactive Flash map of Hampi.

The map provides macro and micro views of the Hampi site, enabling the visitor to compare the larger area to each smaller location. The interactive map shows each location in relation to each other geographically, providing visitors with geospatial sense of each location in relation to each other. The ability to contrast the macro with the micro allows for ‘part-whole’ processing, where the understanding of the whole filters the understanding of
individual elements of a site. The viewer can switch between a detailed micro view, or a larger coherent structure.

Figure 5.15: The interactive Flash map, a view of the Vitthala Temple.

The panoramic views of the Vitthala Temple contrast spatially with the 3D virtual environment of the Virtual Vitthala Temple. The interactive panoramic photographs place the viewer at the centre of the scene with the environment rotating around them, emulating standing in one position and turning around. The viewer has more freedom in the virtual environment, where they can move around the space and see the monuments from different angles. The viewer can choose their preferred mode of interaction, whether it is for greater agency and control over the experience, or ‘less clicking more watching’.

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714 Hodder, 1991, p. 8
715 Tufte, 1990, p. 37
The viewer can compare the Virtual Vitthala Temple with the physical site, allowing them to interrogate the accuracy and authenticity of the two. This shifts authority from the museum, heritage experts and digital designer to the viewer, but raises questions of authenticity in digitised cultural heritage as discussed in Chapter 4. Accuracy combines with authority to create authenticity, a feeling that the copy represents the genuine site.\(^{717}\) This authenticity resists digitisation. The viewer does not compare the virtual to the genuine; they compare it to a digitised copy of a certain view of the original site taken in one brief moment in time. That the photograph can represent the truth of the site is questionable. Having a representation of the site refer back to another representation of the site amplifies a sense of authenticity where authenticity may not exist.\(^{718}\)

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\(^{718}\) Roussou, p. 271.
5.4 The online virtual heritage experience

Using virtual heritage on the World Wide Web gives people a feeling of being ‘there’ on their home computer, or the feeling that ‘there’ has been brought to them. The use of a home computer as mediating technology necessitates designing the experience for a much more restrictive media. The Place-Hampi experience, for example, is designed for AVIE technology. Virtual Reality (VR) experiences require head-mounted, virtual reality displays. In contrast, home users are usually restricted to common web browsers and computer screens, a narrower selection of technology and a smaller viewing area than the Place-Hampi installation allowed.

5.5 Extensible 3D to Unity

When this project began there were few choices for viewing 3D on the World Wide Web. The standard promoted by the Web3D Consortium, an industry funded group that promotes the use of real-time 3D over applications and networks was Extensible 3D (X3D). X3D is an inheritor of the 1997 version of the international standard Virtual Reality Modeling Language (VRML), adding Extensible Markup Language (XML) capabilities to assist with its integration with other technologies on the World Wide Web. It is platform independent, making it suitable for development and testing on personal computers.

An advantage of X3D is that it is open-source and not locked into one proprietary piece of software, unlike many other 3D file types. In theory, this should increase the development of freely available and mutually compatible viewers, plugins (add-ons that give greater capabilities to web browsers) and

719 Lombard & Ditton.
modelling and publishing software. However, individual for-profit companies control many of the browser plugins and viewers needed to view the files and the more robust viewers require a fee to unlock all of their capabilities or a significant license fee to remove watermarks.\textsuperscript{723} Bitmanagement’s BS Contact requires a €300 license fee to remove the watermark on their viewer.\textsuperscript{724} Octaga charges €49 to remove the banner and logo on their Octaga Player plugin and enable all functionality.\textsuperscript{725}

X3D is theoretically future-proof, with future X3D plugins able to read legacy files; in practice, many companies have ceased supporting these products over the last three years, or have gone out of business entirely.\textsuperscript{726} As Champion states, ‘Web-based 3D technology companies in particular seem to appear and disappear at a rapid pace.’\textsuperscript{727} CosmoPlayer only displays VRML97 and is no longer supported.\textsuperscript{728} Flux, a plugin that seemed to serve my project well, was no longer easy to find to download online when MediaMachines, its creator, became Vivaty.\textsuperscript{729} The Vivaty player it evolved into became unavailable after April 2010 when Vivaty went out of business.\textsuperscript{730} The files themselves may be as permanent as it is possible to be on the World Wide Web, but it is difficult to find a plug-in to view them. Another issue is viewing ease. Many products, for instance InstantReality Player, are stand-alone viewers that cannot incorporate the X3D file into the browser window, making it difficult to

\begin{footnotesize}
\textsuperscript{723} For a list of the viewers and their capabilities see http://www.web3d.org/x3d/wiki/index.php/Player_support_for_X3D_components.
\textsuperscript{726} Brutzman & Daly, p. 5.
\textsuperscript{727} Champion, 2011, p. 18.
\end{footnotesize}
seamlessly combine a website with 3D content. Some viewers and plugins do not support multi-textures, which are necessary to create the surface detail of normal, or bump, maps. The fact that a plugin is needed rather than viewing directly via the capabilities of the browser, creates another limitation; users often find plugins troublesome to install, manage and troubleshoot.

There are other free X3D viewers such as Xj3D and Pinecoast Swirl3D, but they repeatedly crashed when opening the Virtual Vitthala Temple. This could have been due to file size, or because there were errors in the code. There is little support for debugging X3D files, making it difficult to see if there were any errors in over 10,000 lines of code. It may be possible to simplify the geometry and reduce polygon count in other virtual heritage projects, but too much reduction in detail in the elaborate nature of the architecture in the Vitthala Temple would have severely hampered accuracy and the feeling of being there. Large file sizes are comparatively common in virtual heritage. One example of a 1911 view of a historic city of Brazil designed to run in a CAVE installation had over 300 megabytes of texture files. Having to deal with this common issue in this project created a typical circumstance for my case study.

Since the start of the project, new technologies have become available, Papervision3D, WebGL, X3DOM and 3D for Adobe Flash among others. Of these, WebGL and X3DOM offer the greatest potential to virtual heritage projects. WebGL enables web browsers to render 3D content without a plug-in, avoiding the pitfalls encountered with the various X3D plugins and

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732 Ortiz Jr., p. 15.
734 Behr, Dähne & Roth, p. 74.
736 Ortiz Jr., p. 16.
viewers. It uses JavaScript and Collada files, the former being standard in browsers and the latter becoming the de-facto cross-platform 3D filetype. A combination of the two ensures that most viewers will be able to see the files and most 3D designers will be able to create them. X3DOM brings X3D files into WebGL, enabling X3D files to be viewed without a plugin. This is beneficial to extant X3D virtual heritage projects, ensuring that they will still be viewable on the new technology. Despite the benefits of WebGL and X3DOM, there are still the problems of competing technologies, with Google developing O3D to work in its Chrome browser and for other browsers through a plugin. At the time of writing, Microsoft has not expressed any intention to incorporate WebGL into their Internet Explorer browser.

Because WebGL and X3DOM are still under development and there is no launch date announced at the time of writing, the Virthal Vitthala Temple is not yet available in this technology. To provide a richer user experience than X3D can offer, I and a Swinburne University of Technology Honours student, Finnian Millour, ported the project into Unity. Unity is cross-platform software for game development and can produce digital 3D environments for Android smart phone apps, Apple iPhone iOS apps, stand-alone executable files for Windows and Mac and applets for viewing on web pages. The professional level software supports lighting and shadows, scope lacking in X3D. The viewer needs the plug-in Unity Player to use Unity files on web pages. Unity appears to solve most of the technical problems of the applied project, but the file size produced for online environments at 32,877

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737 Ortiz Jr., p. 15.
739 Ortiz Jr., pp. 15–16.
kilobytes is far larger than X3D file and too large for easy access on the World Wide Web.

There is currently no single technology to easily publish the Virtual Vitthala Temple on the World Wide Web as it appears in Autodesk Maya (figure 5.18). The files presented in this thesis each solve one aspect; the Adobe Flash video presents a small file size, good quality rendering, shadows and lighting, but lacks the navigability and interactivity of the 3D files. Unity has superior rendering, lights, shadows, interactivity and navigability, but its file size is too large to transmit easily on a web page. X3D has a small file size, navigability and interactivity, but the rendering is of poor quality and it does not support lighting and shadows (figure 5.17). Once separately downloaded textures are included the file size of X3D can increase dramatically.

Figure 5.17: The Virtual Vitthala Temple in X3D with no shadows. Viewed using the Flux plugin.
5.6 Providing accurate information in virtual heritage environments

From a phenomenological perspective, traditional 3D modelling techniques are less than ideal due to their reliance on mathematical Cartesian coordinates rather than the subjective meanings of space formed by human interaction and intentionality.\textsuperscript{743} Mathematical precision is necessary due to the nature of 3D modelling software and to provide accuracy in the virtual environment. Floor plans formed the base of the 3D models (figures 5.19, 5.20 and 5.21). Phenomenological intentionality is unavoidable, however, because as the viewer navigates and interacts with the environment they form a relationship with the space and construct new meaning.

\textsuperscript{743} Brück, p. 54; Flynn, pp. 352–353.
Figure 5.19: A map of the Vitthala Temple.\textsuperscript{744}

This image is unable to be reproduced online. Please consult print copy held in the Swinburne Library.

Figure 5.20: The floor plan of the central monument.\textsuperscript{745}

This image is unable to be reproduced online. Please consult print copy held in the Swinburne Library.

Figure 5.21: The start of the central monument model.

\textsuperscript{745} P-S Filliozat, Plate 4, \textit{Plan of Vithala central monument}. 

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Pierre-Sylvain Filliozat’s architectural drawings from *Haṃpi-Vijayanagar: the Temple of Viṭhala* (figures 5.22 and 5.23) suggested the basic structure of the columns, though simplifying the shapes was necessary to keep the file size as small as possible. Figure 5.24 shows the relative lack of detail in the digital 3D columns compared to diagrams and photographs of the columns.

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746 P-S Filliozat.
747 P-S Filliozat, Plate 35, *Dolotsavamamtapa. Pillar 34 (type F), elevation Western face.*
748 P-S Filliozat, Plate 34, *Dolotsavamamtapa. Pillar 44 (type E), elevation Eastern and Northern face.*

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With the focus on the intricate columns of the central monument, the remaining monuments in the Vitthala Temple complex are simple geometric shapes to reduce file size further (figure 5.25). Textures applied to the shapes faked surface detail (figure 5.26). I compositedit photographs obtained from Sarah Kenderdine and images on the World Wide Web to create textures that were as photorealistic as possible. The lack of architectural accuracy proved disappointing to participants in user testing, with several stating that they wished they could enter the other monuments and explore them.

