Fast Image:

A Study of Photographic Image Usage

and Apprehension by Graphic Design Students and Practitioners

Comparing Print and Online Media

by

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ABSTRACT

The “Fast Image” Study examines the ways digitally networked technologies and online cultural practices influence our engagement with photographic images. These technologies and practices have led to profound changes in the way we access, interact with, and understand images. This interaction is occurring predominantly in the digital sphere of visual communication rather than through the earlier technologies of print.

This poses the argument images can no longer be understood solely through traditional semiotic theories of interpretation and judgement that were fixed to printed modes of communication. We now engage with images through a variety of digitally networked devices and online social interactions that offer a multitude of possible experiences with images, some of which we have agency and others that are purely autonomic.

Using an interpretive approach supported by mixed methods of data gathering including photo-elicitation, interviews and semi-structured questions, this study serves as a catalyst for advancing visual literacy and visual culture discourses to incorporate the effects of emerging technologies and online social practices on photographic image use. These effects include sensorial and cognitive responses to images, those precipitated by online social interaction and the influences of external stimuli on the way we ultimately apprehend images.

To determine the nature of the change in image usage from print-based media to online digital environments, the experiences and practices of established Graphic Design and Advertising industry practitioners, together with those of Graphic Design students, will be used to provide context to this study.

The data indicates that, although essentially in some viewing situations existing semiotic theories can be applied to understanding images, many more factors impact upon the apprehension process including the interplay of optical, technological, physiological and neural processes.

The findings have important implications for visual literacy and culture debate, professional visual communication practice and the development of visual communication curricula at tertiary level.

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CANDIDATE'S STATEMENT

By submitting this thesis for formal examination at CQUniversity Australia, I declare that it meets all requirements as outlined in the Research Higher Degree Theses Policy and Procedure.

STATEMENT AUTHORSHIP AND ORIGINALITY

By submitting this thesis for formal examination at CQUniversity Australia, I declare that all of the research and discussion presented in this thesis is original work performed by the author. No content of this thesis has been submitted or considered either in whole or in part, at any tertiary institute or university for a degree or any other category of award. I also declare that any material presented in this thesis performed by another person or institute has been referenced and listed in the reference section.

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This paper HAS NOT been submitted for an award by another research degree candidate (Co-Author), either at CQUniversity or elsewhere.

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NATURE OF CANDIDATE'S CONTRIBUTION, INCLUDING PERCENTAGE OF TOTAL

In conducting the study, I was responsible for literature review, data gathering, data analysis and concept development. This publication was written by me and my contribution was 80 %.

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My co-author, Dr. Ashley Holmes, contributed to the paper by providing critical feedback on the concept development and structural advice including suggestions for sub-heading nomenclature. The co-author's contribution was 20%.

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ETHICAL CLEARANCE

Ethical approval for this project was given by Central Queensland University Human Ethics Committee: H15/07-175.

DECLARATION

I declare that the main text of this thesis is entirely my own work and that such work has not been previously submitted as a requirement for the award of a degree at Central Queensland University or any other institution of higher education.

Thomas Marotta

LIST OF TABLES

LIST OF FIGURES

TABLE OF CONTENTS

CHAPTER 1 - INTRODUCTION

1.1 Rationale and Significance

Extensive research has been conducted into the ways photographic images are used in visual communication and how these processes have been transformed by the evolution of digital media.

For example, Messaris calls for the elevation of the visual in the level of importance alongside studies of texts in education.[1] Other scholars have acknowledged the need for research into the differences digital media makes in "humanistic enquiry" including education and curriculum design with print no longer being the default medium of communication. We need to understand the role of the image in "media-specific practices."[2] Dewdney argues for the need for new understandings of the image in an "image economy" of screen-based culture.[3] How do we apprehend digitally produced images that circulate within networked digital communication?

This study attempts to provide new insights toward understanding how images are apprehended in an online environment and the role of technology in the apprehension process. The views and practices of graphic design practitioners and graphic design students were examined and compared. The very nature of this comparison offers insights into changing visual literacy and communication practices (with the image being a central element) from traditional printed forms of communication to those oriented in digitally networked-based environments. The findings supplement and expand upon antecedent literature.

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1 Paul Messaris, *Visual Literacy: Image Mind & Reality* (Boulder, CO: Westview Press, 1994), 13.

2 N. Katherine Hayles, *How We Think: Digital Media and Contemporary Technogenesis* (Chicago: The University of Chicago Press, 2012), 1–2.

3 Andrew Dewdney, "Curating The Photographic Image in Networked Culture," in *The Photographic Image in Digital Culture*, 2nd ed., ed. Martin Lister (London: Routledge, 2013), 109, **Error! Hyperlink reference not valid.**.

Within the visual literacy debate, the argument exists that while the majority of students who have grown up with, and interact daily with, digital technologies have acquired "enhanced thinking skills in several areas, many of which are visually-oriented,"[4] exposure to visual information does not necessarily coincide with the student's ability to critically interpret that information.[5] To the contrary, Hayles suggests younger people, in particular, are becoming more adept in negotiating information in busy digital environments[6] requiring less time to recognise an image than was previously the case.[7]

The findings of this research expand the "visual vocabulary" used to discuss images and be considered for incorporation in tertiary studies visual literacy curricula to address (in the context of a digitally networked environment) the need for "a system for learning, recognising, making and understanding visual messages that are negotiable by all people."[8]

1.2 Research Questions

The three primary questions that drove this research are as follows:

1. Has the apprehension of the two-dimensional photographic image changed as a result in the shift from traditional forms of printed communication and information dissemination to digitally based information exchange and communication systems, devices and applications?

This research question is related to detecting changes in the apprehension of the two-dimensional

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4 Eva Brumberger, "Visual Literacy and the Digital Native: An Examination of the Millennial Learner," *Journal of Visual Literacy* 30, no. 1(2011): 20.

5 Denise Hattwig, Kaila Bussert, Ann Medaille and Joanna Burgess, "Visual Literacy Standards in Higher Education: New Opportunities for Libraries and Student Learning Libraries and the Academy," *portal: Libraries and the Academy* 13, no. 1 (January 2013): 61–89, http://muse.jhu.edu/journals/portal_libraries_and_the_academy/v013/13.1.hattwig.pdf.

6 N. Katherine Hayles, "Hyper and Deep Attention: The Generational Divide in Cognitive Modes," *Profession* (January 2007): 188, http://www.jstor.org/stable/25595866.

7 Ibid.,191.

8 Donis A. Dondis, *A Primer of Visual Literacy* (Cambridge: MIT Press, 1973), x.

photographic image comparing printed and online mediums. If there had been a change the objective was to determine and describe the nature of the change.

2. Can traditional Western cultural semiotic and linguistic frameworks be applied to understanding image usage within the online context?

The second research question examined whether employing traditional semiotic techniques to understand image usage conventions was still relevant when applied to the online environment.

3. Is image apprehension affected by the surrounding visual noise that we "operate" in?

The third research question focussed on if and how effects of external stimuli or "noise" in the viewing environment affect image apprehension.

The three research questions were formulated to complement this study's qualitative approach discussed in Chapter Two. It is anticipated that they will facilitate gathering meanings, experiences, and opinions from participants' interaction with images in print and online environments. In addition, the questions combine to provide a holistic interpretation of participant interactions with images in different viewing environments and their resulting viewing experiences. The holistic approach is discussed further in Chapter 6: Interpretation. This approach considers the apprehension of phenomena is subjective and may be experienced differently across different communication systems (research question one). Furthermore, that communication is sign-based (research question two), and with the influence of the viewing environment (research question three), these factors determine how we experience images.

1.3 Scope

The research was limited to two-dimensional photographic images and did not include drawn images or moving images. Images are "prime exponents of the visual."[9] When observing

9 Luc Pauwels, "Visual Literacy and Visual Culture: Reflections on Developing More Varied and Explicit Visual Competencies," *The Open Communication Journal* 2 (2008): 79, https://doi.org/10.2174/1874916X00802010079

image interpretation practices this study focussed on the individual's social semiotic interpretation of the meaning observed within images and not the aesthetic quality of images. Structural, colour or compositional elements including, but not limited to, line, pattern, texture and use of foreground and background objects within photographs were considered. This consideration will provide further visual "tools" to aid, observe and understand image interpretation by the participant.

Images for participant viewing and analysis were selected from the *Australian Geographic* Magazine May–June 2016 edition as part of a participant photo-elicitation task. This method is discussed in Chapter 3: Research Design. Viewing experiences were compared using the printed version of the *Australian Geographic* magazine and its online equivalent on www.autraliangeographic.com. The online version of the images were viewed on desktop computers in a controlled classroom setting. It is beyond the scope of this study to include other viewing devices and environments for the photo-elicitation tasks.

1.4 Expected Outcomes

The expected outcomes of this research were as follows:

- Discover and document if and how image use and interpretation has changed from print environments to online environments.
- Discover and document if and how technology has affected the apprehension of images.
- Extend the body of knowledge related to visual literacy and visual communication using images and progress the discussion of the role of images as communication elements within an online context.

1.5 Chapter Overview

Having outlined the rationale and significance of the study in Chapter 1, the following information provides a succinct overview of the remaining chapters that make up this study.

Chapter 2 – Conceptual Framework examines the theoretical assumptions that support this study. A phenomenological approach is used to provide a common framework to investigate the three research questions outlined earlier. The theoretical framework is interpretivist in nature, inclusive of phenomenology, hermeneutics, relativism and symbolic interactionism (see Figure 2.1, page 13).

Chapter 3 – Research Design provides a detailed analysis of the research design. The chapter illustrates the relationship between strategies for data collection and methodological assumptions and their connection to the conceptual framework as described in Chapter 2. The study's delimitations are also discussed and elaborated upon in Chapter 7: Personal Reflections and Limitations.

Chapter 4 – Literature Review presents an overview of the existing literature relevant to the research questions. This chapter consists of eight key topics, structured in three parts. First, the chapter sets the background to this study and will inform the research questions. These topics relate to meaningful and relevant literature about aspects of image use such as technological affect, social media image usage, effects of visual noise and cognitive factors affecting image apprehension.

Chapters 5 – Discussion outlines the data analysis. Eight key considerations emerged from the data analysis and are used to organise and make sense of the data. They are related to the research questions and establish the groundwork for the major insights, interpreted in Chapter 6: Interpretation.

Chapters 6 – Interpretation establishes the crucial insights to emerge from this study are identified, interpreted, summed up and mapped to the research questions.

Chapters 7 – Conclusion This chapter provides an overview of the thesis, addressing the aims and objectives, suggesting future recommendations and provides an overview of the significance of the study's outcomes in terms of its contribution to existing conceptual and methodological knowledge surrounding photographic image usage consumption.

CHAPTER 2 – CONCEPTUAL FRAMEWORK

The purpose of this chapter is to discuss the methodology used to conduct this research and to establish the relationship between philosophical foundation and method. The term methodology can be defined as the theoretical principles that govern the application of a set of methods, procedures or techniques in the investigation of a research topic.[10]

What is reality and what can be known? How can we know reality? There are many possible answers to this question and the various answers can each provide a singular direction to the approach chosen by the researcher.[11] Firstly we need to consider the ontological approach the researcher takes. Ontology is the study of the fundamental nature of things[12] and ontological assumptions relate to what we believe constitutes social reality. The table below illustrates the relationship of the research questions outlined in Chapter One to the ontological position of this study. Additionally, it introduces the importance of applying a holistic approach to image apprehension, which is summed up in Chapter Six: Interpretation.

Table 2.1 Relationship of Ontological Questions to the Research Questions

Ontological Questions[13]	Relationship to the Research Questions	
What kinds of phenomena exist or can exist?	Q1	How can the effect on image apprehension by the viewing medium be understood by examining the influences different viewing technologies (print and digital) have on us?
What are the conditions within which they exist?	Q2	Do these conditions affect the application of semiotic frameworks of understanding?
	Q3	How can the effect of the viewing environment, particularly effects of 'visual noise' in the online context, influence image apprehension?
What are the relationships between these phenomena?	Can the nature of the relationships between the above factors lead to a holistic understanding of image apprehension?	

10 Austin Harrington, ed., *Modern Social Theory: An Introduction* (New York: Oxford University Press, 2005), 3–4.

11 Egon G. Guba and Yvonna S. Lincoln, "Competing Paradigms in Social Qualitative Research," in *The Handbook of Qualitative Research*, eds. Norman K. Denzin and Yvonna S. Lincoln (Thousand Oaks, CA: SAGE Publications, 1994), 108.

12 Pranee Liamputtong, *Qualitative Research Methods* (South Melbourne, VIC: Oxford University Press, 2013), 389.

13 Norman Blaikie and Jan Priest, *Designing Social Research: The Logic of Anticipation* (Newark: Polity Press, 2019), 120.

The Qualitative Approach

There are two broad research approaches the researcher can take, qualitative and quantitative, and these provide different perspectives to the research. Within these approaches there is a diverse range of paradigms or theoretical frameworks within which a set of assumptions or beliefs can be tested and evaluated.[14] It is not the intention of this study to provide an exhaustive comparison of these two approaches, but it is important to provide an overview of the choices made and to demonstrate why they are best suited to this research.

A qualitative approach was chosen for this study. The term qualitative in this context is used to describe the types of methods used.[15] Methods can be described as a set of activities used to obtain data or information regarding the research topic or question. This is how the early stage of the research is conducted.[16] Qualitative research stresses that the nature of reality is socially constructed and that the "relationship between the researcher and what is being studied" is also important.[17] Given understanding the world is seen through a "series of representations", information gathering can include interviews, conversations, photographs, recordings and field notes.[18] The data is then interpreted and used to examine the qualities of entities, processes, and meanings under the assumption that reality is viewed through a socially constructed lens. That is, it is not experimentally examined or measured in terms of numerical or quantifiable values. Qualitative research does not attempt to achieve objective reality.[19]

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14 Robert Audi, *The Cambridge Dictionary of Philosophy*, 2nd ed. (Cambridge, NY: Cambridge University Press 1999), 641.

15 Guba and Lincoln, "Competing Paradigms in Social Qualitative Research," 105.

16 Norman K. Denzin and Yvonna S. Lincoln, *The SAGE Handbook of Qualitative Research*, 3rd ed. (Thousand Oaks, CA: SAGE Publications, 2005), 2.

17 Norman K. Denzin and Yvonna S. Lincoln, *The Landscape of Qualitative Research: Theories and Issues*, 2nd ed. (Thousand Oaks, CA: SAGE Publications, 2003), 13.

18 Ibid., 4–5.

19 Ibid., 13.

There is more paradigm diversity within the qualitative framework than in the quantitative approach.[20] A qualitative framework can offer many perspectives, interrelated paradigms and methods from which to choose, [21,22] including, among others, phenomenology and hermeneutics[23] which I aim to apply in this study.

The combination of multiple methodological practices and perspectives reflects an attempt to reach an in-depth understanding of the phenomena in question and can bring "rigour, breadth, complexity, richness and depth" to a study.[24] Denzin states qualitative research studies usually represent the many perspectives that present themselves in most human endeavour or the "world of lived experience"[25] and involves in-depth investigation of knowledge through a variety of materials and methods including "personal experience, artefacts, observational, historical, interactional and visual texts" and employing interview techniques, archival or other documentary analyses or ethnographic study.[26, 27]

This study employs various data gathering methods including focus group discussions "intended to elicit personal experiences, interviews, interaction with visual texts and documentary analysis of those texts". To find out "what is going on" the qualitative researcher investigates the quality or nature of something.[28]

The qualities of entities, processes and meanings cannot be experimentally measured in

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20 Jerry W. Willis, *Foundations of Qualitative Research: Interpretive and Critical Approaches* (Thousand Oaks, CA: SAGE Publications Inc., 2007), 147, https://dx.doi.org/10.4135/9781452230108

21 Denzin and Lincoln, *The SAGE Handbook of Qualitative Research*, 2–7.

22 Uwe Flick, *An Introduction to Qualitative Research*, 3rd ed. (London: SAGE Publications, 2006), 16.

23 Denzin and Lincoln, *The SAGE Handbook of Qualitative Research*, 7.

24 Norman K. Denzin, "Triangulation 2.0.," *Journal of Mixed Methods Research* 6, no. 2 (April 2012): 82, https://doi.org/10.1177/1558689812437186..

25 Denzin and Lincoln, *The Landscape of Qualitative Research*, 12.

26 Denzin and Lincoln, *The SAGE Handbook of Qualitative Research*, 3.

27 Charles C. Ragin, *Constructing Social Research: The Unity and Diversity of Method* (Thousand Oaks, CA: Pine Forge Press, 1994), 91.

28 Vivienne Waller, Karen Farquharson and Deborah Dempsey, *Qualitative Social Research: Contemporary Methods For The Digital Age* (London: SAGE Publications, 2016), 5.

terms of statistical methods such as quantity and frequency. These methods are more aligned with quantitative studies where the ontological approach is that the world is real and not socially constructed and that there is no division or difference between appearance and reality.[29] As part of the qualitative approach, the researcher adopts an interpretive framework which subjectively examines the world as not existing independently of our knowledge of it.[30]

29 Jonathon Grix, *The Foundations of Research*, 2nd ed. (Basingstoke, Hampshire: Palgrave Macmillan, 2010), 82.

30 Ibid., 84.

The Interpretivist Position

Through an interpretivist ontological position, this study adopts a subjective understanding of the world and argues that social phenomena and their meanings are continually being changed and revised through social interaction. There are many questions of interest explored throughout this study. What is the significance of photographic images now as elements of communication within the rapidly changing online environment? What was the nature of the photographic image before its appearance in the online environment? Is there a social semiotic change of interpretation between traditional media environments and online environments? These are some of the questions that will be explored throughout this study.

Reality is fluid and is experienced on social and experiential levels relative to specific epistemic systems and practices: "Reality is human experience and human experience is reality."[31,32] These shifting realities are mentally constructed and occur within social situations can help us establish a new perception of the world. Helen Grace calls this phenomenon "particulate vision", something representing a different reality particularly if it is constructed in social media environments. Grace discusses culture and aesthetics in the context of online media and examines how ubiquitous media and user-generated content encourage a new perception of the world.[33] Media technologies profoundly change the everyday experiences of the individual and can change the nature of reality. They shape not only the information we engage with but also the construction of our understanding of the world.[34]

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31 Mary-Jo D. Levers, "Philosophical Paradigms, Grounded Theory, and Perspectives on Emergence," *SAGE Open* 3, no. 4 (2013): 2, https://doi.org/10.1177/2158244013517243

32 Natalie Alana Ashton, "Rethinking Epistemic Relativism," *Metaphilosophy* 50, no. 5 (2019): 588, **Error! Hyperlink reference not valid.**

33 Helen Grace, *Culture, Aesthetics and Effect in Ubiquitous Media: The Prosaic Image* (London: Routledge, 2013), 179.

34 Nicholas Carah and Eric Louw, *Media and Society. Production, Content and Participation* (London: SAGE Publications, 2015), 240.

The Interpretive Approach

Denzin and Lincoln state all research is interpretive and guided by the researcher's set of beliefs and feelings about the world and how it should be understood and studied.[35] This approach also emphasises the importance of subjective meanings carried by actions performed by individuals in the social world [36] with a focus on personal meaning and experience.[37] This process of interpretation often creates an association between larger social forces and the prosaic world of the individual.[38]

Interpretivism covers a range of theoretical perspectives on social enquiry. [39] Four that are closely related have been adopted in this study (see Figure 2.1 and Tables 2.2 to 2.5). These philosophical positions (Phenomenology, Symbolic Interactionism, Relativism and Hermeneutics) offer their own nuanced perspective to knowledge acquisition. Together they cover a range of synergetic perspectives concerned with the subjective understanding of the "way people construct their social world" [40] and will provide a depth and breadth of understanding to this research.

The various theoretical approaches within this body of qualitative research, all different in their theoretical assumptions toward understanding and their methodological focus offer different ways of accessing the phenomenon under study.[41] These are introduced in Figure 2.1 and are further explained in Tables 2.2 to 2.5 on the following pages.

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35 Denzin and Lincoln, *The SAGE Handbook of Qualitative Research*, 22.

36 William Outhwaite, "Interpretivism and Interactionism," in *Modern Social Theory: An Introduction*, ed. Austin Harrington (New York: Oxford University Press, 2005), 110–111.

37 Norman K. Denzin, *Interpretive Interactionism* (Thousand Oaks, CA: SAGE Publications, 1989), 142.

38 Denzin and Lincoln, *The Landscape of Qualitative Research*, 445.

39 Grix, *The Foundations of Research*, 82–83.

40 Ibid., 83.

41 Flick, *An Introduction to Qualitative Research*, 65.

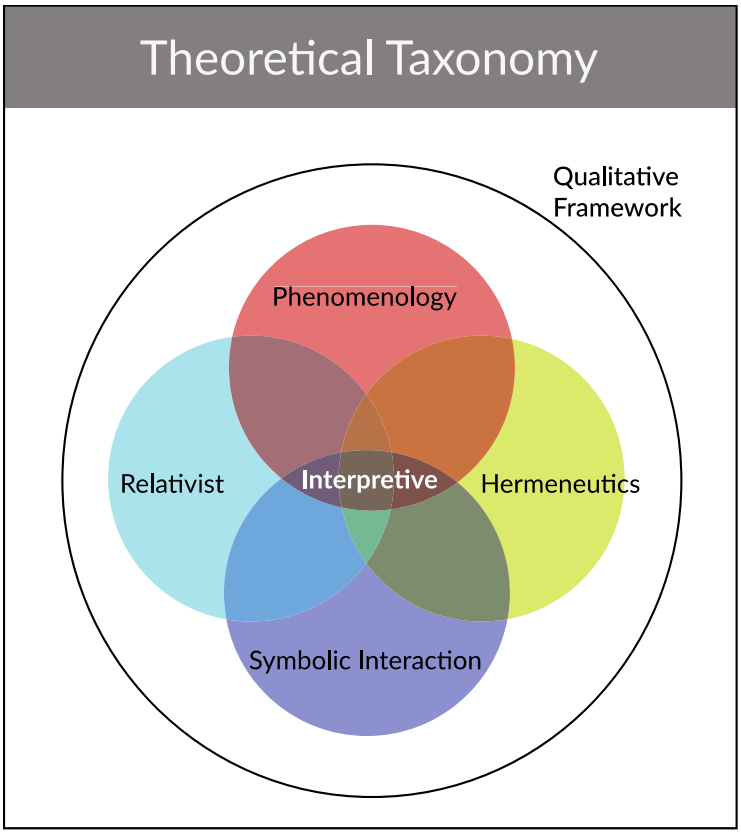

Figure 2.1. Theoretical Taxonomy

Table 2.2. Phenomenology	
Description	Individual consciousness is not separate from experience and things in the world become objects of experience for those who are conscious of them.[42] Concerned with understanding how social relationships and interactions between humans and with objects occur in the everyday world. [43]
Assumption	Human beings construct their own meaning within a particular context that can be dependent on learned conventions, shared meanings and practices in a social context.[44]
Application	Understanding participant's meaning-making in the context of digital and print communication technologies and practices such as online social media communication.

42 Harrington, *Modern Social Theory*, 325.

43 Denzin and Lincoln, *The SAGE Handbook of Qualitative Research*, 484–485.

44 Angie Titchen and Dawn Hobson, "Understanding Phenomenology through Reverse Perspectives," in *Theory and Methods in Social Research*, 2nd ed., eds. Bridget Somekh and Cathy Lewin (London: SAGE Publications, 2011), 122.

Table 2.3. Relativist	
Description	A set of truths or values is dependent upon a system within which a person operates such as their world view and cultural norms.[45]
Assumption	The world is presented in different ways dependent on a set of categories that mediate our interpretation of reality. There is no unmediated access to reality in itself. [46]
Application	Participants interpret the world through categories such as social media, printed magazines, blogs and websites, smartphones and desktop computers; each one mediating their reality.

Table 2.4. Symbolic Interactionism	
Description	Studying and interpreting subjective meanings and individual meaning making[47] within the context of human social interaction.[48]
Assumption	Our intent toward things is based on the meanings that they have for us. These meanings are modified through social interaction involving symbolic communication with other people.[49]
Application	Understanding participants' experiences and how they invest photographic images with meaning when viewing them comparing online and in-print environments.

45 Ashton, "Rethinking Epistemic Relativism," 588.

46 Paul O'Grady, *Relativism: Central Problems of Philosophy* (Stocksfield, Northumberland: Acumen, 2002): 13, https://search.ebscohost.com/login.aspx?direct=true&AuthType=sso&db=e000xww&AN=929397&scope=site.

47 Flick, *An Introduction to Qualitative Research*, 65.

48 Harrington, *Modern Social Theory*, 323.

49 Herbert Blumer, *Symbolic Interactionism: Perspective and Method* (Englewood Cliffs, N.J.: Prentice-Hall, 1969), 2.

Table 2.5. Hermeneutics	
Description	An approach to the analysis of texts that emphasises how prior understandings and prejudices shape the interpretative process.[50] Places importance on interpreting the meanings that motivate individuals or groups to act or speak as they do.[51]
Assumption	Objects are in a permanent state of evolution and understanding is achieved by interpretations "explored along the way."[52] The interpreter's attitudes and conventions are already present in constructing how we understand the world.[53]
Application	Understanding and interpreting participants' experiences when viewing the photographic images within printed and online context and do meanings change in the process?

Qualitative research is interpretative in nature and these interpretations are constructed throughout the research process.[54] The researcher as interpreter collects the data and begins an analysis or interpretation of the data to make sense of what has been learned; in other words, "the interpretive practice of making sense of one's findings."[55] This process of interpretation emphasises the importance of interpretations of human meaning through understanding participant perspectives.[56]

Is image apprehension affected by the surrounding visual noise that we "operate" in? Has the apprehension of the two-dimensional photographic image changed as a result in the shift

50 Denzin and Lincoln, *The SAGE Handbook of Qualitative Research,* 27.

51 Harrington, *Modern Social Theory,* 321.

52 Tony Brown and Daniel Heggs, "From Hermeneutics to Post-Structuralism to Psychoanalysis," in *Theory and Methods In Social Research*, 2nd ed., ed. Bridget Somekh and Cathy Lwein (London: SAGE Publications, 2011), 296.

53 Thomas A. Schwandt, "Three Epistemological Stances for Qualitative Inquiry: Interpretivism Hermeneutics and Social Constructionism," in *The Landscape of Qualitative Research: Theories and Issues,* 2nd ed., eds. Norman K. Denzin and Yvonna S. Lincoln (Thousand Oaks, CA: SAGE Publications, 2003), 301.

54 Denzin and Lincoln, *The SAGE Handbook of Qualitative Research,* 26.

55 Ibid., 2.

56 Albert J. Mills, Gabrielle Durepos and Elden Wiebe, eds., *Encyclopedia of Case Study Research*, vol. 1 (Thousand Oaks, CA: SAGE, 2010), 485.

from traditional forms of printed communication and information dissemination to digitally based information exchange and communication systems, devices and applications? These particular research questions are approached within the context that meaning depends on the cultural context within which it is subsequently interpreted.[57]

The Construction of Meaning

Meaning is understood through the relationship between an individual and events in their environment to which the individual responds and acts. The meaning of the event to the individual determines the particular way they respond.[58, 59] Tables 2.1 to 2.4 present a variety of approaches within the interpretive methodology.[60] Although diverse in origin these theories have a commonality of theorising that focuses on themes of meaning, understanding, action, interaction, language, context and everyday knowledge.[61] These approaches reject the view that meaning in the world exists independently of consciousness.[62]

Relativism

Therefore, this study takes the position that meaning and the perception of reality are socially constructed.[63] Some theorists view "photography as a language, acquiring meaning through cultural and social conventions, and conscious and unconscious processes", a process

57 Michael Quinn Patton, *Qualitative Research and Evaluation Methods*, 3rd ed. (Thousand Oaks, CA: SAGE Publications, 2002), 113.

58 Robert H. Lauer and Warren H. Handel, *Social Psychology: The Theory and Application of Symbolic Interactionism*, 2nd ed. (New Jersey: Prentice Hall, 1983), 21.

59 Ibid., 19.

60 Denzin, *Interpretive Interactionism*, 14.

61 Ibid., 127.

62 Hilary Collins, *Creative Research: The Theory and Practice of Research for the Creative Industries* (USA: Bloomsbury Publishing, 2018), 49. ProQuest Ebook Central, https://ebookcentral.proquest.com/lib/uwsau/detail.action?docID=6552947.

63 Peter L. Berger and Thomas Luckman, *The Social Construction of Reality: A Treatise in the Sociology of Knowledge* (New York: Anchor, Double Day and Company, 1967), 3.

that operates alongside aesthetic content such as subject matter, visual style, and authorial intentions.[64]

The interpretive approach can contribute to an evaluation in research by identifying different definitions of the problem being evaluated using rich descriptions, the use of personal experience stories and the comparison of the perspectives of participants. This suggests that the research be judged from the point of view of the persons most directly affected, the participants.[65]

Denzin posits that a person with a sociological imagination thinks historically and biographically, and researchers make their experience part of the research. The researcher seeks out participants who have undergone the type of experiences the researcher seeks to understand. They seek to interpret the participants' actions and their relationship to the research question. Therefore, the research task of conceptualising the phenomena to be studied is contained within the personal experience stories of the researcher and participants and how experiences are organised, perceived, constructed and given meaning by individuals.[66]

How do participants experience and perceive the two-dimensional photographic image within traditional printed communication and information dissemination compared to digitally based information exchange systems, devices and applications?

Symbolic Interactionism

Symbolic Interactionism and its associated theories form part of the qualitative framework and these theories help situate this study. Symbolic interactionism looks at how people make sense of their experiences through common symbolic processes.[67, 68] The assumption is that

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64 Patrizia Di Bello, "Theories of Photographic Meaning," in *The Oxford Companion to the Photograph*, eds. Robin Lenman and Angela Nicholson (Oxford University Press, 2006), **Error! Hyperlink reference not valid.**.

65 Denzin, *Interpretive Interactionism*, 11.

66 Ibid. , 49.

67 Liamputtong, *Qualitative Research Methods*, 390.

68 Bruce L. Berg, *Qualitative Research Methods for the Social Sciences*, 6th ed. (Boston: Pearson Education, 2007), 10.

behaviour is constructed through interaction between individuals and groups and that much of it is characterised through a type of mutually understood symbolic behavioural performance and feedback process resulting in "intelligibility."[69]

Lindesmith and Strauss identify the symbolic nature of human communication and that even non-verbal interaction involves meanings that depend upon symbols. The individual responds directly toward symbols and their relationships to the external world are mediated through symbols.[70]

Gestures of human communication can transmit important messages that have certain meanings to the receiver.[71] Therefore, if a gesture (such as a thumbs up) is a symbol that can be understood by the sender as well as the receiver, this form of communicative interaction demonstrates the human ability to interpret and understand the meaning inherent in a symbol.[72]

Let us consider photographic images can also communicate important messages, and within photographs, there are symbols that have meaning to both the sender and receiver that is socially constructed, we can then understand the importance of incorporating a symbolic interactionist viewpoint to this research.

Phenomenology

As this study investigates the social and cultural context in which participants view images, therefore a phenomenological framework can help illuminate some of the research questions. Phenomenology is a research methodology used to study lived human phenomena within the everyday social contexts in which the phenomena can occur from the perspective of those who

69 Kenneth Liberman, *More Studies in Ethnomethodology* (Albany: State University of New York Press, 2013): 144–145, ProQuest Ebook Central.

70 Alfred Ray Lindesmith, Anselm L. Strauss and Norman K. Denzin, *Social Psychology*, 5th ed. (New York: Holt, Rinhart and Winston, 1977), 84.

71 Lauer and Handel, *Social Psychology*, 29.

72 Ibid., 29.

experience them.[73] Phenomena are anything that human beings live or experience.[74] How are photographic images used and understood from the perspective of the individual and how individuals interact with photographic images as part of a visual communication process.

Phenomenology can be used to understand the lived experiences of individuals[75] and holds the premise that reality exists in human consciousness and not in an objectively verifiable outside world.[76] This premise supports the qualitative nature of this study, whereby phenomena include photographic images, and how they are used, understood, and interacted with from the perspective of the individual as part of a visual communication process. In this study, the photographic image is considered as being more than a two-dimensional object viewed on various surfaces within different technologies or an object that only holds an observable fixed literal representation of a particular subject matter. The photograph itself can be a transmitter of meaning, requiring a certain type of interpretive process where the viewer applies their meaning to the photographic image, one that comes from personal experience and is formed within a cultural context.[77] This meaning can be shared by individuals or remain a personal interpretation.

Phenomenology is also concerned with the study of human consciousness as a way to understand social reality and how an individual thinks about their experience.[78] Meaning "does not come out of an interplay between subject and object but is imposed on the object by the subject. There is no contribution made by the object to the generation of meaning."[79] Some have argued that researchers should be interested in how participants "invest" meanings into the

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73 Titchen and Hobson, *Understanding Phenomenology Through Reverse Perspectives*, 121.