Figure 5.25: The Virtual Vitthala Temple without image textures.
To achieve as much accuracy as possible, all photographs used in the textures were from the Vitthala Temple. A combination of images sourced from different Indian temples may trick a lay audience, but it would damage the experience for anyone familiar with Indian historical architecture. Frischer, Niccolucci, Ryan and Barceló speak of an experience with a Virtual Pompeii exhibition:

In particular, a number of scholars observed that the design team had fashioned their temple complex out of mural vignettes excised from several different archaeological sites and contexts. Painted panels along the periphery of the reconstructed sanctuary were unsettling to many precisely because they had been filched from other Roman cities. Thus, the reconstruction took form as a pastiched continuum, a collage of recombinant parts. Not the kind of thing scholars of Antiquity are bound to love.749

749 Frischer, Niccolucci, Ryan & Barceló, 2002, p. 11.
The photographs were all from the Vitthala Temple, but some elements of pastiche still appear in the textures. To fit the textures to the simplified columns and to repeat textures and save on file size, the columns of the central monument are not completely accurate. This issue will be rectified in future development of the project.

The reliance on photographs meant that it was not possible to model areas where there were no photographic sources available. The imbalance was due to people being more interested in visual spectacle and less in the mundane. There are many photographs available of the Garuda monument, but none of the interior of the central monument. The Garuda monument attracts tourist interest, where less spectacular parts of the Vitthala Temple are ignored. This bias in the photographic record reflects wider issues in cultural heritage. As

750 Amar. Rath [photograph], 2008, https://picasaweb.google.com/lh/photo/Z4igXWgP1Tr4dxR-YrRpkdMTjNZETYmyPJy0liipFm0 (accessed 16 March 2009).
mentioned in Chapter 4, the World Heritage List of cultural sites prior to the 1990s heavily favoured certain Western sites.\textsuperscript{751} Any project that relies on previous research, or public documentation of cultural sites faces similar challenges.

![Figure 5.28: Looking towards the hidden interior of the central monument. The interior is shrouded in darkness and not accessible.](image)

5.7 Phenomenology and the design process.

Phenomenological method featured in two ways in the design process. I used it to capture information to make initial design decisions and to document and analyse the user experience, gathering more information to develop the design further. The use of the phenomenological method to analyse experience uses the same steps in each instance, but the role of the designer differs. As a generative tool used for initial design decisions in the Virtual Vitthala Case study, I used phenomenological method to analyse my experience. In user-testing, I used the method to analyse the experience of people interacting with the virtual environment.

\textsuperscript{751} Munjeri, p. 16.
5.8 Phenomenological analysis of the designer’s experience

I sought to create a virtual heritage experience that would foster affective responses from audiences. Given that I based the modelling on other people’s photographs of the Vitthala Temple, I expected that I could base the affective experience on someone’s experience of the Vitthala Temple. A lack of direct experience of the site was a challenge in drawing on site experience. I could not travel to India to see the temple first-hand, so I relied on photographs, videos and written descriptions. This limited my ability to recreate a direct experience, but was reflected the situation that virtual heritage designers could face when relying on secondary sources to produce their designs. Theories of phenomenology suggest that faced with a lack of first-hand experience, designers could use psychological phenomenological reduction with photographs, videos, or text-based narratives.\textsuperscript{752} This approach adds another benefit; designers using it should not question whether a phenomenon is real or not, enabling phenomenological method to be used with imaginary experiences, or mediated phenomena.\textsuperscript{753} Following the framework introduced in Chapter 3, I used phenomenological method to document and analyse my experience of representations of the Vitthala Temple.

**Step 1: Decide on the design questions.**

To design an affective information experience I needed data about the influence of affect and information on a person’s experience. My question was: What are you seeing and how does it make you feel? Using a simple question kept the investigation focused.

**Step 2: Establish the criteria for breaking the transcript into meaning units.**

I had two criteria in separating the meaning units, I indicated a shift in thought any time a change occurred in the phenomena (what I was seeing) or affective

\textsuperscript{752}Seamon, 2000, p. 163.
\textsuperscript{753}Giorgi, 2008, pp. 33–34.
state (what I was feeling). This made it easier to associate one affective response with one phenomenon, simplifying their inclusion into the design.

**Step 3: Transcribe the data and break it up into meaning units.**

I studied photographs of the Vitthala Temple site. By bracketing past knowledge and expectations, I could investigate the phenomena as they presented themselves to me, even though the site was being mediated through a photograph. I firstly observed each item on its own, putting aside my knowledge of other material related to the site. I noted my initial emotional reactions, describing the visual imagery that was the phenomena of the photograph and the phenomena of my own affective reaction. Then I viewed the material in a relational context, seeing how the phenomena related to one another and how my affective reactions grew in context after seeing more material.\(^{754}\) I wrote out my responses to photographs of the Vitthala Temple and used the criteria of step 2 to break the transcript into meaning units.

![Figure 5.29: The central monument. Photograph © Sarah Kenderdine.](image)

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\(^{754}\) Seamon, 2000, p. 163.

\(^{755}\) S Kenderdine, Central monument of the Vitthala Temple [photograph].
My reaction to the photograph in Figure 5.29 was as follows:

There is a feeling of space. It’s dark and the landscape recedes into the distance. The buildings are beautiful and old, but the thing that stays with me is how vast the scene seems. I find myself looking at the space around the central monument even though the light in the monument attracts me.

My response to the photograph in Figure 5.30:

The sky is overwhelming. I can almost feel the heat of the sun. Everything is baked in a warm glow. There are columns standing on their own, and other columns that support a roof. The shadows are very dark.

---

756 P Chamarthi.
At first, I went through all photographs, treating them equally. To analyse my responses, I broke the writing down into meaning units, such as with figure 5.29.757

| There is a feeling of space./ It’s dark and the landscape recedes into the distance. It is so dark I can barely see the hills nearby./ The buildings are beautiful and old,/ but the thing that stays with me is how vast the scene seems./ I find myself looking at the space around the central monument/ even thought the light in the monument attracts me./ |

The break between meaning units is indicated by a slash and indicates where a transition of meaning occurs. They are not objective and are determined by the researcher and the question they want to answer.758 To provide affective data for the project, I focussed on photographs set at dusk as these were the most evocative.

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757 Giorgi & Giorgi, p. 34.
My response to the photograph in Figure 5.31:

I can see the sun setting behind the temple complex. The sun glints through the branches of the tree. The uneven ground forms an interesting pattern beneath the tree. The carvings on the monument wall look intricate and I want to touch them. Everything seems so quiet and still. The scene is haunting and it feels very empty.
My response to the photograph in Figure 5.32:

The sun is setting and the sky is light pink in the distance. There are a few people in the courtyard. They seem dwarfed by the large monuments. It feels very empty and lonely. There’s a certain sadness that I feel when looking at this picture that is hard to describe. It’s like it’s on the edge of everyone leaving, so the loneliness is yet to kick in.
My response to the photograph in Figure 5.33:

The moon is between the two rising spires of the tower./ It’s a bit creepy looking at it there./ The tower appears dark and forbidding./ It’s like the moon is framed between two horns./ My eyes are repeatedly drawn upwards to look at the moon./ It seems very cold.

---

With Figure 5.34:

The lit columns are spectacular. They make me want to go into the temple to see what is happening. It seems very happy and festive. Outside the temple it is so dark I can’t see what’s going on. All of my attention is drawn to the lit columns of the monument in front of me.

**Step 4: Conduct an analysis of the meaning units in two stages.**

I transformed the meaning units into design-appropriate terminology. Then I looked behind the statements for larger themes concerning visual information and affective reaction. The visual information I called ‘design analysis’, as it would inform what I included in the design. The affective reaction I called the ‘affective analysis’, attaching these to the corresponding images. Table 2 shows the analysis of the photographs in figure 5.29.

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762 S Ganjam. Vitthala temple at night [photograph].
### Table 5.1: A phenomenological analysis of the photograph in figure 5.29.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Design analysis</th>
<th>Affective analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>There is a feeling of space.</td>
<td>The space is noticeable.</td>
<td>The environment feels spacious.</td>
</tr>
<tr>
<td>It’s dark and the landscape recedes into the distance. It is so dark I can barely see the hills nearby.</td>
<td>It is dark and this hides objects in the distance.</td>
<td>Objects in the distance seem to recede.</td>
</tr>
<tr>
<td>The building is beautiful and old,</td>
<td>The building in the scene is aesthetically pleasing and appears old.</td>
<td>The building is aesthetically pleasing and gives the feeling of age.</td>
</tr>
<tr>
<td>but the thing that stays with me is how vast the scene seems.</td>
<td>The space is noticeable.</td>
<td>The environment feels spacious.</td>
</tr>
<tr>
<td>I find myself looking at the space around the central monument</td>
<td>The space around the monument draws attention.</td>
<td></td>
</tr>
<tr>
<td>even though the light in the monument attracts me</td>
<td>The building is lit.</td>
<td>The light is attractive, but so is the space surrounding the building.</td>
</tr>
</tbody>
</table>

### Step 5: Look for patterns in the second state analyses. See where themes coincide and what they are derived from.

With longer analyses, the investigator can print the table of analysis out, cut up the meaning units and rearrange them based on relatedness. Ordinarily, this is done across multiple cases so the researcher can find what lies in common between the meaning units. I provide the following example to demonstrate how it was done in this case study.

### Design structure for photograph 1

I mentioned space three times in the description; it being noticeable and more perceptually significant than the building. The building appeared old and aesthetically pleasing. These two evaluations could be related or may not be. The building was lit but the rest of the scene was in darkness, hiding distant objects in the environment.

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763 Robinson, p. 216.
764 Giorgi & Giorgi, p. 44.
765 Giorgi & Giorgi, p. 44.
Affective structure for photograph 1
I was emotionally drawn to the space in the scene, mentioning how large the space feels twice. The light and aesthetics of the building are attractive, but so is the space surrounding the building.

Step 6: Challenge the patterns according to the context of the design project.
The patterns are only relevant if they fit the constraints and purpose of the design. In the above examples, space is a recurring issue of importance, prompting me to achieve a feeling of space in the design. Other themes arising from the photographs were the impact of evening compared to daytime, how stunning the illuminated columns appeared and the emptiness and loneliness of some scenes.

Step 7: Incorporate the findings into the design process as directives for design choices.
There were a number of recurring themes in the photographs: The joy of the lit columns, the emptiness of the courtyard, the loneliness when there were few people present, the eeriness of some darkened scenes. To achieve a feeling of space, I adjusted the focal distance in the camera in Maya to make the spaces between objects and around the person appear larger. Although setting the scene in daytime would have presented a typical design response, the phenomenological method analysis suggested that setting it in the evening would influence affective responses from the audience as evidenced by analysing my description of the photographs.

Setting the environment at dusk meant the project could be adapted to a wider range of 3D technologies, X3D being unable to render advanced lighting or shadows while programs with greater rendering capabilities can incorporate lighting to emulate the setting sun. The darkness and emptiness of the scene is associated with creepiness and mystery in the analysis of my
descriptions, by making the scene dark I expect that these feelings will be communicated to the audience. The contrasting joy and welcoming of the lit columns will be incorporated by making sure the columns are much brighter than the surrounding scene. This, however, causes a break with the reality of the site. To ensure the audience is drawn to the carefully modelled central monument, rather than the more rudimentary surrounding monuments, I decided to illuminate only its columns.