74 Ibid., 122.

75 Liamputtong, *Qualitative Research Methods*, 8.

76 Ibid., 13.

77 Jonathon E. Schroeder, "Visual Consumption," in *Routledge Interpretive Marketing Research*, eds. Stephen Brown and Barbara B. Stern (London: Routledge, 2002), 19.

78 Liamputtong, *Qualitative Research Methods*, 8.

79 Michael Crotty, *The Foundations of Social Research: Meaning and Perspective in the Research Process* (St. Leonards, NSW: Allen and Unwin, 1998), 9.

content of images and how this interaction becomes a process where the image represents their knowledge, self-identities, experiences and emotions.[80]

Hermeneutics

Hermeneutics is a philosophical approach to the analysis of texts that stresses how prior understandings and bias influence the interpretive process.[81] In hermeneutics the researcher analyses the data from the perspective of the participants whilst contextualising interpretation to participants' historical and cultural perspective of "being in the world."[82] Hermeneutics incorporates the use of qualitative methods to give context and meaning to the research topic and permits a range of interpretations, some of which may be "closer to the truth" than others and where no interpretation is ever final.[83] The basic premise is that the hermeneutic act of interpretation intends to make sense of what is being observed in a way that communicates understanding.

This methodology attempts to reveal the process of understanding and the conditions in which understanding occurs. [84] It is an iterative process used to conduct a critical analysis or explanation of human action where understanding is produced as a participative process, a dialogic encounter of question and answer – how did this come about?[85] Understanding is not "reproduced by an interpreter."[86] The process is referred to as the hermeneutic circle,[87] a method of examining phenomena through continuous analytical tracking where individual detail of

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80 Sarah Pink, *Doing Visual Ethnography*, 2nd ed. (London: SAGE Publications, 2007), 82.

81 Denzin and Lincoln, *The SAGE Handbook of Qualitative Research*, 27.

82 Will Mason and Tim May, "Hermeneutics," in *SAGE Research Methods Foundations*, eds. P. Atkinson, S. Delamont, A. Cernat, J. W. Sakshaug, and R. A. Williams (London: SAGE Publications, 2019), 2. doi: https://dx.doi.org/10.4135/9781526421036786961.

83 Brown and Heggs, "From Hermeneutics to Post-Structuralism to Psychoanalysis," 295.

84 Schwandt, "Three Epistemological Stances," 304.

85 Richard J. Bernstein, *Beyond Objectivism and Relativism* (Philadelphia: University of Pennsylvania Press, 2011), 160.

86 Schwandt, "Three Epistemological Stances", 302.

87 Denzin and Lincoln, *The Landscape of Qualitative Research*, 300.

phenomena are studied in terms of their relationship to the whole. The aim is to bring both to view simultaneously enabling the researcher to understand what may not have been previously evident through the study of only particular parts of phenomena.[88] Hermeneutic theory has evolved from the translations of text to using and analysing other documents such as photographs as part of the research process.[89,90] Hermeneutics can provide a theoretical approach for interpretive understanding or meaning, making the obscure plain.[91] In this study, the interpretation of participant experience viewing photographic images was studied with special attention to context and how prior understandings and prejudices shape the interpretive process.[92] This is where hermeneutics can provide a theoretical approach for interpretive understanding or meaning, making the obscure plain.

Meaning and Interpretation

Meaning and interpretation are crucial human processes, and individuals create shared meanings through their interactions with others; these meanings then become their reality.[93] This study examines the types of relationships that have existed, exist and are created between photographic images and the technological medium within which they appear. The role of viewers as participants and their environment is also considered. The question being considered is: Does the relationship change according to the contexts in which images are viewed, and are the meanings created shared by research participants? This is important because human action is influenced by external matters that can include the effect that others have on the individual's

88 Zygmunt Bauman, *Hermeneutics and Social Science* (London: Hutchinson and Co, 1978), 28.

89 Jan Sitvast, "Hermeneutic Photography: An Innovative Intervention in Psychiatric Rehabilitation Founded on Concepts From Ricoeur," *Journal of Psychiatric Nursing* 5, no. 1 (2014): 17, https://doi.org/10.5505/phd.2014.69772

90 Salvador Leon, "The Semiotics of Photography: Towards Objective Hermeneutics," *Philosophy Study* 7, no. 12 (December 2017): 634, https://doi.org/10.17265/2159-5313/2017.12.002

91 Ibid., 29–30.

92 Denzin and Lincoln, *The SAGE Handbook of Qualitative Research*, 27.

93 Liamputtong, *Qualitative Research Methods*, 8.

activity. These actions comprise "individual pieces" that move the individual to the realisation of an act which Blumer refers to as a "line of action." Therefore, what one observes people doing creates a context inside of which the individual decides on what action to take.[94]

This study analyses acts performed by participants when engaging with photographic images is undertaken with a view to identifying and interpreting the nature and qualities of the process of apprehension.

What is the Role of the Researcher? – Insider Co-creation

Schwandt argues the phenomenological observer cannot claim to be an uninvolved observer in the research task.[95] The interpreter's task is to engage in critical analysis or explanation of a text or some human action,[96] and in this endeavour one's beliefs are integral or implicit to understanding. Understanding comes in the form of interpretation and the interpreter's bias does not need to be eliminated to come to "a clear" understanding.[97] Understanding requires the engagement of one's biases and the researcher must declare their position relative to that which is being interpreted. Engagement in research requires acknowledging the ongoing experience during the process of interpreting. Kerdeman posits this occurs from the two standpoints of "familiarity and strangeness", arguing that we need some familiarity with the subject under investigation to facilitate understanding.[98] Others argue that what we already know shapes how we understand the world and any attempt to step outside of this process "would be like trying to step outside of our own skins."[99]

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94 Blumer, *Symbolic Interactionism: Perspective and Method*, 96–97.

95 Thomas A Schwandt, "Three Epistemological Stances", 301.

96 Ibid., 300.

97 Hans-Georg Gadamer, *Truth and Method*, 2nd rev. ed., trans. Joel Weinsheimer and Donald G. Marshall (London: Continuum, 1989), 271–272, https://mvlindsey.files.wordpress.com/2015/08/truth-and-method-gadamer-2004.pdf

98 Deborah Kerdeman, "Hermeneutics and Education: Understanding, Control, and Agency," *Educational Theory* 48, no. 2 (1998): 245. http://ezproxy.uws.edu.au/login?url=https://www.proquest.com/scholarly-journals/hermeneutics-education-understanding-control/docview/214141410/se-2?accountid=36155.

99 Shaun Gallagher, *Hermeneutics and Education* (Albany: State University of New York Press, 1991), 87.

Understanding is therefore a collaborative and active process of "producing reality" involving the author of texts; in this case, the researcher, the reader or the person for whom they are written[100] and the research participants who are engaging in the act of reading and interpreting the texts [images] during the data collection phase. The researcher and the participants are co-creators of the findings.[101]

Even in objective writings of qualitative research, interpretations are not "value-free descriptions."[102] This researcher is an active participant in this study, bringing a certain bias during the process of interpreting and reaching an understanding of the research questions. As a practising graphic design, digital media and photography professional and educator in the field, this researcher is considered a member of both study participants' social groups, graphic design practitioners and students. This is considered insider research.[103,104] The area of research was identified by the researcher based on observing photographic image use by students and through personal industry involvement.

The insider position taken and its effect on the study are assumed and compatible with the interpretive approach of this study. There are advantages to insider positionality, such as a better understanding the study's social context through insight into participants' "linguistic, cognitive, emotional, sensory and psychological" assumptions,[105] which can offer a nuanced understanding of the data. However, the disadvantages of greater familiarity can make insiders take things for

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100 Flick, *An Introduction to Qualitative Research*, 87.

101 Ibid., 14.

102 Norman K. Denzin and Yvonna S. Lincoln, *The Landscape of Qualitative Research*, 3rd ed. (Thousand Oaks, CA: SAGE Publications, 2008), 414.

103 Pauline Rooney, "Researching From the Inside - Does it Compromise Validity?: A Discussion," *Leve1 3*, no. 3 (January 1, 2005): 5. https://www.researchgate.net/publication/254584742_Researching_from_the_inside_-_does_it_Compromise_Validity_-_A_Discussion/link/58511ce508aecb6bd8d21d96/download.

104 Melanie Greene, "On the Inside Looking In: Methodological Insights and Challenges in Conducting Qualitative Insider Research," *Qualitative Report* 19, no. 29 (30 October 2014): 1. https://doi.org/10.46743/2160-3715/2014.1106.

105 Christina Chavez, "Conceptualizing From the Inside: Advantages, Complications, and Demands on Insider Positionality," *The Qualitative Report* 13, no. 3 (2008): 479. https://doi.org/10.46743/2160-3715/2008.1589

granted and assume the importance of "their own perspective."[106] The potential effects of these factors on the analysis and interpretation of the data were considered throughout the study using a reflective approach. Understanding was extended through reflexive consideration of how the researcher's position would affect all stages of the research process[107] and was a chance for researchers to rethink and justify their own decisions and to communicate the process of theory development.[108]

The following reflective approaches were adopted for this research:

a: A reflective approach in the way in which the researcher recognised the participants' conceptual, cultural and personal filters through which they observe their worlds.[109]

b: A reflexive approach, related to the degree of influence that the researcher introduced either intentionally or unintentionally to the research findings.

Glaser argues reflexivity can have a "paralysing" approach and that a researcher's impact on data is another variable to consider when it emerges as relevant.[110] Therefore, it is important to keep in mind that our perspectives, belief systems and experiences influence the way we view and work with data. Employing critical self-reflection about oneself as a researcher adds trustworthiness to qualitative research and ensures that interpretations are valid and grounded in the data.[111]

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106 Justine Mercer, "The Challenges of Insider Research in Educational Institutions," *Oxford Review of Education* 33, no. 1 (January 29, 2007): 6. https://doi.org/10.1080/03054980601094651

107 Alma Whiteley, "Supervisory Conversations on Rigour and Interpretive Research," *Qualitative Research Journal* 12, no. 2 (2012): 251, https://doi.org/10.1108/14439881211248383

108 Katja Mruck and Gunter Mey, "Grounded Theory and Reflexivity," in *The SAGE Handbook of Grounded Theory*, eds. Antony Bryant and Kathy Charmaz (London: SAGE Publications, 2007), 519.

109 Greene, "On the Inside Looking In", 1.

110 Catherine Cassell, Ann L. Cunliffe and Gina Grandy, *The SAGE Handbook of Qualitative Business and Management Research Methods: History and Traditions* (London: SAGE Publications, 2018), 47.

111 Robin Whittemore, Susan K. Chase and Carol Lynn Mandle, "Validity in Qualitative Research," *Qualitative Health Research* 11, no. 4 (July 2001): 531, https://doi.org/10.1177/104973201129119299

Triangulation

Triangulation can also be used to ensure trustworthiness.[112] This approach refers to the use of multiple methods or data sources to develop a comprehensive understanding of phenomena.[113] Three types of triangulation were used in this research. These are defined as:

Data Triangulation – the use of different data sources[114] including digital and analogue photos and seeking opinions from Graphic Design student and practitioner sample groups from educational institutions and workplaces. The viewpoints from these two different sample groups will provide the research with multiple perspectives and validation of data.[115]

Methodological Triangulation – uses a combination of data collection methods to have multiple perspectives on an issue being studied,[116] such as photo-elicitation, focus group interviews and semi-structured questionnaires (see Chapter 3: Research Design).

Theory Triangulation – uses different theories to analyse and interpret data. The data collected for this study was viewed through the lens of interpretivist-oriented theories including phenomenology, symbolic interactionism and hermeneutics (see Tables 2.2 to 2.5).

Triangulation has been viewed as a research strategy where the analyses of information from different sources illuminate different versions of participants' understandings of the topic being investigated[117] and strengthen the credibility of how knowledge is arrived at.[118] Other

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112 Irene Korstjens and Albine Moser, "Series: Practical Guidance to Qualitative Research. Part 4: Trustworthiness and Publishing," *European Journal of General Practice* 24, no.1 (January 2018): 121, https://doi.org/10.1080/13814788.2017.1375092

113 Michael Q. Patton, "Enhancing The Quality and Credibility of Qualitative Analysis," *Health Sciences Research* 34, no. 5 part 2 (December 1999): 1192. Gale Academic OneFile.

114 Flick, *An Introduction to Qualitative Research*, 389.

115 Nancy Carter, Denise Bryant-Lukosius, Alba DiCenso, Jennifery Blythe and Alan J. Neville, "The Use of Triangulation in Qualitative Research," *Oncol Nurse Forum* 41, no. 5 (September 2014): 545. https://doi.org/10.1188/14.ONF.545-547. PMID: 25158659.

116 "What is Methodological Triangulation?" SAGE Research Methods Video: Market Research, 2018. https://www.doi.org/10.4135/9781529716528.

117 Flick, *An Introduction to Qualitative Research*, 187.

118 Egon G. Guba, "Criteria for Assessing the Trustworthiness of Naturalistic Inquiries," *Educational Communication and Technology* 29, no. 75 (June, 1981): 87. https://doi.org/10.1007/BF02766777.

benefits include a broader understanding of the phenomenon in question than could otherwise be achieved using one or two methods.[119]

Summary

The image does not exist outside of the constructs of society, the world views of the person by which the image was conceived or those of the spectator. The philosophical frameworks chosen for this study facilitated the understanding of the process of image creation, usage practices and cultural production within online environments compared to print-based environments. Interpreting and understanding the meanings research participants attach to their actions through the research process is an interactive practice shaped by their world views and those of the researcher. The researcher provides a narrative of the "worlds they study" and these accounts are framed within the specific traditions of an interpretive framework, providing "a set of fluid, interconnected images and representations . . . connecting the parts to the whole." [120]

119 Carter et al., "The Use of Triangulation in Qualitative Research," 546.

120 Schwandt, "Three Epistemological Stances," 9.

CHAPTER 3 – RESEARCH DESIGN

The previous chapter outlined the research design's philosophical foundations and informed the method of enquiry adopted. This chapter discusses the relevance of the research design and methods used to the conceptual resources outlined in Chapter Two. Furthermore, it describes the connection between the research design's approach and the ontological and epistemological position taken by the researcher.

Research methods are techniques and procedures used to collate and analyse data.[121] The choice of methods chosen for this study, outlined in Table 3.1 were considered suitable to the ontological and epistemological assumptions of the research and are closely related to the research questions. "Our understanding of what knowledge is and how we acquire it defines the nature of the questions we ask as well as the methodology and methods which help us to ask these questions."[122] Ontology concerns claims and assumptions that are made about social reality, about what exists, what it looks like and its entities and how they interact with each other to reach an understanding of the meaning and nature of existence.[123] This research adopts the position that social phenomena and their meanings are "accomplished by social actors, produced by social interaction and are in a constant state of revision."[124] Whereby "ontology is about what we know, epistemology is about how we know".[125] Epistemology is concerned with the theory of the method of knowledge, how it is acquired, its processes, validation and the possible ways of gaining knowledge of social reality. The aim is to present a view and justification for what can be regarded as knowledge.[126]

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121 Norman Blaikie, *Approaches to Social Enquiry* (Cambridge: Polity Press, 1993.), 7.

122 Jerry Wellington and Michael Hammond, *Research Methods: The Key Concepts*, 2nd ed. (Milton Park: Routledge, 2020), 70.

123 Dale Jacquette, *Ontology: Central Problems of Philosophy* (Chesham: Acumen, 2002), xii.

124 Alan Bryman, *Social Research Methods* (New York: Oxford University Press, 2001), 18.

125 Grix, *The Foundations of Research*, 63.

126 Blaikie, *Approaches to Social Enquiry*, 6–7.

Table 3.1 outlines the relationship between this study's ontology and epistemology to its methodology and methods.

Table 3.1. Overview of Methodological Framework			
Ontology What exists and what does it look like? What units make it up and how do they interact with each other?[127]	**Epistemology** What is knowledge? What can be known about the nature of the social world?[128] How do we acquire knowledge and come to understand the world?[129]	**Methodology** The proposed rationale for the application of the research methods.[130]	**Methods** The approach to data collection.[131]
Interpretivist Understanding the meaning which cultural practices have for those taking part.[132] Truth and knowledge are based on people's experiences and understanding of them. They are subjective and culturally and historically situated.[133]	**Subjectivist** Universal knowledge and observations of external reality are affected by the observer's world view and the observer is influenced by the observed.[134]	**Qualitative Strategy** Interpreting the subjective experience or perspectives of the participants.[135]	• Focus Group Interviews • Individual Interviews • Questionnaires • Photo-Elicitation

Data Collection Process – Sample Group Overview

The following processes and descriptions support the decisions made in designing this research. The two participant sample groups (see Table 3.2) are outlined together with the structure in which data was collected (see Table 3.3).

127 Blaikie, *Designing Social Research*, 8.

128 Patricia Leavy, *Research Design: Quantitative, Qualitative, Mixed Methods, Arts-Based, and Community-Based* (New York: Guildford Publications, 2017), 12.

129 Wellington and Hammond, *Research Methods. The Key Concepts*, 69.

130 Ibid., 128.

131 Ibid., 127.

132 Ibid., 105.

133 Gemma Ryan, "Introduction to Positivism, Interpretivism and Critical Theory," *Nurse Researcher* 25, no. 4 (March 2018): 17, https://doi.org/10.7748/nr.2018.e1466

134 Levers, "Philosophical Paradigms, Grounded Theory, and Perspectives on Emergence," 3.

135 Grix, *The Foundations of Research*, 32.

The final Graphic Design practitioner selection was the culmination of canvassing the researcher's Graphic Design industry network. The student sample group was finalised after requesting permission to interview students from five Australian Universities and Tertiary institutions – three of which allowed their students to participate. The sample groups are as follows:

Graphic Design students: A total of five female and five male Graphic Design students aged between 19 to 26 years with one student being 41 years of age.

Graphic Design Practitioners: A total of three female and two male industry professionals participated from the field of Graphic Design, Advertising and Graphic Design teaching. They ranged in age from 41 to 58 years.

Table 3.2. Sample Group Overview				
Graphic Design Student Sample Group			Graphic Design Practitioner Sample Group	
	Code and Gender	Age	Code and Gender	Age
University 1	1s - Male	21	11p - Male	52
	2s - Female	20	12p - Female	42
	4s - Female	19	13p - Male	41
	5s - Female	23	14p - Female	51
	6s - Female	18	15p - Female	58
	7s - Male	20		
	8s - Male	24		
University 2	9s - Male	41		
	10s - Male	26		
University 3	3s - Female	23		

Why the Two Sample Groups?

The two sample groups were chosen to shed light on the types of changes concerning photographic image use and apprehension in print and online mediums over the past two decades. It was assumed the practitioner group had more experience with, and exposure to,

photographic images in print and would be more able to identify the change occurring across online and print mediums.

The student group was selected to identify current image usage practices assuming they would be more familiar with engaging with online images. Gathering the viewpoints and experiences from both groups would help describe any differences in viewpoints and experiences between them and would assist in recognising if and how image apprehension has changed over time across online and print mediums.

The Graphic Design practitioner group did not undertake the photo-elicitation tasks. The purpose of the study was to use the practitioners' previous knowledge of printed communication to establish a historical perspective of image usage in print with the assumption that the younger generation would have had less exposure to the printed mediums. The study was not a comparison of viewpoints between practitioners and students; rather the practitioner viewpoints were intended to bridge the gap between what was previously experienced in print to what was experienced digitally. This would then set the setting for the student photo-elicitation tasks to determine the nature of the change in apprehension by directly comparing images in print with those viewed online.

Data Collection Methods Overview

The following primary research questions were incorporated into the structure of the data collection process (see Table 3.4). This process was administered in seven stages to the student sample group and two stages to the practitioner sample group. Each stage represented a particular form of data collection and was divided into three parts, each pertaining to the research questions below.

a. Has the apprehension of the two-dimensional photographic image changed as a result of the shift from traditional forms of printed communication and information dissemination

to digitally based information exchange and communication systems, devices and applications?

b. Is image apprehension affected by the surrounding visual noise that we "operate" in?

c. Can traditional Western cultural semiotic and linguistic frameworks be applied to understanding image usage within the online context?

The following section outlines how the methods described above were implemented in this study, which was through a staged process in one sitting. The seven stages administered to student participants in one sitting are indicated in the following table (Table 3.3) together with the two stages administered to the practitioner sample group. Each stage is mapped to the research methods used.

Table 3.3. Data Collection Stages: Graphic Design Students and Practitioners	
Part A: Graphic Design Students	
Stage One	Focus Group Discussion
*Stage Two	Photo-Elicitation: *Australian Geographic* printed magazine
Stage Three	Survey Questions
*Stage Four	Photo-Elicitation: *Australian Geographic* magazine website
Stage Five	Photo-Elicitation Survey Questions
Stage Six	Photo-Elicitation Memorability Questions
Stage Seven	Reflective Photo-Elicitation Focus Group Discussion
Part B: Graphic Design Practitioners	
Stage One	Survey Questions
Stage Two	Individual Interviews

*Stages two and four (Table 3.3) indicate the comparative photo-elicitation tasks using both the *Australian Geographic* printed magazine and the *Australian Geographic* magazine website. These stages will be discussed concurrently as they constitute the same tasks performed using the two different mediums and would facilitate a logical flow of the relevant discussion.

All stages represent a mixed methods approach with student participants engaging in a

combination of practical tasks, such as photo-elicitation, and written and contemplative exercises including interviews and questionnaires. The practitioner sample group participated in individual interviews including the completion of survey questions.

In the context of this study mixed methods refers to the various qualitative instruments used to collect the data. This approach offers the possibility for deep, rich interpretations from the data captured from a range of contexts and benefits the development of theory.[136]

Part A: Graphic Design Student Data Collection Design

Stage One: Focus Group Discussion

Focus Group interviews enable in-depth discussion focusing on a specific area of interest and allow participants to discuss the topic in greater detail.[137] This process helps participants explore and clarify their points of view and allows for rich and detailed data about perceptions, thoughts, feelings and impressions,[138] producing insights that would not normally be possible without group interaction.[139] Focus group interactions amongst participants enhance data quality and elicit a variety of perspectives from participants.[140]

Patton sees the focus group interview as a highly efficient qualitative data collection technique to facilitate the quick access of consistently shared views.[141] This process is helped when the interviewer is objective, flexible, empathetic, persuasive and a good listener, encouraging reserved members of the group to become involved and share their views.[142]

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136 Ryan, "Introduction to Positivism, Interpretivism and Critical Theory," 2.

137 Liamputtong, *Qualitative Research Methods*, 75.

138 David. M. Stewart and Prem M. Shamdassani, *Focus Groups: Theory and Practice* (Newbury Park, CA: SAGE Publications, 1990), 33.

139 Davis L. Morgan, *Focus Groups as Qualitative Research* (Newbury Park, CA: SAGE Publications, 1988), 12.

140 Patton, *Qualitative Research and Evaluation Methods*, 385.

141 Ibid., 86.

142 A. Fontana and J. H. Frey, "The Interview: From Structured Questions to Negotiated Text," in *Handbook of Qualitative Research*, 2nd ed., eds. N. K. Denzin and Y. S. Lincoln (Thousand Oaks, CA: SAGE Publications, 2000), 652.

Interview question design is an important factor in the effective collection of data. The researcher's role is to ask questions that invite the participant to tell the story he or she most wants to tell.[143]

Two focus group interviews were conducted using Graphic Design student participants. The first (Stage One) was an introductory interview designed to gather some background information about participants' viewing habits, preferences and viewpoints when viewing images in print and online mediums. Semi-structured questions were administered to participants both verbally during focus group interviews and as part of a fifteen-page printed study participation guide presented to them at the commencement of proceedings. This acted as a visual prompt when participants were asked to describe a particular experience from multiple options.

Semi-structured interview questions were asked in different focus group settings of between two and four Graphic Design student participants with participant 3s interviewed individually. This structure offered participants the freedom to tell their stories and to illustrate concepts while ensuring the researcher obtained the information required about how an event occurred.[144] The idea was to encourage dialogue amongst the participants. This supports the phenomenological paradigm that assumes reality is not "out there" but is constructed through the interpretations of researchers and study participants.[145]

Students were provided a set of images from *The Australian Geographic Magazine* and the website. These were used as a stimulus to elicit a comparison of viewing experiences across the two mediums. They were asked specific but open questions; "Describe your experience when viewing images on the *Australian Geographic* Magazine website." These types of questions

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143 Mary M. Lopez, "Interview Techniques," in *Encyclopedia of Epidemiology*, ed. Sarah Boslaugh (London: SAGE Publications, 2008), 5, http://dx.doi.org/10.4135/9781412953948.

144 Mary M. Lopez, "Interview Techniques", 8.

145 Peter Willis, "The Things Themselves in Phenomenology," *Indo-Pacific Journal of Phenomenology* 1, no.1 (April 2001) 1, https://doi.org/10.1080/20797222.2001.11433860.

allow participants to give their opinions in their own words[146] and are suited to the phenomenological approach[147] which is supported by the interpretivist methodology used in this study.

Other questions were semi-structured, which encouraged retrospective inspection. For example, questions were asked for clarity ("more difficult or much easier"?) or to seek specific details, such as "what were they?", "Which one do you remember most?" and "why?" This assisted in bringing out specific elements in the interview which determine the impact or meaning of an event for the participants, preventing the interview from remaining on the level of general statements.[148]

The researcher was cognisant that moderation is an important aspect of focus group interviews. Flick describes the following three forms of moderation where moderator interventions support the dynamics and functioning of the group while maintaining the process should not disturb the participant's own initiative. These three forms are:

Formal Direction: to support the functioning and the dynamics of the group such as fixing the beginning, course and end of the discussion.

Topical Steering: Introduction of new questions designed to encourage the topic's elaboration and to elicit deeper insight.

Steering the Dynamic: To address dominance relations by encouraging reserved members to participate more actively in discussions. [149]

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146 Herbert F. Weisberg, Jon A. Krosnick and Bruce D. Bowen, *An Introduction to Survey Research, Polling, and Data Analysis*, 3rd ed. (Thousand Oaks, CA: SAGE Publications, 1996), 78.

147 Mark T. Bevan, "A Method of Phenomenological Interviewing," *Qualitative Health Research* 24, no. 1 (January 2014): 139. https://doi.org/10.1177/1049732313519710.

148 Flick, *An Introduction to Qualitative Research*, 150.

149 Ibid., 193.

This study incorporated Flick's framework to manage the interview process and encourage a permissive atmosphere that allowed participants to express their viewpoints in a supportive and guided environment.

Stages Two and Four: Photo-Elicitation

The data collection instrument consisted of photographic prompts (photo-elicitation) related to the study's research questions. The seven stages were administered to participants in one sitting and are indicated in the following table, together with the research methods used.

The photo-elicitation and associated focus group interviews were conducted with the Graphic Design student sample group to ascertain how they make meaning from viewing images in a practical laboratory setting.

Visual data collected in this study took the form of photo-elicitation. This is a type of interview in which the researcher uses a photo to elicit information from the participants.[150] Harper describes this as "inserting an image into the research interview" facilitating participant engagement.[151] Using visual sources to elicit response data is an important aspect of this research and increasingly more studies being done using this form of data collection.[152] This data collection method is meaningful to qualitative research beyond traditional forms of data collection such as interviews, focus groups and participant observations and has the potential to "evoke more nuanced understanding of the ways in which people experience their worlds."[153] The use of photo-elicitation is not simply a matter of asking participants to provide a response to the content of the images but a tool to aid in understanding how participants use the content of

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150 Veronica Richard, "Photo Elicitation as a Qualitative Research Method," in SAGE Video (SAGE Publications, 2017), Video, 00:30:50, https://www-doi-org.ezproxy.uws.edu.au/10.4135/9781526406590.

151 Douglas Harper, "Talking About Pictures: A Case for Photo Elicitation," *Visual Studies* 17, no. 1 (2002): 14. https://doi.org/10.1080/14725860220137345

152 Flick, *An Introduction to Qualitative Research*, 24.

153 Dawn Mannay, "Visual Methodologies: Participatory Potential, Practicalities, De-Familiarisation and Dissemination," *SAGE Research Methods Cases* (2014): 2. https://www-doi-org.ezproxy.uws.edu.au/10.4135/978144627305013496529.

images to produce meanings through which their representation of knowledge, self-identity, experience and expression of emotion occurs. From an interpretivist viewpoint research participants make meaning of images depending upon cultural assumptions, personal knowledge and the contexts in which the picture is presented. For this reason, if the research study is interested in how people assign meanings to pictures shown to them in different technological environments, it is important to conduct a photo-elicitation interview.[154]

The image had a dual role in this study. Firstly, the study concerned participants' apprehension of images and their experiences viewing them in print and online formats. Secondly, images were used to elicit responses related to the viewing experience via focus group interviews and questionnaires, allowing participants to reflect on their experience. This was intended to encourage deeper and richer responses from participants and gain meaningful insight into the way they construct meaning and understand the usage and apprehension of images.

Matteucci identifies visual material gathered by the researcher as a valid method with which visual data can be collected and used for research.[155] Richard further describes the use of researcher generated photo-elicitation material as "photos that are already in the setting"– in the case of this study, photographs appearing in the *Australian Geographic* magazine and website.[156]

The photographs used in this study were sourced by the researcher from *The Australian Geographic* Magazine, 2016 Tasmania Issue. In the case of photo-elicitation, photographs can be tools to obtain knowledge.[157] Photos used in research become representations interpreted in terms of different understandings of reality and not simply a visual record of reality.[158] Visual

154 Mannay, "Visual Methodologies," 15.

155 Xavier Matteucci, "Photo Elicitation: Exploring Tourist Experiences With Researcher-Found Images," *Tourism Management* 35 (April, 2013): 190, https://doi.org/10.1016/j.tourman.2012.07.002

156 Richard, "Photo Elicitation as a Qualitative Research Method," 00:30:50.

157 John Collier and Malcolm Collier, *Visual Anthropology: Photography as a Research Method*, rev. and expanded ed. (Albuquerque: University of New Mexico Press, 1986), 99.

158 Ibid., 84.

images used in interviews are "made meaningful through the subjective gaze of the viewer", and everyone produces these photographic meanings by relating the image to their existing personal experience, knowledge and "wider social discourses."[159] Photo-elicitation provides important data about participant experiences. This includes nuanced responses and memories, leading to new perspectives and explanations that may not be forthcoming using other techniques.[160]

When discussing the role photographs play in interviews, Sarah Pink states that visual images are made meaningful through the subjective gaze of the viewer and that everyone produces these photographic meanings by relating the image to their existing personal experience, knowledge and "wider social discourses."[161] In research, photos are not simply a visual record of reality but representations that are interpreted in terms of different understandings of reality.[162]

This study attempts to understand the relationship between the participant and the photographic image by creating narratives around the photographs being viewed.

Participants were given two minutes to compare the same sets of images across both mediums commencing with the printed magazine (see Appendix 1. Research Instruments – Students: Stages 2 and 4).

The images were selected based on generality not to provoke overly adverse reactions. These consisted of various subject matter, including scenery, narrative photo stories, people, flora and fauna. The study focuses on photographic imagery; therefore maps, illustrations and advertisements were excluded.

Questions were asked relating to articulating the most and least memorable images,

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159 Pink, *Doing Visual Ethnography*, 82.

160 Rosalind Hurworth, Eileen Clark, Jenepher Martin and Steve Thomsen, "The Use of Photo-Interviewing: Three Examples from Health Evaluation and Research," *Evaluation Journal of Australasia* 4, no. 1/2, (2005): 53, https://search-informit-org.ezproxy.sl.nsw.gov.au/doi/10.3316/ielapa.480330549699745

161 Pink, *Doing Visual Ethnography*, 82.

162 Ibid., 84.

interpretation of narrative and descriptive interpretation and symbolic understanding of the images viewed.

After a period of approximately 30 minutes, during which time participants completed the stage three survey questionnaire (see Appendix 1. Research Instruments – Students: Stage 3), they performed the same task on the *Australian Geographic* website. Again, participants viewed the same set of images across the same page range. It is important to note that the *Australian Geographic* printed magazine is closely replicated in format and layout on the website. The notable differences on the website were double-page spreads presented as single pages, and the left and right arrow page advance icons were used as navigation aids for access to previous and next pages. These replaced the role of physical page-turning in the printed magazine (Figure 3.1).