At the physical site, all monuments are lit at night-time. I decided to trade off accuracy for affect and believability. If the audience were drawn to the other monuments, they would notice how lacking they are in modelling detail compared to the central monument. This demonstrates how designers of virtual heritage may have to diminish accuracy in favour of other aspects of the design. The proposed increased feeling of being there and its contribution to an emotional understanding of the site, combined with other material such as the panoramic photographs that present the site more literally, means that understanding may not be as negatively impacted by inaccuracies as the virtual heritage literature states.

The use of personal photographic experience is legitimate from a phenomenological psychology viewpoint Seamon claiming phenomenological method as a form of radical empiricism:

> If the phenomenon being studied is some artifactual text—for example, photographs, a novel, music, or a landscape—the researcher must find ways to immerse herself in the text so that she becomes as familiar as possible with it. Thus, she might carefully study the text and thoroughly record her experience and understanding. She might ask other parties to respond to the text and provide their insights and awareness. Or she might study other commentator’s understandings of the text—for example,
reading reviews of the novel or studying all critical commentaries on the author or artist in question.\textsuperscript{766}

However, this reliance on secondary sources raises the question as to why the real-life experience of someone else was not used. I could have incorporated a real-world experience of the Vitthala Temple into the design process by using phenomenological method on someone who had visited the temple. I chose not to do so for a number of reasons. Firstly, the people involved with the project and exhibition who had visited the temple were experts in heritage and archaeology. Their experience would not have been that of a typical tourist, so using these experiences may have created disconnection with non-expert audiences of the Virtual Vitthala Temple. Secondly, they have visited the temple on more than one occasion; each visit not only adds new knowledge, but changes the remembered past experience.\textsuperscript{767} In seeking to create an emotionally powerful first visit for virtual visitors, documenting a more nuanced result of a series of expert visits may not have been appropriate.

Sound was an important design consideration. Sound provides supporting sensations to aid the message of the visual communication of the design. Since I needed to augment the feeling of being there by exploiting as many senses as possible, creating an enriched multisensory experience, sound could add a great deal to the feeling of presence. With the limitations on interactivity of X3D and the video walk-through, sounds of striking the musical colonnettes play as a continuous loop when the viewer is in the central monument, with ambient sounds of people and music at the temple playing in other areas of the temple (see figure 5.40).

The sound of people in the space is meant to be at odds with the lack of people in the scene, creating an eerie feeling that the people have just left, or are just out of sight. In the Unity file, the sounds of colonnettes are attached to

\textsuperscript{766} Seamon, 2000, p. 7.
\textsuperscript{767} Spinelli, pp. 12–13.
the colonnettes themselves so that they sound when the viewer clicks them. Ambient sound plays throughout the scene and the viewer can hear footsteps on stone when they move in the virtual environment.

Figure 5.35: Standing inside the central monument, looking north. The audience hears the sounds of columns being struck around them.

Figure 5.36: A sound map of the Virtual Vitthala Temple.
By using phenomenological method I could analyse affective responses to the design research material, finding out what phenomena triggered them and incorporating those elements into the design process. The use of the method in this applied project demonstrates how designers could use photographs, descriptions or videos in a situation where there is no immediate experience of an environment.

5.9 A walkthrough of the Virtual Vitthala Temple

The end product was a virtual heritage file that could be viewed by most visitors to the website through an X3D plugin, or as a movie walkthrough. The Unity file is too large to quickly download from a website so it is viewed as an executable file on a computer. The following pages describe the experience of the movie walkthrough. The large image shows the initial view from the position indicated by an x on the map. The thumbnail images at the bottom of the page show the transition between places, illustrating the written description of the journey.
I am in a temple, looking at the illuminated columns. There are intricately carved columns all around me, illuminated by lights on the floor. It is evening and I can hear the sound of hollow columns being struck. The pitch varies as different columns sound. The sound comes from all around me. I hear music and people’s voices, but I can’t see anyone. I see a darkened doorway in front of me. I cannot enter so I turn further right to see what lies outside the monument. I can see hills in the distance and more grey, granite buildings. I start walking out of the monument towards the courtyard. I am curious to see what lies out there. As I walk out, the sound of the columns fades.
I am in the courtyard. It is empty but I can hear the sounds of many people talking and playing music. The noise belies the emptiness in front of me, as if there are many invisible people here carrying on with activities that I cannot see. There are hills in the distance and the sky is getting darker as night approaches. I walk down the stairs and find stone paving beneath my feet. There is a stone wall in front of me, a pillared hall and a large tower. I look to my left to and see a solitary tree growing in the courtyard. I keep turning left to see the brightly lit central monument from the outside.
Figure 5.43: Beside the central monument.

I can see an intricately carved stone chariot pulled by two stone elephants in front of the central monument. There is another tower with an opening that leads out of the temple complex. There are more pillared monuments in the distance. The scene feels empty although I hear the sounds of the missing people. I walk around the front of the temple and look towards it.

Figure 5.44: Walkthrough map. The X indicates current location.

Figure 5.45: Thumbnails showing movement.
I am at the front of the central monument, looking at the columns. There is a staircase in front of me, inviting me in. The staircase is flanked by two stone elephants, larger than the ones in front of the stone chariot. I start walking towards them and climb the stone stairs. As I walk towards it, the monument overwhelms me with its size. I am inside the monument and the hollow, musical notes of the columns sound again. This time, I look to my left to see what lies outside the monument in that direction. I start walking.
I can see another tower beyond the interior of the monument. It looks much like the other two towers and leads out of the temple site to the south. I start walking towards the stairs that lead outside. I climb down the stairs and look to my right where new structures greet me. Staring down towards the building at the far end of the courtyard I feel the emptiness of the area. It seems as if the buildings form a corridor that stretches on into the distance. I can hear the invisible people again and I wonder what they are doing. I turn to the right to face the central monument again, and keep turning.
I am looking at the stone chariot from the other side of the central monument. Clouds drift overhead as I look around the temple. I walk towards the chariot, looking at the glowing columns as I pass. I am now in front of the stone chariot, staring at its carvings and looking beyond it to the enormous tower in the background. I walk towards the stone chariot to get a better look.
I am in front of the large stone chariot. Its wheels are almost as tall as me. I want to feel the rough stone of the elephants under my hands and to touch the carvings on the large tower, but I am held back and can only look. I turn towards the central monument, looking over the wide, empty courtyard. The warmly glowing columns are inviting compared to the cold grey of the surrounding area. I walk up the stairs one more time and finish my journey surrounded by the glowing columns and their percussive musical sounds.
5.10 Phenomenological method and user testing

User testing is an important part of software design.\textsuperscript{768} According to Jeffries and Desurvire, more problems are revealed in HCI testing with users than through other heuristic methods of problem detection.\textsuperscript{769} Traditionally usability testing in HCI measures task support and how usable the design is, rather than gathering data about holistic experiences.\textsuperscript{770} Surveys are one method of user testing that allows researchers to gather data about affective, behavioural and cognitive information. Microsoft Game Studios, for example, use surveys as one of their testing methods in finding out how fun their games are.\textsuperscript{771} There are benefits to conducting surveys on user experience. They do not require direct researcher observation, being less labour intensive.\textsuperscript{772}

Previous Place-Hampi testing involved a visitor survey. The survey asked 284 respondents about feelings of co-presence, dwelling and immersion, interaction and performance, and virtual embodiment.\textsuperscript{773} The survey was significant, being one of the first to extensively evaluate virtual heritage for a large, multicultural audience.\textsuperscript{774} The four page questionnaire used a phenomenological framework, gathering data through questions grouped using the following themes:

1. Orientation, navigation, negotiation and spatio-temporal issues.
2. Bodily experience of the space, or embodiment.
3. The relationship between user and content, cross-cultural aspects and the cinematic.

\textsuperscript{772} Pagulayan et al., p. 147.
\textsuperscript{774} Kenderdine, Shaw & Kocsis, p. 249.
4. The relationship between user and interface usability, participation, co-presence and orientation.
5. Level of immersion or presence.
6. Flow or the time spent in the experience and level of involvement.
7. Social experience levels.\textsuperscript{775}

The survey gathered useful data, such as which parts of the body visitors most felt the experience. 145 people felt that they fully or partially lost ‘awareness of other visitors’, where 137 responded that they felt it was a ‘social experience’ that they ‘shared with other people’\textsuperscript{776}

The survey conducted on Place-Hampi was not suitable for testing the Virtual Vitthala Temple. Surveys such as the Place-Hampi questionnaire or the Questionnaire for User Interaction Satisfaction (QUIS) can evaluate a person’s overall experience and elements of the experience, but they do not provide a method for analysing the relationships between the elements.\textsuperscript{777} Where surveys give broad insight into preferences, usability studies provide in-depth insight into actions and behaviour.\textsuperscript{778} The Place-Hampi survey asked questions about the shared experience, where the Virtual Vitthala Temple represents a solitary experience, used by one person on one computer. Many of the questions were specific to the AVIE interface, such as whether the 3D perception while wearing glasses was effective, or specific to the design of the 3D experience, such as how many locations the respondent visited. With some modification, the survey could be used to evaluate the Virtual Vitthala Temple, but to answer questions of affect, information and phenomenological relationships between the two, this thesis needed to use another testing method.

\textsuperscript{775} Kenderdine, Shaw & Kocsis, p. 251..
\textsuperscript{776} Kenderdine, Shaw & Kocsis, pp. 251-252.
\textsuperscript{778} Pagulayan et al., p. 149.
After using phenomenological method to analyse the designer’s experience and use the data as a generative design tool, I adapted the method to conduct user testing. Chapter 3 discussed how phenomenological method interrogates the relational elements of experience. The research has also used it to analyse the interplay of affect and information in the viewers’ experience of the Virtual Vitthala Temple. Rather than ask viewers to write down their responses during or after the experience, I recorded them speaking their thoughts out loud during the experience, a technique called ‘think-aloud’. By combining phenomenological method with think-aloud techniques, the testing documented an experience as it was happening, rather than rely on the viewer’s memory later. The viewer could bring up issues that were important to them rather than answering a set of questions that were important to the researcher.

There are challenges in direct observation and the use of think-aloud methods. Experience testing using direct researcher observation is labour intensive as the researcher must be present for the user experience, has to document the experience then has to analyse the documentation later. This can create rich documentation, but it can also be biased and misleading. In trying to do two things at once—interact with the virtual environment and report verbally—the viewer can become distracted and do both tasks poorly. Talking through their activity may alter their behaviour.

Other testing methods can involve screen capture video or logs of viewer behaviour. This can show what the viewer did, but not why they did it or what they were thinking when it happened, making non-intrusive testing methods unsuitable for this thesis.

779 Norman & Panizzi, p. 247.
780 Norman & Panizzi, p. 248.
781 Norman & Panizzi, p. 247.
782 Norman & Panizzi, p. 248.
783 Norman & Panizzi, p. 250.
5.11 A phenomenological analysis of viewer experience

Eleven people participated in the user testing of the Virtual Vitthala Temple, eight female, three male. Participants volunteered by responding to posters in the Prahran campus of Swinburne University of Technology. The participants came largely from the Faculty of Design, with one person coming from the National Institute of Circus Arts. None of them had visited the physical site of the Vitthala Temple or Hampi. A couple had visited other Indian temples.

Each person used the Virtual Vitthala Temple on a desktop computer. Participants were told before the experience that they would be conducting user-testing on a virtual heritage environment and that the purpose of the test was to measure affective and cognitive information as they experienced it. The length of user experiences ranged from 6:58 minutes to 20:55 minutes. The people were asked to speak their thoughts out loud while interacting with the virtual environment, a technique called Think-Aloud or Talk-Aloud. I recorded this and transcribed the results. I divided the transcriptions into meaning units and analysed the results using the stages of phenomenological method outlined in Chapter 3.

Phenomenology stresses that each individual experience is unique. It is difficult to compare data obtained using phenomenological method without the risk of generalising the experience. The representation of results in Table 5.2 does not seek to imply a sameness of experiences. The categories are intentionally broad and cover a range of phenomena, tabulation of the number of times a theme is mentioned demonstrating patterns within the experiences.
<table>
<thead>
<tr>
<th>Phenomena</th>
<th>Viewer 1</th>
<th>Viewer 2</th>
<th>Viewer 3</th>
<th>Viewer 4</th>
<th>Viewer 5</th>
<th>Viewer 6</th>
<th>Viewer 7</th>
<th>Viewer 8</th>
<th>Viewer 9</th>
<th>Viewer 10</th>
<th>Viewer 11</th>
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<td>Affective states</td>
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</table>

Table 5.2 Summary of data from user testing
I printed the second state analysis for each person, cut them out and rearranged them to cluster similar information within the one person’s experience. I recorded these patterns of information in a table and found larger themes within the clusters that formed the categories for the table. ‘Information’ contains the sub-categories of interpretation, matching information and reading. ‘Current experience’ contains completeness, expectations and experiential parameters and so on. The number of times a theme is mentioned is not based on absolute numbers, otherwise experiences yielding more data such as the 20:55 minute experience would be disproportionately represented. To give equal weighting to each person’s experience, I represent the themes as percentages of the data reported. Sometimes the data exceeds 100% because a meaning unit can fit into two categories, or due to the rounding of numbers.

A ranking of the themes shows the themes most often mentioned in the think-aloud protocols.

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>332</td>
<td>Space and movement</td>
</tr>
<tr>
<td>260</td>
<td>Virtual phenomena</td>
</tr>
<tr>
<td>132</td>
<td>Information</td>
</tr>
<tr>
<td>121</td>
<td>Past experiences</td>
</tr>
<tr>
<td>78</td>
<td>Shared experiences.</td>
</tr>
<tr>
<td>64</td>
<td>Interactivity</td>
</tr>
<tr>
<td>33</td>
<td>Current experience</td>
</tr>
<tr>
<td>32</td>
<td>Affective states</td>
</tr>
<tr>
<td>22</td>
<td>External phenomena</td>
</tr>
<tr>
<td>20</td>
<td>Glitches</td>
</tr>
<tr>
<td>17</td>
<td>Time</td>
</tr>
<tr>
<td>6</td>
<td>Future experiences</td>
</tr>
</tbody>
</table>

Table 5.3 Ranking sort of second state analysis themes

The ranking reveals the most mentioned theme to be space and movement. People reported where they were moving in the virtual environment and many experimented with movement early in the experience. One of the reasons
space and movement is so often mentioned is because of technical issues with navigation. Rather than class navigation problems as technical issues, or glitches, I categorised them with other reports of navigation and movement because often the viewer overcame the problem on their own and the problem formed an intrinsic part of their movement around the virtual environment.

The second most frequently mentioned theme is the virtual phenomena of the experience, where people spoke about what they were seeing and hearing. This theme included appearance, audio, details, lighting, materiality, modality and textures. People reported that they were attracted by high quality, intricate details on surfaces and disappointed when the details were lacking. They were impressed by the lighting, but many interpreted the lighting system in ways that were not intended in the design. One viewer reported that the time of day changed depending on where she moved in the environment because the sky was lighter in some sections. Several decided that the lights below the pillars were candles when in reality they are electric lights. Viewers’ likes and dislikes, as well as misinterpretations, can be used in an iterative design process to improve the virtual environment.

The third most often mentioned theme was information. This covered two general concepts, the desire for additional information in the environment and the matching, or mismatching, of current information to information from past experiences. Most of the viewers wanted more information about the real life Vitthala Temple. A few wanted rollovers and pop-up windows to provide information, others suggested voice-over narratives and one proposed interactive and non-interactive characters in the environment to deliver information from a human perspective. Many wanted a variety of methods available so that people could choose the method that suited them best.

Fourth most often mentioned theme was past experience. The viewers often used their previous experiences to create a role for themselves, gamer or
tourist, for instance. Even when a person had no direct past experience of an Indian temple, they referred to other cultural sites or historic buildings they had visited. If the phenomena they encountered in the virtual environment differed greatly from what they had experienced before, this often diminished the feeling of reality. Sometimes, however, these differences were perceived as beneficial to the experience. An absence of people meant no large noisy crowds to try to move through to see the temple, for instance. This suggests that matching phenomena should be done carefully to positively shape the person’s experience. However, since no two people have the same past experience and each person interprets the phenomena differently this would be a challenge.

The summary of results presents general themes that occurred in viewer experiences, but it does not reflect the strength of phenomenological method. To preserve the individuality of experience phenomenological method is used to analyse patterns and themes within one person’s experience, looking at relationships between the different meaning units. Rather than generalising an experience, it burrows down to find deeper meaning. I used phenomenological method to find deeper individual meaning in each viewer’s transcript. On the following pages I present the transcript of Viewer 1 and its analysis to demonstrate how the method is used.

The full transcript of the experience of Viewer 1.

Umm so I’m approaching this as a tourist would, the space, is that the idea? I mean, that’s the way, I guess, I have been to a few Indian temples before and I have always been there as a tourist. So I guess that’s the way that I would probably think of it.

Okay. So my first impressions: The music sounds quite authentic from what I remember. If you could just have some wafting smells of all sorts... that would be better. (Laughter)
In terms of creating, how ‘real’ this experience feels, the instant thing that feels different to me is that there’s no people or movement. In terms of when I remember other places and what I would expect of a temple if I was to visit one again that there would be movement and lots of noise and, there’s noise there, but mess and chaos and everything that goes with it. So this looks a lot more calm and peaceful, which is probably more attractive in terms of exploring.

It’s an evening kind of theme too, which is different to most of my experiences.

Just getting used to the way that you navigate. I look up and down with the mouse, but not left and right.

This does look different to the other ones that I've been to before.

Probably a bit of a 3 ... ooh very fast... 360. Sorry about that.

So I can see that there’s sort of a perimeter space with buildings in the middle and the middle one’s lit which looks more welcoming like I could go there. The darker places look less inviting, like maybe they’re not open or maybe there’s nothing in there to look at.

Okay. So I’ll go to the lit space first. I’ll go up the stairs. It does feel like a video game, but I’m not a particularly familiar with video game person. So in a sense controlling things without it feeling ‘jutty’, I suppose, or rushed is something that I’m not very experienced with.

The surfaces. The texture on the surfaces is interesting to see because I remember there were a lot of carvings and relief artwork... it does feel flat, but I think that’s obviously a part of the rendering of a ... the digital interface. That causes it could probably do it in amazing detail but it would be ridiculous to actually have a look at, to actually navigate.

Walking through this space you get a sense of being inside, inside the... underneath or... on the outside.
I wonder what’s inside here ... this is one of the darker places. I don’t know if there’s anything there but probably not. No. I’ll go backwards out of the dark space.

Now as far as I can see there’s no obvious way down except for maybe the way that I came in, so I’ll go out that way. I hope I’m not making you feel nauseous with my poor driving.

So ... walking around, I’ll go have a look at one of the other places. As far as I can see it doesn’t look like you can go inside.

So I’ll check around the back.

I think my poor driving skills are probably a bit of a distraction for me. I’m not very good at this.

This open space with a perimeter and a few buildings inside of it are definitely reflective of my real experiences of being at an Indian temple. I do remember them as having often sort of perimeter structures, maybe even a walkway all the way around so it looks familiar in that sense.

Representation of like a stone floor is what I’m... which is... I’ll go up to this structure here and see if there’s anything else... I’m not sure if there’s anything else that I should be able to find, whether there’s any insides or exhibits or anything. I suppose that’s for me to discover... so I’ll look around in case there is.

Another thing I remember about the real temples is that there was always the human element, so, beggars or worshippers or people who were working there. It was always busy and that was a big part of the experience of being there, so that’s different in this experience. Maybe in a good way. (Laughter).

You don’t have to take your shoes off here.
I don’t think I can go out there. I can’t go out the perimeter so that’s okay. I can see that there’s a different entry up to the middle part that I was at before. So I might go and have a look there. It looks a little bit lighter from this way so maybe, maybe there’s stuff inside. I’ll go up the stairs, try and not run into a wall.

So inside this space, which I can’t go in any further,, but I can see inside it, so I would, if I could see other things inside there I would be happy to go in and explore them, but it’s not allowing me to, so, that’s fine.

So on the basis of that I think that I haven’t missed any, like my thinking is that I’ve experienced most of what the space is like and I haven’t missed any sort of buildings or exhibits or features of the creation space that I should have...so I feel like I’ve seen ... that I’ve seen it.

I then placed a mark to separate meaning units in the transcript. The research question determined the criteria for where these marks should go. I indicated where the viewer talked about affect or information in their experience.

Umm so I’m approaching this as a tourist would, the space, is that the idea? I mean, that’s the way, I guess, I have been to a few Indian temples before and I have always been there as a tourist. So I guess that’s the way that I would probably think of it. /

Okay. So my first impressions. The music sounds quite authentic from what I remember./ If you could just have some wafting smells of all sorts... that would be better. (Laughter)/

In terms of creating, how ‘real’ this experience feels, the instant thing that feels different to me is that there’s no people or movement./ In terms of when I remember other places and what I would expect of a temple if I was to visit one again/ that there would be movement and lots of noise and, there’s noise there, but mess and chaos and
everything that goes with it. So this looks a lot more calm and peaceful, which is probably more attractive in terms of exploring./

It’s an evening kind of theme too, which is different to most of my experiences./

Just getting used to the way that you navigate. I look up and down with the mouse, but not left and right.

This does look different to the other ones that I’ve been to before./

Probably a bit of a 3 ... ooh very fast... 360. Sorry about that.