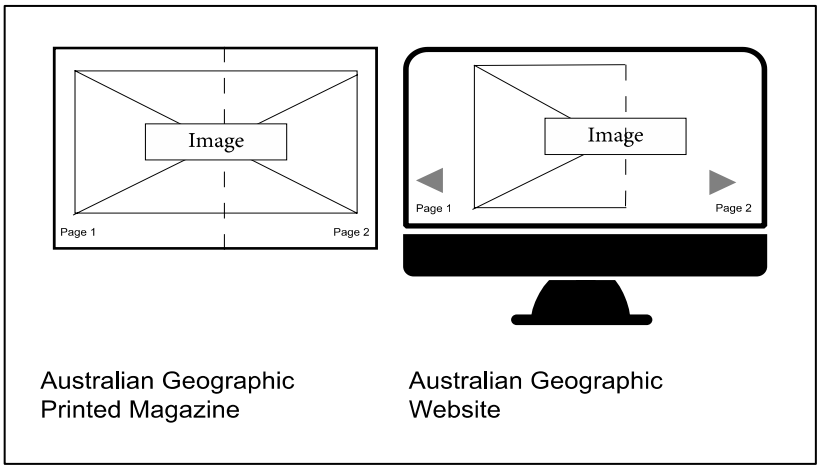

Figure 3.1. Representation of differences when viewing a double page spread in the *Australian Geographic* printed Magazine and the one-page representation on the website.

The photo-elicitation tasks were designed to understand participants' experiences when viewing the same set of images in the *Australian Geographic* printed magazine and the *Australian Geographic* magazine website and whether there was a difference of viewing experience between the two technologies.

The *Australian Geographic* Website – Photo-Elicitation Data Collection Method (Website)

The following section further describes the data collection process and methods used for both the *Australian Geographic* printed magazine and its companion website. ***1.1 Design***

Participants were provided with the URL of the *Australian Magazine* website and a link to the online version of the May–June 2016 edition of the *Australian Geographic* Magazine. In addition, they were provided with the question and answer task sheets with which to record their responses. (see Appendix 1. Research Instruments – Students). A time duration of two minutes was set for the viewing of the researcher-selected images using the iPhone 6.0 Stopwatch native application. All participants used Google Chrome as the browser and performed their task on Dell desktop computers with a monitor resolution of 1920 x 860 pixels.

1.2 Stimuli

Participants were asked to view a selection of photographic images from the May–June 2016 edition of the *Australian Geographic* Magazine website, pages 61–71, 78–85 and 89–93. The researcher randomly selected these images to provide a cross-section of photographic image content including people and scenery. A variety of photographic image sizes were chosen. The pages viewed replicated the pages and page numbering in the printed magazine except for double-page spreads. These were separated as single pages and participants were expected to use the previous and next chevron (see Figure 3.3). All images were in colour and none had unusual, shocking, or provocative content.

1.3 Procedure

Participants carried out the task seated at workstations in a classroom setting under both natural and fluorescent lighting conditions. Instructions were provided and explained at the commencement of the data collection session to help complete the photo-elicitation and survey

question tasks. At the end of the task, participants were asked to provide their responses to these questions in written form.

The *Australian Geographic* Magazine – Photo-Elicitation Data Collection Method (Print)

2.1 Design

Participants were provided with their copy of the May–June 2016 edition of the *Australian Geographic* Magazine "Tasmania" Issue. In addition, they were provided with the question and answer task sheets with which to record their response (see Appendix 1. Research Instruments – Students). A time duration of two minutes was set to view the researcher-selected images using the iPhone 6.0 Stopwatch native application.

2.2 Stimuli

Participants were asked to view a selection of photographic images from the May–June 2016 edition of the *Australian Geographic* Magazine, pages 61–71, 78–85 and 89–93. The researcher randomly selected these images to provide a cross section of photographic image content including people and scenery. The dimensions of the magazine were 31cm x 21cm.

A variety of photographic image sizes were chosen including double-page spreads, half-page, quarter-page and eighth-page size representations of images. All images were in colour and none had unusual, shocking, or provocative content.

2.3 Procedure

Participants carried out the task seated at workstations in a classroom setting under both natural and fluorescent lighting conditions. Instructions were provided and explained at the commencement of the data collection session to help complete the photo-elicitation and survey question tasks. At the end of the task, participants were asked to provide their responses to these questions in written form.

Stage Three: Survey Questions

Surveys are regularly used in the social sciences as a primary way of gathering data[163] and can be adopted to investigate a wide variety of topics from varying perspectives. They are an effective way of collecting information on people's attitudes, values, beliefs, behaviours and opinions.[164] They are a reliable method of inquiry because the same set of standardised questions, phrased in the same way, is presented to participants[165] and are most effective when combined with other methods.[166]

The questions were designed in a structured format using specific stimulus statements such as "Do you think images online are manipulated?" Answers were solicited using the Likert scale method, where participants were asked to rate their response to a symmetric always–never scale of possible statement choices.

The Likert scale is a widely used form of measurement in social sciences survey research offering the researcher a tool for measuring people's attitudes, opinions and descriptions of people's lives and environments.[167] This form of measurement allows a set of response categories to be summated or averaged producing a more reliable measure than could otherwise be obtained by use of a single item.[168]

The rationale for using structured questions during the stage three data-gathering process was to determine whether prescribed behaviours, such as "hours per day spent on devices" and

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163 Maggie Walter, *Surveys and Sampling in Social Research Methods: An Australian Perspective* (South Melbourne, Vic: Oxford University Press, 2006), 189.

164 Maggie Walter, ed., *Social Research Methods*, 2nd ed. (South Melbourne, Vic.: Oxford University Press, 2009), 152.

165 Valerie Sheppard, "Research Methods For The Social Sciences: An Introduction," (Open Source Creative Commons, 2020), 188, https://pressbooks.bccampus.ca/jibcresearchmethods/.

166 Grix, *The Foundations of Research*, 129.

167 Paul E. Spector, *Summated Rating Scale Construction: An Introduction.* Quantitative Applications in the Social Sciences, no. 82 (Newbury Park, CA: SAGE, 1992), 2. https://dx-doi-org.ezproxy.uws.edu.au/10.4135/9781412986038.

168 Jonathan E. Brill, "Likert Scale," in *Encyclopedia of Survey Research Methods*, ed. Paul J. Lavrakas, https://dx-doi-org.ezproxy.uws.edu.au/10.4135/9781412963947.n273.

“hours per day spent reading books,” impacted how participants engaged with and experienced images either digitally or in print form.

Stage Five: Photo-elicitation Survey Questions

Structured statements using the Likert scale method were presented to participants, such as “Viewing images on the *Australian Geographic* website was easy,” requiring a rated response; strongly agreeing to strongly disagree. Participants were asked to elaborate upon their choice to obtain richer and more meaningful answers than would otherwise be possible by only adhering to structured questions. Questions presented during this stage were designed to understand the nature of participants’ recent photo-elicitation viewing experiences through a comparison between digital and print technologies, with the view to determine whether technology has a mediative effect on the viewing experience making the encounter either easy or difficult.

Stage Six: Photo-elicitation Memorability Questions

Participants were shown five randomly selected and previously viewed printed colour images from the *Australian Geographic* magazine during this stage. These images were included in the participation guide and presented to evoke responses that could indicate whether either medium, the printed magazine or the website, had the greater potential to present an image as being the most memorable. Participants were asked to write their responses to structured questions (see Appendix 1: Research Instruments: Students).

> “Do you remember viewing the following images? Circle either yes or no. lf you circled yes, place a number from 1 to 5 next to each image, l being the most memorable and 5 being the least memorable. Next, choose the source of the image from the options on the right [*Australian Geographic* magazine/website/both].”

Stage Seven: Photo-Elicitation: Reflective Focus Group Discussion

Stage Seven presented a reflective focus group discussion held at the end of the data collection session. This stage was designed to elicit information regarding participants' immediate viewing experiences, comparing the printed magazine with its online equivalent following the photo-elicitation activities. Questions regarding memorability were also asked to determine whether any particular image presented as the most memorable and if one medium aided memorability over the other. There were no immediate cues presented to participants before the questions (see Appendix 1: Research Instruments: Students).

Part B: Graphic Design Practitioners Data Collection Design

The data collection method for the practitioner sample group consisted of two stages: stage one, a preliminary survey questionnaire sent via email followed by stage two, individual in-person and online interviews (see Appendix 1, Research Instruments: Practitioners). These interviews took place within one week of the survey completion. In addition, online interviews were conducted using Skype and Zoom applications. This was the most accessible technology for participants at the time of data collection and will be discussed further in this section.

The survey and individual interviews were designed to seek the views from the perspective of Graphic Design industry practitioners who were considered as having had more exposure to print media. The intention was to provide antecedent context to online digital image use and identify whether consanguinity over time exists between image apprehension in print compared to online mediums seeking comparative opinions from two generational groups, millennials/generation Z and generation X.

Stage One: Survey Questionnaire

The survey questionnaire was divided into three areas each relating to one of the three primary research questions, similar to, and previously described in, the Graphic Design student

data collection stage. Surveys allow for a "big picture" overview[169] with questions designed to gauge participants' views on how images are used and understood through technology.

Participants were given structured questions utilising the Likert scale method with each question offering a set of symmetrically balanced bipolar response categories indicating varying levels of agreement or disagreement to the question or statement [strongly agree/strongly disagree]; for example, "Images are understood differently when looking at the same image in print or on a website."

Questionnaire topics and insights to responses were explored in more depth with a follow-up interview using open-ended questions (see Appendix 1, Research Instruments: Practitioners). Open-ended questions allow for a wide range of possible responses that provide more detail relating to a given phenomenon. The responses to open-ended questions are constructed by participants rather than suggested by response options such as those presented in structured questions, therefore avoiding bias.[170]

Stage Two: Interviews

Following the completion of the questionnaire, participants were invited to attend an interview. Participants were individually interviewed. Two were interviewed in person, two were interviewed using the video and voice recording functionality within the Zoom application,[171] a cloud-based remote video and web conferencing service, and one participant was interviewed using the online text, voice and video application, Skype.[172]

The interviews conducted in person were recorded using the Voice Recorder native iPhone

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169 Jonathan Lazar, Jinjuan Heidi Feng and Harry Hochheiser, "Surveys," in *Research Methods in Human-Computer Interaction* (San Francisco: Elsevier Science & Technology, 2017), https://learning.oreilly.com/library/view/research-methods-in/9780128093436/xhtml/chp005.xhtml#st0020.

170 Saoirse Connor Desai and Stian Reimers, "Comparing the Use of Open and Closed Questions for Web-based Measures of the Continued-influence Effect," *Behavior Research Methods* 51 (2019): 1427, https://doi.org/10.3758/s13428-018-1066-z.

171 https://www.zoom.us.

172 https://www.skype.com/en.

app.[173] All voice recordings were transcribed using the online audio transcription service temi.com.[174] These interviews offered the benefits of synchronous communication by providing the environment for more spontaneous responses and less deliberation, with the participant able to react to the researcher's questions promptly.[175]

Participants were selected for their capacity as an expert in their field. Participant opinions and points of view on digital media and image usage in online and print formats were gathered using open-ended questions and were sought regarding:

- The use of images to effect communication through digital media and print formats.
- The effectiveness of images as elements of communication within emerging digital environments.
- Whether images are still understood through the culturally and socially constructed meaning placed on them by the individual when viewed in digital environments.

These interviews were semi-structured to maintain flexibility and "open up" the possibility for unexpected lines of enquiry using open-ended questions. This method allows the researcher, through the collection of open-ended data, to explore participant thoughts, feelings and beliefs about a particular topic.[176] The possibility of obtaining rich data is further enhanced with the use of questions prompting elaboration on a particular topic[177] with the focus on permitting the

173 Voice Recorder and Audio Editor, v. 5, TapMedia Ltd, 2022, iPhone/Mac, https://itunes.apple.com/us/app/voice-recorder-audio-editor/id685310398?mt=8.

174 https://www.temi.com.

175 Raymond Opdenakker, "Advantages and Disadvantages of Four Interview Techniques in Qualitative Research," *Forum: Qualitative Social Research* 7, no. 4 (2006): 5, https://www.proquest.com/scholarly-journals/advantages-disadvantages-four-interview/docview/869232974/se-2.

176 Melissa DeJonckheere and Lisa M. Vaughn, "Semistructured Interviewing in Primary Care Research: A Balance of Relationship and Rigour," *Family Medicine and Community Health* 7, e000057 (2019): 1, https://doi.org/10.1136/fmch-2018-000057.

177 Kathy Charmaz, *Constructing Grounded Theory*, 2nd ed. (London: SAGE Publications, 2014), 97.

interviewee to tell their own story.[178] "Do you think viewing images on digital devices such as smartphones, tablets and desktop computers has altered the way people interpret images? If so, in what ways?"

Assessing the "Quality" in Qualitative Research

Qualitative research can be valid and reliable "without being subject to traditional ways of assessing validity and reliability."[179] Flick argues for a reformulation of traditional criteria applied to validity and reliability, one that is derived from the theoretical background used in the research study.[180]

The positivist view that human behaviour can be quantitively measured is grounded in an empirical analytic approach to finding out about the nature of "reality."[181] This is at odds with the interpretive foundations of this study described in Chapter 2.

In the context of this study, validity refers to "does the data represent what it's supposed to represent" and are the results due to factors the researcher suggests in their interpretation.[182] One validates an interpretation of data "arising from a specified procedure"[183] or through "the measuring instrument in relation to the purpose for which it is being used."[184]

This section has outlined the multiple methods of data gathering. It was anticipated that responses to questions in each stage of the data collection process would fluctuate amongst

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178 Frances Ryan, Michael Coughlan and Patricia Cronin, "Interviewing in Qualitative Research: The One-to-one Interview," *International Journal of Therapy and Rehabilitation* 16, no. 6 (2009): 310, https://doi-org /10.12968/ijtr.2009.16.6.42433.

179 Flick, *An Introduction to Qualitative Research*, 367.

180 Ibid., 368.

181 Teresa Smallbone and Sarah Quinton, "Increasing Business Students' Confidence in Questioning the Validity and Reliability of their Research," *Electronic Journal of Business Research Methods* 2, no. 2 (2004): 154, https://academic-publishing.org/index.php/ejbrm/article/view/1184/1147.

182 Steve Taylor and Claire Parsons, "Reliability and validity," SAGE Research Methods Video: Practical Research and Academic Skills, 2017, https://dx.doi.org/10.4135/9781526443847

183 Robert L. Thorndike, William H. Angoff, E. F. Lindquist, and American Council on Education, *Educational Measurement*, 2nd ed. (Washington: American Council on Education, 1971).

184 E. G. Carmines and R. A. Zeller, *Reliability and validity assessment*, (Thousand Oaks, CA: SAGE Publications, 1979), 17, https://dx.doi.org/10.4135/9781412985642

participants due to the idiosyncratic nature of their responses. Therefore, reliability in this case, is not based on dependability or consistency of "measurements across conditions."[185] Varied responses were anticipated and consistency in this case is irrelevant.

The researcher argues other alternative criteria can be applied to assess qualitative research such as those suggested by Guba et al.: trustworthiness, credibility and dependability.[186] This study's data analysis has produced credible and trustworthy results through in-depth engagement with the research process by participants and researcher, the triangulation of different methods and data,[187] arguing the appropriateness of the terms of philosophical reference of interpretation[188] as stated in Chapter 2, and the articulation of subjectivity with evidence of reflexivity (see Chapters 2, 4.8 and 7.4).

The multiple stages of data collection have allowed for a detailed description of the phenomena under study; this is an important provision for promoting credibility helping to convey contextual situations of photographic image use. Shenton argues insights gained through these methods of investigation allow "the reader of the final account to determine the extent to which the overall findings ring true."[189] Dependability can be achieved by accounting for any shifting conditions in the research related to the participants. The use of "overlapping methods" – in the case of this study, interviews, surveys and photo-elicitation – can also enhance dependability.[190] This has been achieved through the consistency of methods and methodical

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185 Deborah L. Bandalos, *Measurement Theory and Applications for the Social Sciences* (New York: Guilford Publications, 2018): 157, ProQuest Ebook Central, https://ebookcentral.proquest.com/lib/uwsau/detail.action?docID=5188172.

186 Yvonna S. Lincoln and Egon G. Guba, *Naturalistic Enquiry* (Thousand Oaks, CA: SAGE Publications, 1985), 43.

187 Anne Burns, "Mixed Methods," in *Qualitative Research in Applied Linguistics*, eds. J. Heigham and R.A. Croker (London: Palgrave Macmillan, 2009): 127, https://doi-org.ezproxy.uws.edu.au/10.1057/9780230239517_7

188 Denzin and Lincoln, *The SAGE Handbook of Qualitative Research*, 25.

189 Andrew K. Shenton, "Strategies for Ensuring Trustworthiness in Qualitative Research Projects," *Education for Information* 22, no. 2 (July 2004), https://doi.org/10.3233/EFI-2004-22201.