So I can see that there’s sort of a perimeter space with buildings in the middle and the middle one’s lit/ which looks more welcoming like I could go there./ The darker places look less inviting, like maybe they’re not open or maybe there’s nothing in there to look at./

Okay. So I’ll go to the lit space first. I’ll go up the stairs./ It does feel like a video game/ but I’m not a particularly familiar with video game person. So in a sense controlling things without it feeling ‘jutty’, I suppose, or rushed is something that I’m not very experienced with.

The surfaces. The texture on the surfaces is interesting to see/ because I remember there were a lot of carvings and relief artwork/... it does feel flat/ but I think that’s obviously a part of the rendering of a ... the digital interface./ That causes it, could probably do it in amazing detail but it would be ridiculous to actually have a look at, to actually navigate./

Walking through this space you get a sense of being inside, inside the ... underneath or ... on the outside./

I wonder what’s inside here ... this is one of the darker places./ I don't know if there’s anything there, but probably not. No. I'll go backwards out of the dark space. /
Now as far as I can see there’s no obvious way down except for maybe the way that I came in, so I’ll go out that way. I hope I’m not making you feel nauseous with my poor driving.

So ... walking around, I’ll go have a look at one of the other places. As far as I can see it doesn't look like you can go inside.

So I’ll check around the back.

I think my poor driving skills are probably a bit of a distraction for me. I’m not very good at this.

This open space with a perimeter and a few buildings inside of it are definitely reflective of my real experiences of being at an Indian temple. I do remember them as having often sort of perimeter structures, maybe even a walkway all the way around so it looks familiar in that sense.

Representation of like a stone floor is what I’m... which is... I’ll go up to this structure here and see if there’s anything else... I’m not sure if there’s anything else that I should be able to find, whether there’s any insides or exhibits or anything. I suppose that’s for me to discover so I’ll look around in case there is.

Another thing I remember about the real temples is that there was always the human element, so, beggars or worshippers or people who were working there. It was always busy and that was a big part of the experience of being there, so that’s different in this experience. Maybe in a good way (laughter).

You don’t have to take your shoes off here.

I don’t think I can go out there. I can’t go out the perimeter so that’s okay. I can see that there’s a different entry up to the middle part that I was at before. So I might go and have a look there. It looks a little bit lighter from this way so maybe, maybe there’s stuff inside. I’ll go up the stairs, try and not run into a wall.
So inside this space, which I can't go in any further, but I can see inside it,/ so I would, if I could see other things inside there I would be happy to go in and explore them/ but it's not allowing me to, so, that’s fine./

So on the basis of that I think that I haven’t missed any, like my thinking is that I’ve experienced most of what the space is like and I haven’t missed any sort of buildings or exhibits or features of the creation space that I should have/...so I feel like I’ve seen ... that I’ve seen it./

The next step was to translate each meaning unit into design terminology. The purpose is not to change the viewer’s experience into design jargon, but to summarise it in a vocabulary useful to the designer.

<table>
<thead>
<tr>
<th>Transcript of Viewer 1</th>
<th>Design terminology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Umm so I’m approaching this as a tourist would, the space, is that the idea? I mean,</td>
<td>The viewer is asking for information about how</td>
</tr>
<tr>
<td>that’s the way, I guess, I have been to a few Indian temples before and I have always</td>
<td>to interact with the design, what role she should take. Given her previous</td>
</tr>
<tr>
<td>been there as a tourist. So I guess that’s the way that I would probably think of it.</td>
<td>experience as a tourist she adopts that role.</td>
</tr>
<tr>
<td>Okay. So my first impressions. The music sounds quite authentic from what I remember.</td>
<td>The viewer compares the sound of the music to the music she remembers from her</td>
</tr>
<tr>
<td></td>
<td>tourist experiences. The information matches, creating a feeling of authenticity.</td>
</tr>
<tr>
<td>If you could just have some wafting smells of all sorts... that would be better.</td>
<td>The viewer states that additional information in the form of smell would improve the</td>
</tr>
<tr>
<td>(laughter)</td>
<td>experience.</td>
</tr>
<tr>
<td>In terms of creating, how ‘real’ this experience feels, the instant thing that feels</td>
<td>There is a lack of information that occurred in her real life experiences, the</td>
</tr>
<tr>
<td>different to me is that there's no people or movement.</td>
<td>presence of people and movement in the scene.</td>
</tr>
<tr>
<td>In terms of when I remember other places and what I would expect of a temple if I was</td>
<td>The viewer includes a feeling of expectation, not just comparing the experience to</td>
</tr>
<tr>
<td>to visit one again</td>
<td>past experiences but to anticipated future experiences.</td>
</tr>
<tr>
<td>that there would be movement and lots of noise and, there’s noise there, but mess and</td>
<td>Also missing from the information is mess and chaos. There is noise in the scene</td>
</tr>
<tr>
<td>chaos and everything that goes with it.</td>
<td>but she now appears to think the noise is different in some way to her original</td>
</tr>
<tr>
<td></td>
<td>experience.</td>
</tr>
<tr>
<td>Statement</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
</tr>
<tr>
<td>So this looks a lot more calm and peaceful, which is probably more attractive in terms of exploring.</td>
<td>She gets a feeling of calmness and peacefulness from the lack of authentic noise, mess and chaos and evaluates that it make the scene more attractive to explore.</td>
</tr>
<tr>
<td>It’s an evening kind of theme too, which is different to most of my experiences.</td>
<td>The information about time of day differs from her own experiences, which were not at that time of day.</td>
</tr>
<tr>
<td>Just getting used to the way that you navigate. I look up and down with the mouse, but not left and right.</td>
<td></td>
</tr>
<tr>
<td>This does look different to the other ones that I've been to before.</td>
<td>The information in the virtual temple is different to the ones she has visited before.</td>
</tr>
<tr>
<td>Probably a bit of a 3 ... ooh very fast... 360. Sorry about that.</td>
<td></td>
</tr>
<tr>
<td>So I can see that there’s sort of a perimeter space with buildings in the middle and the middle one’s lit</td>
<td>She notices the layout of the buildings and the fact that the central monument is lit.</td>
</tr>
<tr>
<td>which looks more welcoming like I could go there.</td>
<td>The light makes the monument seem more welcoming. It gives the impression that she could go there.</td>
</tr>
<tr>
<td>The darker places look less inviting, like maybe they’re not open or maybe there’s nothing in there to look at.</td>
<td>The darker monuments are less inviting. She speculates that this could be because they are closed or there is nothing to look at.</td>
</tr>
<tr>
<td>Okay. So I’ll go to the lit space first. I’ll go up the stairs.</td>
<td></td>
</tr>
<tr>
<td>It does feel like a video game</td>
<td>The feeling she gets from the experience is that it’s like a video game.</td>
</tr>
<tr>
<td>but I’m not a particularly familiar with video game person. So in a sense controlling things without it feeling ‘jutty’. I suppose, or rushed is something that I’m not very experienced with.</td>
<td>She is not experienced with video games or the way to navigate them optimally.</td>
</tr>
<tr>
<td>The surfaces. the texture on the surfaces is interesting to see</td>
<td>She finds the surface textures interesting.</td>
</tr>
<tr>
<td>because I remember there were a lot of carvings and relief artwork...</td>
<td>She recalls information from her previous experiences, that the temples contained a lot of carvings and reliefs.</td>
</tr>
<tr>
<td>it does feel flat</td>
<td>The surfaces feel flat.</td>
</tr>
<tr>
<td>but I think that’s obviously a part of the rendering of a ... the digital interface.</td>
<td>She comes up with an explanation of why it feels flat, that it’s because of the digital rendering.</td>
</tr>
<tr>
<td>That causes it, could probably do it in amazing detail, but it would be ridiculous to actually have a look at, to actually navigate.</td>
<td>She anticipates that it would be possible to render in more detail, but it would create negative aspects to viewing and navigating.</td>
</tr>
<tr>
<td>---</td>
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</tr>
<tr>
<td>Walking through this space you get a sense of being inside, inside the... underneath or... on the outside.</td>
<td>She gets a feeling of being relative to parts of the design, inside, underneath and outside.</td>
</tr>
<tr>
<td>I wonder what’s inside here... this is one of the darker places.</td>
<td>She expresses a sense of curiosity about what is inside a space that is dark.</td>
</tr>
<tr>
<td>I don’t know if there's anything there, but probably not. No. I’ll go backwards out of the dark space.</td>
<td>She anticipates that there is nothing there so she backs away.</td>
</tr>
<tr>
<td>Now as far as I can see there’s no obvious way down except for maybe the way that I came in, so I’ll go out that way.</td>
<td>There is no information about how to go down so she returns the way she came.</td>
</tr>
<tr>
<td>I hope I’m not making you feel nauseous with my poor driving.</td>
<td>She hopes she is not creating a negative experience for the researcher through her poor navigation skills.</td>
</tr>
<tr>
<td>So ... walking around, I’ll go have a look at one of the other places. As far as I can see it doesn’t look like you can go inside.</td>
<td>Looking at another building she evaluates that you cannot enter it.</td>
</tr>
<tr>
<td>So I’ll check around the back.</td>
<td>She adopts another way to inspect the building, by going around the back.</td>
</tr>
<tr>
<td>I think my poor driving skills are probably a bit of a distraction for me. I’m not very good at this.</td>
<td>She evaluates her own navigation skills as being poor. Her lack of navigation skills distract her from the experience.</td>
</tr>
<tr>
<td>This open space with a perimeter and a few buildings inside of it are definitely reflective of my real experiences of being at an Indian temple. I do remember them as having often sort of perimeter structures, maybe even a walkway all the way around</td>
<td>She compares the architectures of the virtual temple with her memories of visiting a real Indian temple.</td>
</tr>
<tr>
<td>so it looks familiar in that sense.</td>
<td>The matching information gives a feeling of familiarity.</td>
</tr>
<tr>
<td>Representation of like a stone floor is what I’m... which is... I’ll go up to this structure here and see if there's anything else... I’m not sure if there’s anything else that I should be able to find, whether there’s any insides or exhibits or anything.</td>
<td>She does not know if there is anything else in the virtual environment to find, such as interiors or exhibits. She navigates around the environment to find out.</td>
</tr>
<tr>
<td>I suppose that’s for me to discover so I’ll look around in case there is.</td>
<td>She explains away the lack of information by saying that it’s her role to find out if there’s anything else to see.</td>
</tr>
</tbody>
</table>
Another thing I remember about the real temples is that there was always the human element, so, beggars or worshippers or people who were working there. It was always busy and that was a big part of the experience of being there, so that's different in this experience.

She compares the information in the virtual environment to her own experience again. The virtual environment lacks people, beggars, worshippers and workers. The fact that the real site is busy was a big part of her previous experiences and that is lacking here.

Maybe in a good way

She evaluates that this lack of busyness might be a positive aspect of the experience.

You don’t have to take your shoes off here.

The virtual environment does not demand the same types of interaction as the real site.

I don’t think I can go out there. I can’t go out the perimeter so that’s okay.

She has no problem with the fact that she cannot go outside the perimeter.

I can see that there’s a different entry up to the middle part that I was at before. So I might go and have a look there. It looks a little bit lighter from this way so maybe, maybe there’s stuff inside. I’ll go up the stairs, try and not run into a wall.

The light and the fact that it is a different entrance suggest to her that there may be something inside the space she was at before.

So inside this space, which I can’t go in any further, but I can see inside it,

There is a mismatch of information, she can see inside the space, but cannot go inside it.

so I would, if I could see other things inside there I would be happy to go in and explore them

If there were things inside the space it would make her happy to go inside to explore them.

but it’s not allowing me to, so, that's fine.

The environment is not allowing her to enter and she is not bothered by that.

So on the basis of that I think that I haven’t missed any, like my thinking is that I’ve experienced most of what the space is like and I haven’t missed any sort of buildings or exhibits or features of the creation space that I should have

She thinks that she has experienced most of the space and hasn’t missed any of the information.

...so I feel like I’ve seen ... that I’ve seen it.

This gives her the feeling that she has finished the experience.

Table 5.4: First level analysis of the transcript of Viewer 1.

Next, the table is expanded to allow a third column where each meaning unit is analysed for overall patterns or relational meaning.
<table>
<thead>
<tr>
<th>Transcript of Viewer 1</th>
<th>Information units in design terminology</th>
<th>Overall meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Umm so I’m approaching this as a tourist would, the space, is that the idea? I mean, that’s the way, I guess, I have been to a few Indian temples before and I have always been there as a tourist. So I guess that’s the way that I would probably think of it.&quot;</td>
<td>The viewer is asking for information about how to interact with the design, what role she should take. Given her previous experience as a tourist she adopts that role.</td>
<td>The viewer slips into a role they adopted in the past, one they are familiar with that seems most appropriate for them in the context of the experience.</td>
</tr>
<tr>
<td>&quot;Okay. So my first impressions. The music sounds quite authentic from what I remember.&quot;</td>
<td>The viewer compares the sound of the music to the music she remembers from her tourist experiences. The information matches, creating a feeling of authenticity.</td>
<td>The viewer finds authenticity in comparing audio information with sounds they remember from their own experience. A match between the two creates authenticity.</td>
</tr>
<tr>
<td>&quot;If you could just have some wafting smells of all sorts... that would be better. (laughter)&quot;</td>
<td>The viewer states that additional information in the form of smell would improve the experience.</td>
<td>Increasing the number of senses involved in the experience may improve the experience.</td>
</tr>
<tr>
<td>&quot;In terms of creating, how ‘real’ this experience feels, the instant thing that feels different to me is that there’s no people or movement.&quot;</td>
<td>There is a lack of information that occurred in her real life experiences, the presence of people and movement in the scene.</td>
<td>A feeling of reality is hampered when information in the virtual does not match remembered information of the real. People and movement would increase the feeling of reality in the scene.</td>
</tr>
<tr>
<td>&quot;In terms of when I remember other places and what I would expect of a temple if I was to visit one again that there would be movement and lots of noise and, there’s noise there, but mess and chaos and everything that goes with it.&quot;</td>
<td>The viewer includes a feeling of expectation, not just comparing the experience to past experiences, but to anticipated future experiences.</td>
<td>People compare current experiences to future expectations of similar experiences, not just to experiences from their past.</td>
</tr>
<tr>
<td>&quot;Also missing from the information is mess and chaos. There is noise in the scene, but she now appears to think the noise is different in some way to her original experience.</td>
<td>Although the sound matches to some degree, it doesn’t match entirely. This meaning unit suggests that the sound needs to match other information in the scene in order for it to be judged completely authentic.</td>
<td></td>
</tr>
<tr>
<td>So this looks a lot more calm and peaceful, which is probably more attractive in terms of exploring.</td>
<td>She gets a feeling of calmness and peacefulness from the lack of authentic noise, mess and chaos and evaluates that it make the scene more attractive to explore.</td>
<td>A difference in experience in not all negative. The sense of peace and calm makes the virtual experience more attractive for exploration.</td>
</tr>
<tr>
<td>It’s an evening kind of theme too, which is different to most of my experiences.</td>
<td>The information about time of day differs from her own experiences, which were not at that time of day.</td>
<td>Time of day is another thing that can be compared to previous experiences.</td>
</tr>
<tr>
<td>Just getting used to the way that you navigate. I look up and down with the mouse, but not left and right.</td>
<td>The information in the virtual temple is different to the ones she has visited before.</td>
<td>Viewers note where the points of difference in experiences are.</td>
</tr>
<tr>
<td>This does look different to the other ones that I've been to before.</td>
<td>Viewers notice differences of lighting.</td>
<td></td>
</tr>
<tr>
<td>Probably a bit of a 3 … ooh very fast... 360. Sorry about that.</td>
<td>So I can see that there’s sort of a perimeter space with buildings in the middle and the middle one’s lit which looks more welcoming like I could go there.</td>
<td>Viewers notice differences of lighting.</td>
</tr>
<tr>
<td></td>
<td>She notices the layout of the buildings and the fact that the central monument is lit.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The light makes the monument seem more welcoming. It gives the impression that she could go there.</td>
<td>Lighting gives the viewer a feeling of welcome, that the space is open for exploration.</td>
</tr>
<tr>
<td></td>
<td>The darker monuments are less inviting. She speculates that this could be because they are closed or there is nothing to look at.</td>
<td>The viewer states that darkness gives the opposite message, that the space cannot be explored or there is nothing to see there.</td>
</tr>
<tr>
<td></td>
<td>The dark places look less inviting, like maybe they’re not open or maybe there’s nothing in there to look at.</td>
<td></td>
</tr>
<tr>
<td>Okay. So I’ll go to the lit space first. I’ll go up the stairs.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>It does feel like a video game</td>
<td>The feeling she gets from the experience is that it’s like a video game.</td>
<td>The experience gives the feeling of a video game.</td>
</tr>
<tr>
<td>but I’m not a particularly familiar with video game person. So in a sense controlling things without it feeling ‘jutty’. I suppose, or rushed is something that I’m not very experienced with.</td>
<td>She is not experienced with video games or the way to navigate them optimally.</td>
<td>The viewer judges her own ability to navigate the environment and finds herself wanting because she has little experience in similar virtual environments.</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>The surfaces. the texture on the surfaces is interesting to see</td>
<td>She finds the surface textures interesting.</td>
<td>The surface textures give interest to the scene.</td>
</tr>
<tr>
<td>because I remember there were a lot of carvings and relief artwork...</td>
<td>She recalls information from her previous experiences, that the temples contained a lot of carvings and reliefs.</td>
<td>The reason for this interest is because she can compare it favourably with the surface details of her previous experience.</td>
</tr>
<tr>
<td>it does feel flat</td>
<td>The surfaces feel flat.</td>
<td>The surfaces feel flat compared to her memory of real surfaces in her previous experience.</td>
</tr>
<tr>
<td>but I think that’s obviously a part of the rendering of a ... the digital interface.</td>
<td>She comes up with an explanation of why it feels flat, that it’s because of the digital rendering.</td>
<td>The viewer rationalizes why the surface feels flat and puts it down to the mediating technology.</td>
</tr>
<tr>
<td>That causes it, could probably do it in amazing detail but it would be ridiculous to actually have a look at, to actually navigate.</td>
<td>She anticipates that it would be possible to render in more detail but it would create negative aspects to viewing and navigating.</td>
<td>The viewer adds arguments explaining why fixing that problem through technology would not create a better experience.</td>
</tr>
<tr>
<td>Walking through this space you get a sense of being inside, inside the... underneath or... on the outside.</td>
<td>She gets a feeling of being relative to parts of the design, inside, underneath and outside.</td>
<td>She feels her location in relation to other parts of the virtual environment.</td>
</tr>
<tr>
<td>I wonder what’s inside here... this is one of the darker places.</td>
<td>She expresses a sense of curiosity about what is inside a space that is dark.</td>
<td>Although she earlier stated that darkness was uninviting and suggested nothing to see, she wonders what is inside one of the dark areas of the environment.</td>
</tr>
<tr>
<td>I don’t know if there's anything there but probably not. No. I’ll go backwards out of the dark space.</td>
<td>She anticipates that there is nothing there so she backs away.</td>
<td>At the same time she expects there is nothing in the dark space.</td>
</tr>
<tr>
<td>---</td>
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<td>---</td>
</tr>
<tr>
<td>Now as far as I can see there’s no obvious way down except for maybe the way that I came in, so I’ll go out that way.</td>
<td>There is no information about how to go down so she returns the way she came.</td>
<td>When no new information presents itself for her to solve navigation problems she follows a path she used before.</td>
</tr>
<tr>
<td>I hope I’m not making you feel nauseous with my poor driving.</td>
<td>She hopes she is not creating a negative experience for the researcher through her poor navigation skills.</td>
<td>She invites the researcher into her experience, apologizing for a self-judged deficiency in her part of presenting the experience.</td>
</tr>
<tr>
<td>So ... walking around, I’ll go have a look at one of the other places. As far as I can see it doesn’t look like you can go inside.</td>
<td>Looking at another building she evaluates that you cannot enter it.</td>
<td>The viewer judges her potential for agency through the visual appearance of the spaces.</td>
</tr>
<tr>
<td>So I’ll check around the back.</td>
<td>She adopts another way to inspect the building, by going around the back.</td>
<td>She uses navigation as a problem-solving device. If one path is blocked to navigation she uses an alternative route to find out more about an area.</td>
</tr>
<tr>
<td>I think my poor driving skills are probably a bit of a distraction for me. I’m not very good at this.</td>
<td>She evaluates her own navigation skills as being poor. Her lack of navigation skills distract her from the experience.</td>
<td>Problems with navigation distract the viewer from the overall experience. They then lead to negative self-judgement about her role in the experience.</td>
</tr>
<tr>
<td>This open space with a perimeter and a few buildings inside of it are definitely reflective of my real experiences of being at an Indian temple. I do remember them as having often sort of perimeter structures, maybe even a walkway all the way around</td>
<td>She compares the architectures of the virtual temple with her memories of visiting a real Indian temple.</td>
<td>The viewer finds that the layout of the virtual environment matches the layout of comparable real environments.</td>
</tr>
</tbody>
</table>
so it looks familiar in that sense. | The matching information gives a feeling of familiarity. | Matching information creates a feeling of familiarity.

Representation of like a stone floor is what I’m... which is... I’ll go up to this structure here and see if there’s anything else... I’m not sure if there’s anything else that I should be able to find, whether there’s any insides or exhibits or anything. | She does not know if there is anything else in the virtual environment to find, such as interiors or exhibits. She navigates around the environment to find out. | The viewer uses navigation to find out what is available to interact with or look at.