190 James Dean Brown, "Open-Response Items in Questionnaires," in *Qualitative Research in Applied Linguistics*, eds. J. Heigham and R.A. Croker (London: Palgrave Macmillan, 2009): 127, https://doi-org.ezproxy.uws.edu.au/10.1057/9780230239517_7

processes during the data collection and analysis process.[191] This process is "logical, traceable" and has been clearly documented in this chapter.[192]

Summary

This chapter began by making explicit the relationships between the conceptual framework discussed in Chapter 2 and the choices for the data-gathering methods chosen. The interpretive philosophical position informed the way the data was gathered and analysed. The mixed methods approach used in this research design has been presented through a structured seven-step process (Graphic Design students sample group) and a two-step process (Graphic Design practitioner sample group). This strategy, together with acknowledging the role of the researcher as an "active participant" was considered beneficial to establishing the dependability of this research from a qualitative perspective – insights obtained from the data-gathering process can be useful in other research contexts.

The following chapter reviews the literature supporting this study's research questions. The eight themes discussed provide the technological, sociocultural and semiotic context. The chapter provides the foundation for this research with relevant neuroscientific aspects of image apprehension.

191 Lorelli S. Nowell, Jill M. Norris, Deborah E. White and Nancy J. Moules, "Thematic Analysis: Striving to Meet the Trustworthiness Criteria," *International Journal of Qualitative Methods* 16, no. 1 (2017): 1, https://doi.org/10.1177/1609406917733847

192 Gerard A. Tobin and Cecily M. Begley, "Methodological Rigour within a Qualitative Framework," *Journal of Advanced Nursing* 48, no. 4 (2004): 392, https://doi-org.ezproxy.uws.edu.au/10.1111/j.1365-2648.2004.03207.x

CHAPTER 4 - LITERATURE REVIEW

This chapter provides a foundational framework for the study and examines the existing literature highlighting the relevance to the study's research questions. Eight themes are presented and expanded upon in Chapter Five: Data Analysis, and Chapter Six: Interpretation. The following table demonstrates the literature's connection to the research questions.

Research Question One. Has the apprehension of the two-dimensional photographic image changed as a result in the shift from traditional forms of printed communication and information dissemination to digitally based information exchange and communication systems, devices and applications?	4.4 The Image and the Technological Affect 4.5 Does Size Matter 4.6 The Online and The Printed Image 4.7 Neuroscience and the Phenomenology of Body, Mind and Image
Research Question Two. Can traditional Western cultural semiotic and linguistic frameworks be applied to understanding image usage within the online context?	4.1 The Image and Digital Culture 4.2 The Image as Seen Through Semiotic and Emerging Interpretive Theories 4.3 The Image as Fauxtography 4.7 Neuroscience and the Phenomenology of Body, Mind and Image
Research Question Three. Is image apprehension affected by the surrounding visual noise that we "operate" in?	4.7 Neuroscience and the Phenomenology of Body, Mind and Image 4.8 The Recall and Retrieval of Memory

The literature will explore concepts that locate this study within current photographic image discourse and provide context to new approaches to understanding image usage revealed through the data and articulated in Chapter 6: Interpretation.

Cultural, neuroscientific and affective aspects of image use will be examined along with semantic discourses concerning visual literacy and its various interpretations. The literature review is presented in three parts looking at image usage and apprehension; theoretical, technological and neurological. They provide a variety of approaches and serve as a reference point during data gathering and analysis, which situates this study as providing a point of difference. Becker posits the importance of inspecting competing ways of talking about the same subject matter, identifying and critically examining the ideological components of the established approach – "use the literature, don't let it use you." [193]

193 Howard Saul Becker, *Writing for Social Scientists: How to Start and Finish Your Thesis, Book, or Article* (Chicago, IL: University of Chicago Press, 1986), 149.

PART ONE: THEORETICAL ASPECTS

4.1 The Image and Digital Culture

The ways people make themselves visible to the world are undergoing substantial change due to new devices and social practices that enable the capture and sharing of photographic images. Obviously, many twenty-first-century folk enjoy using the affordances of new systems of representation to express, interpret and make sense of the conditions of their lives. This section examines the ways people conduct themselves and engage in the social aspects of life through images in online interactions of conscious and unconscious intentions.

A New Type of Image

Social media and photo-sharing applications such as Snapchat, Twitter, Facebook, Instagram and Tiktok offer a capacity to make information and representation of events, things and happenings instantly available in real-time, connecting us to events as they happen.[194] The individual particularities of these technological forms allow for a mediative effect to privilege certain types of relations, experiences and effects to overlook the content or meanings contained in images.[195] The significance of these types of image practices is increasingly important in terms of offering an insight into new possibilities of image use, and how meanings are expressed, experienced, altered and consumed through new technologies.

A new type of image is being presented where the convergence of new technologies and cultural practices is largely external to the traditional notions of the image-making process of photography. Scarlett acknowledges that these practices are shaping the performative and discursive trajectories of the medium.[196] People are publishing themselves, what they are doing

194 Charlie Gere, *Digital Culture* (London: Reaktion Books, 2008), 208.

195 Andrew Darley, *Visual Digital Culture: Surface Play and Spectacle in New Media Genres* (London: Routledge, 2000), 60.

196 Ashley Michelle Scarlett, "Remediating Photography: Re-Imagining Ethics In-Light of Online Photo-Sharing Practices," thesis (Queens University, 2010), 50.

at the moment, what they see around them – "bits of their lives."[197] Here the traditional photograph is subordinated as a unit of social communication. The image is now a "Social Image."[198]

The Social Image

The idea of the social image is not new. At the end of the nineteenth century the introduction of the Kodak Camera set in motion particular social processes through contemporary photographic culture, a "Kodak Culture" – "camera equipment for anyone's everyday use." [199] Ordinary people began using camera equipment while participating in leisure-oriented activities reflecting a cultural phenomenon of people creating new forms of visual expression, unpretentious "snapshots", casual and "home-made" photographs recording the "happy moments with one's family and friends." [200]

The Polaroid camera was also a technology for everyday use and provided people with the affordance of instant photographs. It is not the purpose of this paper to cover the historical timeline of vernacular photographic practice but to place social photographic image use into a contemporary social context.

People continue to engage in social practices of capturing moments of life and self-expression through images. Previously communication occurred around the image, now the social image is in communication. It is a different type of image travelling with metadata, a conversational talking point, an attention grabber, a joke, sometimes appearing for the sake of appearance, the need to be there. According to Horning "the point of being on social media is to

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197 Jay David Bolter, *The Digital Plenitude: The Decline of Elite Culture and the Rise of New Media* (Cambridge: MIT Press, 2019), 163.

198 Nathan Jurgenson, *The Social Photo: On Photography and Social Media* (London: Verso, 2019), 9.

199 Richard Chalfen, *Snapshot Versions of Life* (University of Wisconsin Press, 1987), 17, ProQuest Ebook Central, https://ebookcentral.proquest.com/lib/cqu/detail.action?docID=3444963.

200 Ibid., 4.

produce and amass evidence of being on social media." [201]

Our motivation to create or engage with online social images is motivated by the desire to maintain or create social relationships through "constructing personal and group memory; self-presentation; and self-expression."[202] These visually based social interactions occur on both social media sites and online dating sites. The image is in conversation occurring between people participating in the social aspects of life, fulfilling online social norms by which their persona and the content they present can be judged through likes and dislikes, comments, the number of followers, swiping left or right and possibly the most severe sanction for not fulfilling social expectations, to be ignored altogether. This is a social process of encoding and decoding cultural codes within communication and not necessarily about decoding the image's semantic structure.

Self-Representation Through the Image

Acts of self-representation through images occur in various forms to present an ideal self. For example, people communicating through online dating sites act out, through images and textual description, normative expectations or desirable characteristics of men and women in courtship.[203] They present an ideal self through their – in this instance – virtual online performance in front of others, an activity described by Goffman as "marked by a continuous presence before a set of observers in an attempt to influence those observers." [204]

This ideal self is further actualised and presented on social networking sites where personal experiences and self-representation occur through images. Edirisinghe et al. describe this process

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201 Rob Horning, "Affective Privacy and Surveillance," *Marginal Utility Blog*, *The New Enquiry*, 30 April 2013, https://thenewinquiry.com/blog/affective-privacy-and-surveillance/.

202 Nancy Van House, Marc Davis, Morgan Ames, Megan Finn and Vijay Viswanathan, "The Uses of Personal Networked Digital Imaging; An Empirical Study of Cameraphone Photos and Sharing," in *CHI '05 Extended Abstracts on Human Factors in Computing Systems* (2005): 1854, https://doi-org.ezproxy.uws.edu.au/10.1145/1056808.1057039.

203 Lee Humphreys, "Photographs and The Presentation of Self Through Online Dating Services," in *Digital Media: Transformations in Human Communication*, eds. Paul Messaris and Lee Humphreys (New York: Peter Lang, 2006), 40.

204 Erving Goffman, *The Presentation of Self in Everyday Life* (London: Pelican Books, 1971), 22.

as cultural computing where participants of different backgrounds and demographics follow established cultural protocols [205] using images as tools of cultural membership[206] and self-expression.[207]

Frosh describes the act of taking a selfie as a demonstration of connective and communicative performance.[208] Conversational and discursive interactions occur between the viewer and the image viewed. The selfie says not only "see this, here, now," but also "see me showing you me," indicating a performance of communicative action and is a trace of that performance.[209]

This type of performance through images is less about authenticity and more about presenting a desired image before an online audience and is expressed in the form of "Hey! Look at me" vocalisations that are integrated into the sociability of photographs, with Jurgenson describing the selfie as shorthand for exhibitionism and narcissism, a desire to present an idealised self-image "aroused by the technologies of visibility."[210]

Sometimes this type of image is curated by the author as a self-styled aesthetic of visual performance through orchestrated poses, lighting and location indicating a form of pseudo-celebrity. On other occasions, the selfie presents a more spontaneous visual statement of the self, an instant autobiographical snapshot reflecting modes of everyday living, being and relating to

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205 Chamari Edirisinghe, Kening Zhu, Nimesha Ranasinghe, Eng Tat Khoo, Vidyarth Eluppai Srivatsan, Janaka Prasad Wijesena, Owen Noel N. Fernando and Adrian David Cheok, "Modeling Literary Culture Through Interactive Digital Media," *Virtual Reality* 15, no. 4 (December 5, 2011): 240, https://doi.org/10.1007/s10055-009-0147-9.

206 Ilpo Koskinen, "Seeing with Mobile Images: Towards Perpetual Visual Contact," in The Global and the Local in Mobile Communication: Places, Images, People, Connections. Communications in the 21st Century: The Mobile Information Society, Conference in Budapest (Budapest: 2004), 3.

207 Ashley M. Holmes, "Cohesion, Adhesion and Incoherence: Magazine Production with a Flickr Special Interest Group," *M/C Journal* 13, no. 1 (2010), 6, https://doi.org/10.5204/mcj.210.

208 Paul Frosh, "The Gestural Image: The Selfie, Photography Theory, and Kinesthetic Sociability," *International Journal of Communication* 9 (1 January 2015), 1609, https://www.researchgate.net/publication/280802937_The_Gestural_Image_The_Selfie_Photography_Theory_and_Kinesthetic_Sociability.

209 Ibid., 1610.

210 Jurgenson, *The Social Photo*, 54.

others. Rather than only being informed by prior expressive conventions and "visual practices of snapshot photography,"[211] the selfie is informed by social expectations for self-presentation now occurring in online social media environments.

The Everyday Image

An everyday aesthetic is being represented through images in social media environments. This is expressed through collaborative interactions of shared display of memory, taste, history, daily life, and judgment.[212] These images have become everyday acts of representation.

Everyday photography is more than the representation of people, pets, food, and things. It is indicative of the collective moral and aesthetic values of the particular time and place at which something is considered worth photographing, encouraged by social convention as to what is believed to be deserving of showing and admiring. This type of photography does not attempt to authentically reproduce an external reality but reflects and reproduces our view of the world through the social norms of a particular society at a particular time.[213]

Dewdney argues the rapid acceleration of screen interactions infers a social response within a historical and cultural context where computing is remediating earlier technologies such as television and analogue photography.[214] Viewing on digital screens is now moving beyond entertainment, previously a characteristic of television, toward new types of ubiquitous social interactions which are becoming "unremarkable acts in everyday life." [215]

Social media applications encourage an immediate and transitory communication exchange

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211 Mehita Iqani and Jonathan E. Schroeder, "#Selfie: Digital Self-portraits as Commodity Form and Consumption Practice," *Consumption Markets & Culture* 19, no. 5, (2016): 405, https://doi.org/10.1080/10253866.2015.1116784.

212 Susan Murray, "New Media and Vernacular Photography: Revisiting Flickr," in *The Photographic Image in Digital Culture*, 2nd ed., ed. Martin Lister (London: Routledge, 2013), 165, https://ebookcentral.proquest.com/lib/cqu/detail.action?docID=1415807.

213 Pierre Bordieux, *Photography: A Middle-brow Art* (Stanford, Calif.: Stanford University Press, 1990), 94.

214 Dewdney, "Curating the Photographic Image In Networked Culture," in *The Photographic Image In Digital Culture*, 2nd ed., ed. Martin Lister (London: Routledge, 2013): 98.

215 Ibid., 98.

where the small and mundane moments of life "such as bottles, cupcakes, trees, debris, and architectural elements" are offered as documentation of daily life and indicates a reshaping of the way that we construct narratives about ourselves and the world around us.[216]

McLuhan argued that as we interact with media (of which the image plays a part) the media become prostheses. With each new technological development, new extensions occur encouraging new types of interactions that require new ways of understanding.[217]

These extensions afforded by new technologies are further articulated by Edirisinghe et al.[218] and Grace[219] who acknowledge that the mass connectivity and technological advancements delivering the huge proliferation of images have created new cultural values altering the human conception of the world. This is affecting and shaping our values and associated customs. These extensions were intensified by the technology of printing[220] and have now been raised to a new form of intensity by the networked computer resulting in instantaneous and ubiquitous actualisation of the visual, verbal and aural through screen-based dissemination.

Grace examines ubiquitous online media and user-generated content to determine how these concepts establish a new altered perception of the world, one she calls "particulate vision." She investigates how social media and camera phone practices can represent a different reality. In this context, images are captured while engaging in everyday social activities, generating impressions or feelings of a particular moment and being shared in the moment to generate or participate in online conversations as communication is occurring. These images are produced in a state of "partial attention and continuous distraction."[221]

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216 Murray, "New Media and Vernacular Photography: Revisiting Flickr," in *The Photographic Image in Digital Culture*, 2nd ed., ed. Martin Lister (London: Routledge, 2013), 166.

217 Marshall McLuhan, *Understanding Media: The Extensions of Man* (Cambridge, MA: MIT Press, 1997), 7.

218 Chamari Edirisinghe et al., "Modeling Literary Culture Through Interactive Digital Media," 239.

219 Grace, *Culture, Aesthetics and Affect in Ubiquitous Media*, 179.

220 Walter J. Ong, *Orality and Literacy* (London: Routledge, 1996), 135.

221 Grace, *Culture, Aesthetics and Affect in Ubiquitous Media*, 4.

The act of capturing such images through mobile phone camera practices suggests an everyday quality to recording aspects of otherwise "unnoticed lives", an act of "life making and survival."[222] Life making and survival is performed in the sense of the need or desire for sharing these everyday images to create and maintain social relationships, to construct personal and group memory and as self-presentation.

The Everyday Image: Difference through Banality

This everyday quality can be described as banal, meaning "trite, feeble, commonplace"[223] or "too often used in the past and therefore not interesting."[224] The everyday social image exhibits most of the above characteristics, yet it would be prudent to reconsider trite and feeble as inherent characteristics of these images. Yes, this type of image can be considered banal by the very nature of its online pervasiveness and repetitive motifs; however, banal is not synonymous with feebleness. The social image's inherent ubiquity alone indicates a point of difference to one considered an original. The social image is significant.

Lehtonen et al. posit the pervasiveness of the social image brings about a qualitative change of declining value to individual images. However, their collective importance as tools of communication in visual culture has "become enormous." [225]

The ordinary forms and ubiquity of vernacular photography being shared via social media platforms evoke a sense of the banal, with Shinkle suggesting social media image's pervasive presence in our lives assumes that banality is considered a contemporary photographic aesthetic. He further argues that banality should be classed as a photographic genre requiring a critical

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222 Ibid., 44.