I suppose that’s for me to discover so I’ll look around in case there is. | She explains away the lack of information by saying that it’s her role to find out if there’s anything else to see. | She adopts a role of explorer in answer to this lack of information.

Another thing I remember about the real temples is that there was always the human element, so, beggars or worshippers or people who were working there. It was always busy and that was a big part of the experience of being there, so that’s different in this experience. | She compares the information in the virtual environment to her own experience again. The virtual environment lacks people, beggars, worshippers and workers. The fact that the real site is busy was a big part of her previous experiences and that is lacking here. | The viewer finds that the human element is one of the biggest parts of an experience at a site like this. That human element is lacking in the Virtual Vitthala Temple.

Maybe in a good way | She evaluates that this lack of busyness might be a positive aspect of the experience. | Some parts of the human element in experiences are negative, so the lack of human presence may even be good in the virtual environment.

You don’t have to take your shoes off here. | The virtual environment does not demand the same types of interaction as the real site. | Real environments demand a different set of interactions to be culturally appropriate to the space.

I don’t think I can go out there. I can’t go out the perimeter so that’s okay. | She has no problem with the fact that she cannot go outside the perimeter. | The viewer responds neutrally to being restricted from leaving the temple complex.
I can see that there’s a different entry up to the middle part that I was at before. So I might go and have a look there. It looks a little bit lighter from this way so maybe, maybe there’s stuff inside. I’ll go up the stairs, try and not run into a wall.

The light and the fact that it is a different entrance suggest to her that there may be something inside the space she was at before.

Two things invite the viewer to new areas: a change in light and an obvious entrance.

So inside this space, which I can’t go in any further, but I can see inside it,

There is a mismatch of information, she can see inside the space but cannot go inside it.

The viewer predicts that she would have been happy if the information matched. She would have been happy to enter and explore a space that she could see inside.

so I would, if I could see other things inside there I would be happy to go in and explore them

If there were things inside the space it would make her happy to go inside to explore them.

She thinks that she has experienced most of the space and hasn’t missed any of the information.

A feeling of experience completion is created when the information she has experienced far outweighs the information she thinks she may have missed.

but it’s not allowing me to, so, that's fine.

The environment is not allowing her to enter and she is not bothered by that.

She views the environment as permitting or prohibiting travel. She does not respond negatively to this restriction, though.

So on the basis of that I think that I haven’t missed any, like my thinking is that I’ve experienced most of what the space is like and I haven’t missed any sort of buildings or exhibits or features of the creation space that I should have

This gives her the feeling that she has finished the experience.

...so I feel like I’ve seen ... that I’ve seen it.

Table 5.5: Second level analysis of the transcript of Viewer 1
I drew the following information from the transcript of Viewer 1. The viewer adopts the role of a tourist, a role she has experienced previously when interacting with similar sites in the real world. Her experience is with real world heritage sites, she has little experience with virtual environments. Her lack of experience with virtual environments makes her think she will perform poorly during the user-testing experience.

She is attracted to the surface textures, but finds they are lacking compared to the surfaces she has seen at real life heritage sites. She blames the mediating technology for this deficiency and thinks that improving the textures won't necessarily create a better user experience due to other technological factors like rendering time. Adding people and movement to the environment would increase the feeling of reality since the human element is the biggest part of an experience like this. However, she believes that sometimes the experience benefits from there being no people. An empty environment is peaceful and relaxing.

The viewer constantly compares information in the virtual environment to her own past as well as future hypothetical experiences. The set of appropriate interactions in a virtual heritage environment are different to a real world cultural heritage environment. Sometimes the mismatching information diminishes the feeling of reality, such as when the sound doesn't match expectations. When information doesn't match the viewer's experience, it seems less real. However, the temple feels more peaceful and calm without noise and crowds and is attractive to explore. The viewer compares the current experience with her past experiences and when the information matches it gives a feeling of familiarity and authenticity. However, sometimes it is good. The comparison of information can be as small as the time of day in which the experience is set.
The participant reports that providing stimuli for additional senses could improve the experience. The contrast between light and dark creates an obvious entrance and point of interest for the viewer. The light areas feel welcoming, however the viewer is left wondering what is in the dark places. She doesn't expect to find anything in there.

If the viewer can see inside a space she would like to explore it. She judges whether she can navigate through or act on a space or object by its visual appearance. When it comes to her movements around the virtual environment she feels that the environment itself is restricting where she can go, but she doesn't mind that. If an area is blocked off she tries to find another way to access it. If she can't find an alternative way to get there she returns to a path she has followed before.

Although the experience of this participant was unique, generalised theory is possible based on patterns drawn from the data. These patterns can be compared to other viewers’ experiences to see if they can establish broader suggestions for the design of virtual heritage. A phenomenological analysis of the viewers’ think-aloud transcript found patterns in the viewers’ experiences. These patterns suggest broad recommendations for designers of virtual heritage:

- Viewers tend to adopt roles based on their own experiences. These roles provide sets of behaviours, appropriate or inappropriate for the environment. Providing appropriate roles may reduce stress expressed in individual who don’t know how they are expected to act.
- Past experiences set an expectation for information the viewer thinks they will encounter in the virtual environment. A mismatch in information may not create a negative experience, in some instances a mismatch can be positive, but it will hamper the feeling of how ‘real’ the experience is.
- Increasing modality through additional senses will not necessarily increase a sense of authenticity unless the information provided matches the information expected by the viewer.
• Comparing a virtual environment to past experience means that many people will compare it to their experience of computer games rather than their experiences in the real world. This can create a negative experience where a person worries they have insufficient experience to use the environment correctly. It can foster a set of inappropriate expectations or interactions, for example, spending time looking for ‘Easter Eggs’, or secret information hidden in the environment, or thinking that someone will jump out and start shooting at them in a peaceful temple environment.

• Viewers persistently sought additional information, usually by asking questions of the researcher about the environment, but also stating what sort of information they would like provided in the Virtual Vitthala Temple. Information provides purpose as well as a context for the experience.

• Most of the information the viewers wanted was about the original site itself. Some questions were asked about the construction of the virtual environment.

• Lighting creates a mood for the environment and can act as a cue for sets of interactions. Light areas appear inviting. However, sometimes dark areas will appear mysterious and therefore invite further inspection by being different to the surrounding environment.

• People will react to socially agreed cues in the environment to decide on certain actions. An obvious doorway or entrance will invite the viewer to try to walk through, even if darkness suggests they are not welcome.

• Some parts of the experience may be more enjoyable than an actual visit to the original site. This creates a possibility that the viewer would be disappointed that the real life environment is messy, noisy, busy or otherwise less attractive. Increased authenticity of the environment could minimise this, but given the inherent differences between a real world environment and a virtual environment it remains a concern. As technology improves and virtual environment increase in verisimilitude this concern is likely to increase over time.
The patterns of behaviour provided generalised knowledge for the use of phenomenological method and think-aloud techniques in the user testing of virtual heritage:

- There may be a tendency to try to please the researcher, resulting in biased self-reporting. Where viewers found negative aspects to their experience some presented a justification of the problem, reframed it to present it as a positive experience or blamed themselves for what happened.

- The act of thinking aloud acts against a feeling of presence. For a person to feel present in a virtual environment they must immerse themselves in the virtual environment, ignore the mediating technology and withdraw from their physical environment. Speaking their thoughts out loud requires a constant engagement with the researcher in the physical environment and demands the viewer constantly assess the workings of the mediating technology as well as the virtual environment. Not surprisingly none of the viewers tested in this thesis reported a sense of ‘being there’ and one reported that despite their feeling of engagement with the virtual environment they did not feel like they were really there.

- The pervasive use of think-aloud technique in usability testing makes it difficult to use for non-usability testing. Many of the viewers spent time reporting on usability issues of navigation and interactivity rather than informational or affective issues of experience, presumably because this is how they would have heard of the technique in the past. This, however, could be due to most viewers being recruited from a faculty of design where they would be used to think-aloud as a method of testing usability.

- Phenomenological method traditionally uses text for its analysis of experience. This makes it unsuitable to analyse non-textual information such as yelps of joy or surprise, or non-verbal information of facial expressions. Breaking up and analysing the text after the experience divorces it from its context. The viewer’s speech is cleaved from
behaviours during the experience making it difficult to align what the viewer thought with what they did.

5.12 Further development of the Virtual Vitthala Temple

Use of scripting in Unity or, in future developments, using JavaScript with WebGL, would enable a tailored personal experience. For instance, Viewer 1 reported a feeling of mismatch that the time of day presented in the virtual environment did not match the typical time of day a tourist would visit an Indian temple. To match virtual information to expected information, a person could choose the time of the day, or even the era in which the architecture is set. Figures 5.63 and 5.64 show examples of how different the virtual environment feels when different times of day are selected.

Figure 5.58: The Virtual Vitthala Temple shown at evening.
The greater the possibilities for change, the more unique the experience will be. A person who remembers their visit to the Vitthala Temple could choose settings that replicate that experience to share their memories with a friend. The website could record the preferences onto a database using server-sided scripting and pass that experience on as the framework for the next person’s experience that they could alter according to their needs. The ability for people to change an environment through their interaction over time adds a feeling of placeness to the virtual environment.\textsuperscript{784} One of the drawbacks to this is that virtual environment designers must create the elements needed for each permutation, resulting in a more labour-intensive project. However, the additional work for the designers is balanced by the benefit that they are in control of the possible design outcomes and the messages that these outcomes entail. Through this control, designers of virtual environments can prevent people from slowly eroding the original message of the site over time.

\textsuperscript{784} Champion, 2007, p. 7.
5.13 Narratives

People are interested in how people inhabited places in the past, not simply in viewing the architecture.\textsuperscript{785} Viewer 1 stated that people provided the biggest part of her previous experiences of Indian temples, something lacking in the Virtual Vitthala Temple. Several viewers stated that they would have liked to see people using the temple environment to see the context of the temple in use. Including people in the scene, changes the relationship between the person and the environment. It allows for different stories about the site to be introduced, involving different people at different times. There are various ways avatars can enhance a virtual environment. One test participant wished for avatars as tour guides. Several wanted to see how people interacted with the environment. Another possibility suggested in testing was to see the detritus of human interaction, offerings left at altars and other evidence of human interaction. I propose a new way of bringing time, context, people and ritual into the virtual environment, a technique I call ghosting. Currently 3D avatars can be used to stand in for real people at the site. Programming these avatars requires additional scripting, which increases the workload in creating a virtual heritage project. There are some arguments that virtual humans can result in small file sizes and pre-programmed behaviour.\textsuperscript{786} Through the use of tools such as H-Anim, which aims to simplify the modelling and scripting process, this does not necessarily result in a great deal of extra work for 3D designers.\textsuperscript{787}

These 3D models can impede movement around the site and cause frustration because the person viewing the site cannot walk through them.

Turning off collision detection so that people can walk through the avatars

\textsuperscript{785} Roussou & Drettakis, p. 5; Mosaker, p. 18.
reduces the believability of an experience. Ghosting works in a similar way to the videos incorporated into the Place-Hampi experience. Video can be created in one of two ways, either with an actor against a blue-screen that can be keyed out later, or as a 3D character animation. The video can be applied as a texture to a flat surface and activated when a person walks to a given spot in the environment. A short video would appear as if a brief snippet of the history of the site is being played near the person’s viewing position (see figures 5.60 and 5.61).

This technique has a number of advantages over the use of 3D avatars. Firstly, the video files would be short and of low quality, typically producing a smaller in file size than a 3D avatar with its necessary scripting. Secondly, the technique draws on traditional beliefs about ghosts, who do not interact with the person, appearing and disappearing with no announcement; they could interact with the site in the ways they did when they were living there and they are intangible, able to move through objects and have objects move through them. Using video ghosts from different time periods means that the site exists in its own timespace, representing neither past nor present, with the videos drawn from all eras to show snippets of the site’s history. Virtual heritage writers and the user testing in this research suggest that audiences are interested in people, not just objects, ghosts introducing human interest into the virtual environment. The trigger mechanism of user movement would add interaction and purpose to the virtual environment. Observing non-interactive characters going about their tasks would increase the sense of being an outsider looking in and may feel intrusive to the viewer, especially if the viewer is already an outsider to the site and its culture. This use of passive observation would remove any feeling that the viewer could influence the characters and their culture. Ghosts provide a human element appropriate to the experience, giving a focus to the experience and circumventing issues of

789 Roussou & Drettakis, p. 5; Mosaker, p. 18.
an empty heritage site. The use of ghosts to demonstrate culturally appropriate actions could stop users who are experienced in computer game virtual environments from expecting culturally inappropriate violent actions.

Figure 5.60: Lord Vishnu dances at the temple. An example of how a 3D avatar could work as a ghosted movie clip.

Figure 5.61: Women and children on the steps of the central monument. An example of how a video clip of people could work as a ghosted movie clip.

Concluding remarks

Case studies often raise issues for which there are no easy answers. The case study of the Virtual Vitthala Temple sought to reconcile conflicting technological, theoretical and practice-driven requirements, revealing the
challenges in combining knowledge from phenomenological psychology, presence, virtual heritage, information design and experience design to incorporate it within design practice.

The Virtual Vitthala Temple case demonstrates the use of phenomenological method as a design tool and as a method for user testing. The designer can use phenomenological method to analyse their own experience, or the experience of others. Using the design or research question to determine breaks of meaning units focuses the analysis on data that is useful to the design process.

As a tool for user testing, phenomenological method balances the input of viewers and designers. The viewers determine what information is important to them in the experience through their selection of what to report using the think-aloud technique; the designers determine what is important to the design by choosing the criteria for breaking the transcript into meaning units for analysis. Think-aloud technique provides an in-depth transcript of experience as it happens, providing a quantity of text to analyse using phenomenological method. It creates a greater volume of text from a larger holistic experience compared to the use of phenomenological method to analyse a designer’s experience of a series of photographs. However, think-aloud technique acts as a barrier to any feelings of presence; it creates a co-experience where one would not naturally occur by involving the researcher-as-observer and may result in biased accounts of the experience on behalf of the viewer.

Phenomenological psychology states that each experience is unique and the transcripts of the test participants in the case study support this view. Phenomenological method analyses one person’s experience, finding patterns and themes within that experience. It is possible to compare these themes across different viewer experiences, but the results do not seek to find an average, generalised or optimal experience from the data. Instead,
the results reveal broad patterns and themes that repeat across individual experiences, while preserving the uniqueness and detail of the original individual experience below.
Discussion and Conclusion

This thesis has addressed the neglect of affect in information design, particularly in new media contexts. Chapter 1 exposed the neglect of affect in information design, explaining the historical reasons for this omission. This exclusion of affect creates an unnecessary limitation within information design. Where information designers largely reject disciplinary restrictions narrowing their design area there is a need to reject information biases that limit information design to non-affective paradigms of logic. Some information design writers have shown recent interest in including affect, albeit in small ways. These small steps in developing affective information design are leading to promising new areas for information design research. Information designers can broaden their scope for communicating information where they consider affect. The inclusion of affect gives information designers the ability to plan for any potential negative impact affect may have, or to make use of positive effects. Considering affect as a type of information processing means designers can anticipate a wider variety of potential audience responses.

The discussion of cognitive psychology in Chapter 2 established that incorporating affect into information design would assist in memory formation and recall, decision-making and the interpretation of meaning. Affect and cognition influence each other strongly and one is rarely present without the other. Mood can influence the persuasiveness of a piece of information design. Any information design requiring an evaluative response, whether something is good or bad as opposed to the cognitive response of true or false, involves affect. Any information design requiring a decision needs affective input. The consideration of affect in information design is not merely a matter of opening up the field to new methods of problem solving, it is needed to fully utilise the power of human information processing to make successful information designs.
Chapters 1 and 2 establish why affect is an important issue in information design. However, information design literature and cognitive psychology do not offer methods to incorporate affect into the information design process. Experience design includes affect and information and focuses on new media, providing new ways to communicate with audiences. Phenomenology provides a framework for investigations of experience design, this thesis drawing from phenomenological psychology to provide a theoretical basis for experiential information design, to provide a tool for incorporating affect and information in the design process and to create a method for user-testing the final design. Phenomenological psychology gives the following knowledge to designers of experience:

- All experience is meaning-making. People interpret the phenomena they see to create meanings of what they experience.
- Experience is relational. People draw their meanings from their relationships with the phenomena and from the relationships phenomena form with each other.
- People experience their phenomena as real. By suspending judgment a designer or researcher can see the experience from the user’s viewpoint.

Use of the phenomenological method in the case study, a virtual heritage project, reveals strengths and weaknesses of the method. The designer can use phenomenological method to analyse their own experience, documenting their design process in a way to incorporate information that may have otherwise been overlooked.

The use of phenomenological method to incorporate experience into the design process opens up new types of experience as sources of information. The data from secondary experiences of photographs, videos and audio recordings can be incorporated into the design process as easily as the recollection of a first-hand experience. The bracketing of past knowledge
and suspension of disbelief make imaginings or hallucinations potential experiences for investigation. Although an imaginary walk-through will not give the same type of data as a real-life experience, it provides evidence of that person’s experience that can then be analysed for useful information.

The chief strength of phenomenological method is that the designer, or researcher determines the meaning units of experience based on the design or research question. This allows the designer or researcher to ignore unnecessary information and see where patterns of relevance to the project exist. Analysing the experience transcript in two steps means the designer or researcher does not stop at obvious answers, but rather investigates why the person responded in the way they did and how it relates to other responses they had within the experience.

The use of phenomenological method to analyse viewer experiences of the Virtual Vitthala Temple provided insight into people’s responses to the virtual environment and provided broader suggestions for designers of virtual heritage.

- The human element is the most important part of an experience, whether it is real or virtual. Viewers create meaning through human interaction. When they are unsure of a site’s context, seeing other people using the site provides information in a more naturalistic way than pop-up menus.
- People crave co-experience. The Virtual Vitthala Temple is intended as a solitary experience. The think-aloud technique is supposed to be a one-sided commentary on a viewer’s experience, but all viewers involved in the testing procedure created elements of co-experience in their experience. All attempted to draw the researcher into their experience. Some imagined other people’s responses to the environment, even when no-one else was there. Even in cases where only one person will
experience the virtual environment, digital designers are advised to include issues of co-experience in their design considerations.

- Viewers will adopt a role to determine their interaction with the virtual heritage environment even when no role is set out for them. This role decides whether their interaction is culturally appropriate or not. Providing an appropriate role will help people act in ways that support the cultural experience and will lessen the anxiety of people who do not know how they are expected to act in the virtual environment.

- Although phenomenological method is a promising tool for virtual heritage research and the design of virtual environments, the think-aloud technique is not appropriate for studying issues of presence. It documents a person’s affective and cognitive response to an experience in detail, but the act of thinking aloud acts as a barrier to any feelings of ‘being there’ by constantly drawing attention from the virtual environment and back to the real world.

Other designers may have made some of the same decisions as were made in the case study without use of the phenomenological method. Likewise, some of the conclusions drawn from the user-testing are pre-empted by previous virtual heritage research and are not unique to this thesis. The benefit that phenomenological method brings to the design process is the ability to find patterns, relationships and meanings behind the design choices. Where other design and virtual heritage choices may be made in isolation or informed by separate studies, phenomenological method places them holistic experiences and reveals deeper meaning to provide broad recommendations.

**Further research**

Further research could explore different levels of human interest and their influence on presence and information processing. Designers of virtual heritage could use ghosting, short clips demonstrating people using the site,
as a way of creating narratives and context for virtual heritage environments. Ghosted clips of people could convey historic information about the site, prompt affective responses from audiences through emotional human-interest stories, convey intangible cultural heritage such as dance, ceremonies or traditional skills and provide insight into different eras of the site. Ghost clips could provide relatively low bandwidth co-experiences that would allow audiences to look into a culture while maintaining a level of separation. Further testing using think-aloud technique and phenomenological method would reveal if this way of providing information to viewers creates a richer, more positive experience than the Virtual Vitthala Temple without any human presence.

The initial design process used phenomenological method to analyse the designer’s experience with secondary sources to incorporate affect and information into the design process. Another project is needed to incorporate the first-hand experience of a person into a virtual heritage project from the start of the design process. Future projects could include first-hand experiences of a number of people, with patterns in their experiences providing broader design approaches in representing the cultural heritage data.

Phenomenological method was useful in testing people’s affective and cognitive responses to a virtual environment. Use of the method in other design experiences, from interior design to 2D print design, would determine its usefulness as a broader design research tool. As each experience is phenomenologically unique; each application of the phenomenological method to a person’s experience would differ. Repeated use of the method would expose further strengths and weaknesses in a phenomenological approach to user testing. Given the weakness of think-aloud technique in testing for the feeling of presence, future research should adapt the Place-Hampi questionnaire to investigate whether people viewing the Virtual Vitthala Temple feel like they are ‘really there’. Developing the design of the Virtual Vitthala Temple to
make it more suitable for online delivery would make it easier to survey large numbers of viewers through a website.

In conclusion, information and affect are both important factors in the processing of information. Phenomenological method can be used to bring the two elements together into a design process and to later test viewers’ experiences of the design to see if the design is successful. Although it is not appropriate for testing issues of presence, phenomenological method can reveal larger patterns of how viewers make meaning from their experiences with a design. Further design work on the Virtual Vitthala Temple coupled with user-testing surveys will reveal if this design process succeeds in incorporating a feeling of presence into virtual heritage environments. Development of the phenomenological method for design through applying it to different design situations will reveal its usefulness beyond designing virtual environments.
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