223 *Oxford Reference*, s.v. "Banal," https://www.oxfordreference.com/

224 *Cambridge Dictionary*, s.v. "Banal," https://dictionary.cambridge.org/dictionary/english/banal

225 Turo-Kimmo Lehtonen, Ilpo Koskinen and Esko Kurvinen, "Mobile Digital Pictures – the Future of the Postcard? Findings from an Experimental Field Study", paper presented at the 9th Interdisciplinary Conference on Research in Consumption, Dept. of Design History/Material Culture, University of Applied Arts (Vienna, Austria, Friday 27 June to Sunday 29 June, 2003), 15, http://www2.uiah.fi/~ikoskine/recentpapers/mobile_multimedia/Mobiles_Vienna.pdf

examination of the importance of the ordinary.[226]

The everyday social image is a different type of image sometimes forming part of a narrative depicting an hour, a day, a week, a month or more of lived activity experienced in a person's day-to-day life. These images are part of a memory trace, not human memory but machine memory stored as bits and bytes, archived to the cloud, able to be retrieved and displayed through application functionality, such as that provided by Facebook Memories. These images evoke more than they explain, they transmit experience rather than facts.[227] Their importance lies in the narrative's critical role to the ongoing construction of identity helping us to remember, creating a "sense of self."[228]

These images are instantly present and non-present. Their movement is fluid across digital networks travelling through time and space announcing their arrival through social media alerts and notifications presented to us in social media spaces. They are tactile and can be controlled to a certain degree by touch, swiped into and out of view appearing as shifting arrays of individual snapshots of the everyday. They travel by the multitude, appended and augmented with inflections by other listeners to the online conversations in which these images appear. Their lifespan is extended with every interaction, encouraging likes, comments and emoticons, attaching to the image a particular universal emotion that the listener deems appropriate.

This is difference through banality. The everyday social image becomes a banal yet unique technological mediation of our lives, an augmentation of reality – sight, speech and human sociality delivered to us through social media platforms as "gamified scorekeeping,"[229]

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226 Eugenie Shinkle, "Boredom, Repetition, Inertia: Contemporary Photography and the Aesthetics of the Banal," *Mosaic: A Journal For the Interdisciplinary Study of Literature* 37, no. 4 (December 1, 2004): 165, Gale Academic OneFile.

227 Jurgenson, *The Social Photo*, 15.

228 Nancy A. Van House, "Flickr and Public Image-Sharing: Distant Closeness and Photo Exhibition," in *CHI '07 Extended Abstracts on Human Factors in Computing Systems* (2007): 2718, https://doi-org.ezproxy.uws.edu.au/10.1145/1240866.1241068.

229 Jurgenson, *The Social Photo*, 15.

quantified as numbers of likes, friends, followers, tweets and retweets – life that is categorised and quantifiable.[230] The image is part of a socio-technical process of the convergence of technologies and social practices and can be better understood in this context.[231] We can observe our corporeal relationship with technology as mediating the way we view and consume the world around us, allowing an expanded way of seeing and capturing images. The camera phone has become inseparable to our body and is allowing for a second visuality different to the physiological process of vision, one that is technical – seeing and capturing life through our digital screens. This mode of seeing can occur on a subconscious level, an automated response to something that may affect us in our environment, something that motivates us to capture the event. Kikuchi et al. describe this process as an automated subconscious response to predictive signals from the environment or predictable sensory evidence.[232] It becomes an external process of picture taking and presentation, one driven by the photographer's "frame of reference and cultural perspective."[233]

Images captured under these conditions can pose interpretive challenges if analysed through traditional semiotic discourses of representation and signification. On occasion, they operate as unitary signposts signalling presence – "I am here" – photographic emojis indicating singular mono-dimensional expression.

What interest is there in these images? How do we classify them? How do they affect us? Are these images coded with meaning? Perhaps all we need is to acknowledge our experience of these images in conversation, the affect, without concern for deconstructing their semiotic

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230 Ibid.,111.

231 José van Djick, "Digital Photography: Communication, Identity, Memory," *Visual Communication* 7, no. 1 (February 2008): 59, https://doi.org/10.1177/1470357207084865.

232 Yukiko Kikuchi, Jennifer Ip, Gaëtan Lagier, James C. Mossom, Sukhbinder Kumar, Christopher I. Petkov, Nick E. Barraclough and Quoc C. Vuong, "Interactions between Conscious and Subconscious Signals: Selective Attention Under Feature-Based Competition Increases Neural Selectivity during Brain Adaptation," *The Journal of Neuroscience* 39, no. 28 (2019): 5506, https://doi.org/10.1523/JNEUROSCI.3052-18.2019.

233 van Djick,"Digital Photography", 64.

anatomy which may very well reveal an absence of signification or meaning. These questions are external to the type of photograph being discussed here, without relation to its essence and the answers to these questions can only be seen as an attempt to impose an intellectual paradigm outside of the photograph itself. These "new" photographs evade classification traditionally applied to older forms of representation. Photography is reinventing itself and we may say in this instance it is unclassifiable.[234]

Punctum or Studium?

In 1980 Roland Barthe's writings in *Camera Lucida* precede the online social image but they provide a hint to how we can consider this type of image. Barthes reflects that for him most photographs provoke only a general or "polite" interest. They "please" or "displease" [235] and do not elicit any intense emotion. This act of viewing is a studied encounter with the photograph. Barthes describes this interaction as "studium," a form of study applied to the photograph that helps inform the viewer through their culturally acquired world view, assisting in interpreting the photographer's intentions of representation and signification.[236] There may be occasion, however, where a photograph jumps out from others, one that "breaks or punctuates" the "studium." Barthes refers to this as "punctum", further describing the sensorial reaction as "that accident which pricks me."[237] These instances of photographic engagement have the potential to provide a more extraordinary and arresting experience.

The Social Image lends itself to "punctum" where certain images can have a more potent sensory effect on the viewer and are not necessarily designed for semantic deconstruction. We can consider the following example: A photo-taking ritual occurs with people taking images designed to attract attention and interest from others in the photographed objects as well as to

234 Roland Barthes, *Camera Lucida: Reflections on Photography*, trans. Richard Howard (New York: Hill and Wang, 1981), 4.

235 Barthes, *Camera Lucida*, 27.

236 Ibid., 27.

237 ibid., 96.

themselves. The images can take on a theatrical form of people performing activities, such as preparing a dinner dish, showing people what they are going to eat before posting the images in the moment.[238] We may rightly presume that on their own these images hardly arouse any excitement or warrant any deep interpretation apart from the mono representation of "I see you, I see what you are doing", neither "punctum" nor "studium." However, these image arrays are sometimes punctuated with the more unusual.

Koskinen observes that when sending visually based messages "senders have to make drama out of the banalities of everyday life"[239] by embedding images to stimulate interest sometimes accompanied by text to arouse a response or to prompt the desired action.

Sometimes the banality is punctuated with a joke, activating the punctum (Fig. 4.1). These are "joke images," ambiguous to the outside observer; such images are shared and understood within a particular social group because of the closeness of the relationship and shared context and understanding.[240]

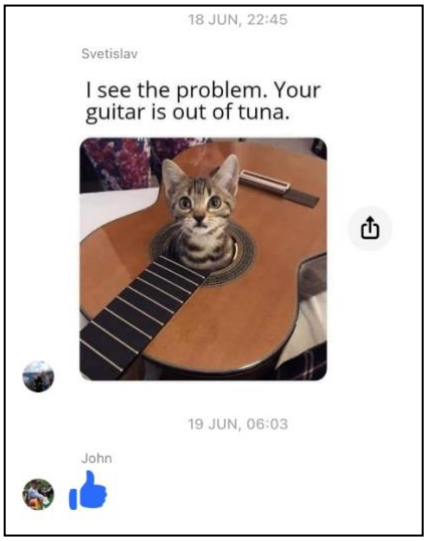

Figure 4.1. Punctuation in an Online Conversation:
The Punctum. Source: Marotta

238 Dong-Hoo Lee, "Mobile Snapshots: Pictorial Communication in the Age of Tertiary Orality," in *New Visualities, New Technologies: The New Ecstasy of Communication*, eds. J. Macgregor Wise and Hille Koskela (London: Routledge, 2013), 181–182. ProQuest Ebook Central.

239 Koskinen, "Seeing with Mobile Images," 11.

240 Ibid., 48.

Orality

We are increasingly presenting and expressing ourselves through images. This is occurring through online social norms of communication where we create and consume images, constructing our ideological selves through online networked spaces. We are performing visual representations of ourselves and our lives,[241] actualising the human need for connection with others by engaging in "the dynamic performance of relatedness and connectedness in everyday encounters."[242] These interactions form part of the ubiquity of digital information permeating our lives, being pushed from our smartphones, offering us the digital potential for an endless stream of texts, updates, notifications, emails and, increasingly, social interaction through images.

Images within this social stream of activity are presented in an increasingly oral mode. Ong describes McLuhan's aphorism "the medium is the message" as registering an "acute awareness of the importance of the shift from orality through literacy and print to electronic media."[243] Communication on social media platforms, textual or visual, requires "anticipated feedback" to take place. The message does not occur through a linear path of sender to receiver but via a feedback loop where the sender also positions themselves as the receiver in anticipation of a response before sending the message. "To speak, you have to address another or others." [244] This is a reciprocal exchange replicating the act of oral communication increasingly visual in nature. People are speaking through images.

Analogue images were previously, and are still to some extent, shared in oral communication used to narrate aspects of family life or history. They are imbued with a sociality

241 Marita Sturken and Lisa Cartwright, *Practices of Looking: An Introduction to Visual Culture* (New York: Oxford University Press, 2005), 185–186.

242 Daniel Chandler and Rod Munday, "Sociality," in *A Dictionary of Social Media* (Oxford: Oxford University Press, 2016), https://www-oxfordreference-com.ezproxy.sl.nsw.gov.au/view/10.1093/acref/9780191803093.001.0001/acref-9780191803093-e-1403.

243 Walter J. Ong, *Orality and Literacy* (New York: Taylor and Francis, 2005), 29.

244 Ibid., 172.

that van Dijck describes as "typically taken and compiled in a home mode of pictorial communication."[245] The digital social image also functions to narrate life but also to present a sense of self and to confirm social relationships and communal membership.[246]

Edwards argues verbal articulation of images are extending their social function. Through orality images become part of dynamic and shifting storytelling where the spoken and the seen are brought together and replayed on different occasions connecting people to people.[247] This is occurring through online social media platforms where images are active and fluid in nature, digital bits and bytes travelling across networked screens. These images are used as short bursts of visual dialogue announcing a sense of presence and participation in online communal dialogue.

The Social Image is Oral-Visual

The way we communicate is changing, facilitated by technological and social affordances of the internet and social media platforms. Operating within these conditions, early media such as television and photography have been repurposed with extended capabilities taking on a different cultural form as they appear in online distribution channels such as YouTube, Flickr and Facebook. These earlier media forms emerge as new media on the internet, improved versions of previous media and carry with them their unique affordances of distinctly nuanced communication possibilities – the sharing of life's moments in increasingly visual form. These forms of communication allow for and encourage extended-expression and meaning of the image, including adding comments, likes and tags. The expanded and transformative possibilities for the communicative use of images through online social interactions appear to be part of a

245 José van Dijck, *Mediated Memories in the Digital Age: Cultural Memory in the Present*, (California: Stanford University Press, 2007), 8.

246 Lee, "Mobile Snapshots: Pictorial Communication," 172–173.

247 Elizabeth Edwards, "Thinking Photography Beyond the Visual?" in *Photography: Theoretical Snapshots*, eds. J. J. Long, Andrea Noble and Edward Welch (London: Taylor & Francis Group, 2009), 39.

continuum of evolving modes of communication occurring over time.

Early oral-based cultures were transformed by technologies such as printing and writing where sound shifted to visual space creating a transformative effect on human thought and expression.[248] Similarly, the way new media technologies such as camera phones, the internet and social media platforms allow us to use images is transforming the way we express ourselves. This expression through images is increasingly exhibited as oral form where people speak to each other through images.

Oral practices involving images are not unique to social online images but as previously mentioned can be considered an extension of the social act of people gathering together and verbalising narratives around analogue images viewed in photographic albums. In this setting, the narrative surrounding the photographic image occurs as dialogue between the viewer/narrator, viewer/listener and the photograph.[249]

A characteristic of networked technologies through which images are shared is immediacy, the ability to instantaneously capture and disseminate images and have them seen, heard and responded to by active listeners on social media platforms. This closely mirrors the spontaneous performance of human speech through a seamless integration of social and technological convergence creating a form of digitised human call and response.

This can be described as the spontaneous oral-visual interaction between the speaker (the sender of the image) and listener (recipient) in which all the sender's visual statements ('calls') are punctuated by expressions of acknowledgment ('responses') from the online listener offering affirmation through commentary or agreement with the speaker/sender. These responses can take on the form of comments, likes or dislikes and sometimes images. This techno-social

248 Ong, *Orality and Literacy*, 117.

249 Martha Langford, *Suspended Conversations: The Afterlife of Memory in Photographic Albums*, (Montreal: McGill-Queen's University Press, 2001), 124.

phenomenon is creating a form of communication where photography is invisible disappearing into oral communication[250] occurring online.

Figure 4.2. Oral Visual Call and Response in an Online Conversation. Source: Marotta

Online social photographs are centred on and extend verbalisation through the oral nature of online social communication occurring through images. This process should be understood as images not replacing words but taking on characteristics of a vocal act described by Edwards as "paralinguistic sound – sighing, weeping, and laughing, and the tone of voice" [251] that is influencing the narratives with and around photographs. The oral-visual nature of online social dialogue highlights the essential relationship between photographs, sound, voice and social practices extending, and incorporating the image into online vocalisations.

250 Daniel Rubinstein, "Cameraphone Photography: The Death of the Camera and the Arrival of Visible Speech," *The Issues in Contemporary Culture and Aesthetics* 1 (2005): 4.

251 Edwards, "Thinking Photography Beyond the Visual?" 105.

As previously indicated, often there is no storytelling with the social image – just shout-outs of confirmation of presence and of existence, photographs used as oral performance intended to generate ongoing communication with "background listeners" who may be part of the sender's social network[252] (see Figure 4.2).

Were he alive today Ong might see this orality as an extension of the primary orality of verbal expression within prewriting or print cultures, a secondary orality that can be observed in digital-photo taking and sharing on social media for social interaction. As indicated, oral and visual modalities are merging toward an "oral-visual" mode. Images are becoming more like spoken language, integral elements for social interaction establishing and reconfirming social bonds between individuals and groups.[253]

Summary

The social media image has arrived as a convolution occurring through a path of how images have been used and are used now through new technologies and social practices. In this context the term convolution should be understood through mathematical meaning where two "functions" meet, one being modified by the other winding together to produce a third function.[254] The social media image is the "third function," the result of converging technologies of analogue image and digitally networked screens encouraging new social practices of image sharing.

Oral and visual modalities act upon each other, seemingly being reshaped toward a singular "oral-visual" mode of expression occurring within virtual conversations in a socially networked world. Through the use of images, these conversations are both visual and oral.

These are flows of social interaction where increasingly image-based messages, content,

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252 Ibid., 179.

253 van Djick, "Digital Photography: Communication, Identity, Memory," 61.

254 Oxford English Dictionary, s.v. "convolution," https://www-oed com.ezproxy.sl.nsw.gov.au/view/Entry/40879?redirectedFrom=convolution#eid. PROBLEM WITH LINK

contexts and interpretations occur bearing a similarity to oral communication happening in the moment. Lee describes this as people engaging in and experiencing a communal sense of sharing, being present but not necessarily together in the same physical place and without any awareness of the temporal gap between speaking, seeing and listening.[255]

The type of images discussed in this section are new types that carry new types of meaning not inherent in the image itself but from an interpretivist view, closely associated with their use in social dialogue. Within this context we need to develop and expand photographic discourse into new areas. Photography not as "representation, technology, or object" but as a socio-technical network where photography is an act that takes place when a set of "technologies, meanings, uses and practices align."[256]

The image has become an active form of conscious and unconscious exchange between people, an element of sociality moving across digital networks through which we express our identities in "oral-visual" performance, selecting photographic moments and presentable photographs through which we speak to others.

4.2 The Image as Seen Through Semiotic and Emerging Interpretive Theories

This section investigates the evolving nature of semiotic and speculative image visual language theories. Earlier semiotic theories traditionally rooted in textual forms of communication are discussed alongside emerging theories of phenomenological apprehension and conception of meaning, constructed and shared via digitally based information exchange and communication systems. These latter forms of networked online image use have encouraged new

255 Lee, "Mobile Snapshots: Pictorial Communication," 177.

256 Edgar Gómez Cruz and Eric T Meyer, "Creation and Control in the Photographic Process: IPhones and the Emerging Fifth Moment of Photography," *Photographies* 5, no. 2 (September, 2012): 221, https://doi-org.ezproxy.uws.edu.au/10.1080/17540763.2012.702123.

avenues of investigation into how we make sense of the world through digitality. This discussion further highlights changes in the way image interpretation occurs now comparing traditional print media and digital online media and poses the question of whether or not emerging theories are congruent with the semiotic tradition.

We Are Experiencing Images Differently

The image is an integral element of communication within the media landscape and can be experienced and understood in many ways. A review of the existing literature has revealed changes in the approach to understanding the nature of images that extend beyond the boundaries of traditional semiotic theorists, such as Saussure, Barthes and Peirce. While their approaches to semiotics differ, all three were concerned with how signs create meanings. Saussure takes a structural analysis of signs rooted in linguistics and considers the sign as uniting a concept and a "sound-image".[257] Peirce focuses on the iconic, symbolic and indexical dimensions of signs with the view that meaning comes through our interaction with the environment and others. It is those interactions that disclose characteristics of the things with which we interact.[258] Barthes refers to cultural meanings that become attached to forms of communication, including images.[259] In the context that Barthes is referring to, images have symbolic, historical and emotional connotative values attached to them.[260]

This qualitative nature of this study focuses on social semiotic rather than linguistic aspects of image analysis and considers the way social semiotic theory has developed from the structural concept of the sign to the way people use "semiotic resources" to produce and interpret

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257 Arthur Asa Berger, *Media Analysis Techniques, Sixth edition.* (California: SAGE Publications, Inc., 2019), 3-4.

258 Alex Kirlik and Peter Storkerson, "Naturalizing Peirce's Semiotics: Ecological Psychology's Solution to the Problem of Creative Abduction," *Studies in Computational Intelligence* (SCI 314): 33, https://doi.org/10.1007/978-3-642-15223-8_2

259 Arthur Asa Berger, *Media Analysis Techniques, Sixth edition.* (California: SAGE Publications, Inc., 2019), 4.

260 Roland Barthes, "Rhetoric of the Image," in *Image-Music-Text: Essays*, trans. Stephen Heath (London: Fontana Paperbacks, 1984), 46.

"communicative artefacts" [261] [photographic images]. The acts of interpretation and production occur in social and technical situations and are inclusive of, mind and body and it is within this context that this research is situated (see Chapter 4.7, 5 and 6).

There is considerable variation among leading semioticians as to what semiotics involves. Contemporary semioticians and cultural theorists study signs as part of semiotic sign-systems and include effects of the medium within which the sign is placed and of sociality[262] or genre as influencing meaning. This is pertinent to our apprehension of images in digital media.

New affective experiences afforded the image include new ways of interaction and consequences of effect unique to digital media. In this environment, we are experiencing images differently and this is sometimes related to the physical nature of screen-based devices through which images are viewed. Ernst posits the importance of physical aspects of our interaction with media claiming the interaction is "vetoed by the influence of electro or even quantum physical laws,"[263] "vibrating media considered as discreet micro-events called digital."[264] Ernst suggests that when engaging with media the experience is not seen only from a culturally imposed world view but as an "experiencing of the event."[265]

In other instances, technology is altering cognitive processes where humans are becoming hyper-attentive, developing a preference for multiple information streams and the desire for high levels of stimulation.[266] This is further explained in Chapter 6.

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261 Theo van Leeuwen, *Introducing Social Semiotics* (Oxon: Routledge, 2005), xi.

262 Gunther Kress and Theo van Leeuwen, *Reading Images:The Language of Visual Design*, 2nd ed. (London: Routledge, 2006), 6.

263 Wolfgang Ernst "Experimenting with Media Temporality: Pythagoras, Hertz, Turing," in *Digital Memory and the Archive*, ed. Jussi Parikka (University of Minnesota Press, 2013):185, https://www.jstor.org/stable/10.5749/j.ctt32bcwb.

264 Ibid., 189.

265 Ibid.,185.

266 Hayles, "Hyper and Deep Attention," 187.

Continuum or Change in Theoretical Approach?

Scholars such as Kress et al. have identified but not fully explained the link between changes in society, technological affect and the associated changing of semiotic codes particularly within the digital context of image usage such as social media.[267] Answers to the following questions may help to fill this gap:

1. Is it possible to establish a continuum between previous image apprehension discourses and new image apprehension theories?
2. How is the perception and understanding of photographic images changing along with evolving methods of communication, information dissemination and new emergent media channels?
3. Can traditional western cultural semiotic and linguistic frameworks be applied to understanding images within the online context and to what extent?
4. Can these frameworks be used with contemporary concepts such as the effects of de-territorialisation which Hansen describes as "the body's ongoing relations with the world" being "disturbed and potentially expanded"[268] through technological innovation, or in other words, the body's capacity to supplement and collaborate with technology?[269] Hansen alludes to the changing perception of the image in light of virtual relationships occurring between humans and computer technology.

Sensory-motor activity and the environment in which it occurs is playing a role in meaning-making and concept definition.[270] Through neurocognitive processes the body plays an active

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267 Kress and van Leeuwen, *Reading Images*, 267.

268 Mark B. N. Hansen, *Bodies in Code: Interfaces with Digital Media* (New York: Taylor & Francis Group, 2006), 28, ProQuest Ebook Central.

269 Mark B. N. Hansen, "Affect as Medium, or the 'Digital-Facial-Image'," *Journal of Visual Culture* 2, no. 2 (August 2003): 205, https://doi.org/10.1177/14704129030022004.

270 Giuseppe Riva, "From Virtual to Real Body: Virtual Reality As Embodied Technology," *Journal of Cyber Therapy & Rehabilitation* 1, no. 7 (22 March 2008):7.

part in shaping perception and action, performing functional roles in enabling meaning-making.[271] This is elaborated in Section 6 of this chapter, The Image and Neuroscience.

These new theories expand the possibilities of understanding as the destabilisation of photography and representation is occurring in part through the use of images as communicative elements in digitally networked environments, including social media platforms. Gómez claims that on these platforms photographs and representation are no longer stand-alone signifiers but are increasingly a condition of the world views of participants in a shifting digital culture of "sharing, connectivity, and sociability."[272] Images in this context may be better understood as cultural and social objects mediated in a culture of digitality.

This provides us with important theoretical considerations to studying human interaction with images. Some literature highlights the relationship between the phenomenological and neurological experience and how this can affect, in different degrees of combination, our perception towards objects informing and altering our ways of seeing. Khachouf et al. suggest a bodily basis of the mind and adopt a naturalistic view of the phenomenological concept of intentionality, arguing it is the *a priori* characteristic of lived experience, an "embodied and enactive approach to the biology of consciousness" – understanding our world independent of experience.[273] Jackendoff considers the "phenomenological mind" (apprehension through experience) as a projection from the "computational mind" (cognitive mechanisms), a process where all knowledge processing takes place.[274] Intentionality becomes the property of a mental

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271 Shaun Gallagher, *How the Body Shapes the Mind* (Oxford: Oxford University Press, 2005), https://doi.org/10.1093/0199271941.001.0001.

272 Edgar Gómez Cruz and Helen Thornham, "Selfies Beyond Self-representation: The (Theoretical) F(r)ictions of a Practice," *Journal of Aesthetics and Culture* 7, no.1 (December 8, 2015): 8, doi:10.3402/jac.v7.28073.

273 Omar T. Khachouf, Stefano Poletti and Giuseppe Pagnoni, "The Embodied Transcendental: A Kantian Perspective on Neurophenomenology", *Frontiers in Human Neuroscience* (September 2013): 1, https://doi.org/10.3389/fnhum.2013.00611

274 Ray S. Jackendoff, *Consciousness and the Computational Mind:Vol. 1: Explorations in Cognitive Science* (Cambridge, Mass: A Bradford Book, 1990), 18, EBSCOhost.

state.[275] Hansen articulates the role and significance of images in neuroscience and perceptual phenomenology and argues the correlation between mental images, material images, images in "the mind and images in the world." [276]

Semiotic and Linguistic Frameworks

To better understand the role emerging theories play in image apprehension and whether they should be considered separate from, or able to augment, traditional theories, it is important to acquaint ourselves with antecedent discourses of semiotics, the study of signs. The epistemological position of semiotics attempts to understand how meanings are made, how reality is represented [277] and how meaning is produced using signs.[278] Umberto Eco offers a broad definition of semiotics as a theory for understanding meaning concerned with everything that can be taken as a sign, such as words, images, sounds, gestures and objects. [279]

There is considerable variation among semioticians as to what semiotics involves. Contemporary semioticians and cultural theorists study signs as part of semiotic sign-systems and include effects of the medium within which the sign is placed and of sociality,[280] while others situate the photograph within "cultural modernity" arguing meaning-making occurs within this context.[281] Zajonic posits that affective reactions to a photograph occur without prior perceptual and cognitive encoding. For example, a person can experience an instinctual reaction to stimulation when encountering an image which may occur before cognitive processes and

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275 Ray S. Jackendoff, *Consciousness and the Computational Mind:Vol. 1: Explorations in Cognitive Science* (Cambridge, Mass: A Bradford Book, 1990), 20, EBSCOhost.

276 Mark B. Hansen, "From Fixed to Fluid," in *Releasing the Image: From Literature to New Media*, eds. Jacques Khalip and Robert Mitchell (Standford, CA: Stanford University Press, 2011), 84, ProQuest Ebook Central.

277 Daniel Chandler, *Semiotics: The Basics*, 3rd ed. (London: Routledge, 2017), 2, ProQuest Ebook Central.

278 Ibid., 13.

279 Umberto Eco, *A Theory of Semiotics* (Bloomington, IN: Indiana University Press, 1976), 7, http://www.jstor.org/stable/j.ctt16xwcfd.

280 Kress and van Leeuwen, *Reading Images*, 6.

281 Larry Ray, "Social Theory, Photography and the Visual Aesthetic of Cultural Modernity," *Cultural Sociology* 14, no. 2 (June 2020): 139, https://doi.org/10.1177/1749975520910589.

semiotic decoding, considered necessary for further and deeper perception to occur.[282] This is discussed in Chapter 5.7. Lotman claims that applying aspects of "classic formal language theory" to the study of online images can pose problems when applied to texts in the digitally networked semiotic hyperspace.[283] The very nature of the differences between objects created and viewed in non-digital environments – mono-dimensional texts, images, paintings or sculptures and those created and consumed in the nonlinear hypertext digital environments – indicate the application of previous theories may not be enough.

Conceptual systems of various branches and approaches within the framework of contemporary semiotics differ considerably. Semiotics is evolving as a discipline with "general models and conceptual systems" still being formed. [284] It is important to acknowledge and understand the changing nature of semiotic discourse to incorporate recent technological and social influences on photographic image usage. This includes addressing the epistemological dichotomy of philosophical and scientific approaches to how we view the world [285] (see Discussion Chapter 6.1.2 and 6.2.2). Tønnessen et al. acknowledge a biological foundation is central to the study of communication and signification experience, whether it is phenomenal or not. They argue that communication is sign based and this is the way we relate to our environment. Experiencing phenomena presupposes being endowed with a mind, which entails having holistic, coherent and subjective experiences; however, not all biological felt experience has the form of phenomena. The non-phenomenal experience is possible.[286] There are occasions when experiencing images where we pick up on and understand signs in a very different way

282 R. B. Zajonc, "Feeling and Thinking: Preferences Need No Inferences," *The American Psychologist* 35, no. 2 (February 1980): 151, https://doi.org/10.1037/0003-066X.35.2.151.

283 Kalevi Kull, and Ekaterina Velmezova, "What is the Main Challenge For Contemporary Semiotics?" *Sign Systems Studies* 42, no. 4 (October 2014): 530, https://doi.org/10.12697/SSS.2014.42.4.06.

284 Ibid., 531.

285 Ibid., 533.

286 Morton Tønnessen, Timo Maran, and Alexei Sharov, "Phenomenology and Biosemiotics," *Biosemiotics* 11, no. 3 (29 November 2018): 326, https://link.springer.com/article/10.1007/s12304-018-9345-8.

from our established "communicative habits dominated by symbolic language." According to Hendlin this occurs biologically. [287] Can the brain or state of the nervous system conceive something other than the representational qualities of the object being experienced? This is discussed further in Chapter 5.7.

Affective Understanding - Experiencing the Image

The physicality of touch when interacting with paper or touch-enabled screens has associated neural responses that may impact understanding. Kull considers tactility, in particular the use of hands, as playing a significant role in many fields of the arts such as sculpture, graphic arts, painting, and music, a significance transcending the obvious – for reasons of creation and performance. There are deeper reasons, ones that we can allude to that are instinctive and linked to a bio-phenomenological act.[288]

Peirce used the analogy of listening to music to suggest that there is a sensory reaction or response which has no direct reference to how we may act on a given occasion. To understand meaning from these types of interactions we must determine what habits it produces – meaning, in this case, is understood by simply observing what habit it involves.[289] Peirce is describing a system of instinctual consciousness and awareness of phenomena as they occur, something not wholly based on learned cultural and social norms.

Signification is more than a matter of deducing meaning from the exclusive and specific phenomenon of human language. When discussing photographic signification in visual communication, what is received by the viewer is an array of signs which can never be truly

287 Yogi Hale Hendlin, "Expanding the Reach of Biosemiotics," *Biosemiotics* 14 (29 April 2021):1, https://doi-org.ezproxy.cqu.edu.au/10.1007/s12304-021-09425-z.

288 Ekaterina Velmezova and Kalevi Kull,, "Interview with Vyacheslav V. Ivanov About Semiotics, the Languages of the Brain and History of Ideas," special issue, *Sign Systems Studies* 39, no. 2–4, (April 2011):306, https://doi.org/10.12697/SSS.2011.39.2-4.12.

289 Nathan Houser and Christian J. W. Kloesel, eds., *The Essential Peirce, Volume 1: Selected Philosophical Writings (1867–1893)*, (Bloomington: Indiana University Press, 1992), 131.

singularised because, as they are received, they are always interacting with each other, in multiple configurations accessed from different devices and situations.[290]

Images can activate the affective response of the viewer. Kesner posits affect is an unmediated response to expressive form and linked to empathic vision, a feeling or sense for something.[291] It is possible for affect [the feeling one experiences from an image] and reason [a meaning that is understood through logical reasoning and conditioned thinking] to be a dynamic combination where, through psychological and neuronal activity, acts of perception occur. Contemporary mind and brain sciences indicate the interconnectedness of emotion and cognition both at the level of the brain, neuronal mechanisms and the architecture of the human mind.[292]

When we consider the tactility of the image as an affordance of new screen technologies, we begin to see the importance to perception of the body and its relationship to technology. Gallese describes this as a new form of non-linguistic "bodily visuality" that is central to the way we apprehend the world, one that is becoming less language-centred and more sensuously embodied.[293] The image is experienced as an event rather than through structural and historical form[294] where tactile engagement is occurring with images through touch-enabled devices; this is described by Hansen as a shift from signification to the imitation of reality.[295]

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290 Paul Cobley and David Machin, "Semiotics," *in A Companion to Photography*, ed. Stephen Bull (Hoboken, New Jersey: John Wiley & Sons, 2020), 150.

291 Ladislav Kesner, "The Warburg/Arnheim Effect: Linking the Cultural/Social and Perceptual Psychology of Art," *Journal of Art Historiography* 11 (December 2014):19, http://ezproxy.uws.edu.au/login?url=https://www.proquest.com/scholarly-journals/warburg-arnheim-effect-linking-cultural-social/docview/1638900302/se-2.

292 Georg Northoff, "From Emotions to Consciousness – A Neuro-Phenomenal and Neuro-Relational Approach," *Frontiers in Psychology* 3 (2012): 303, https://doi.org/10.3389/fpsyg.2012.00303.

293 Vittorio, Gallese, "Mirroring, a Liberated Embodied Simulation and Aesthetic Experience," in *Mirror Images. Reflections in Art and Medicine*, ed. Helen Hirsch, Kunstmuseum Thun and Alessandra Pace (Vienna: Verlag für moderne Kunst, 2017): 8–9.

294 Mark B. Hansen, "Bodies in Code or How Primordial Tactility Introjects Technics Into Human Life," in *Bodies in Code: Interfaces with Digital Media* (New York: Routledge/Taylor & Francis Group, 2006): 90, ProQuest Ebook Central.

295 Mark Hansen, *Embodying Technesis. Technology Beyond Writing* (Michigan: University of Michigan University Press, 2000), 302.

The image in this context is about the experience, not communication. Understanding can be achieved by feeling, contact, and the "evidence of the senses" rather than the mind. Under these conditions, meaning can be experienced through emotionality triggered by surface forms[296] presented through the haptic affordances of digital devices. Contact with these forms occurs through sight, sound and touch and provides a sensual experience that transmits meaning.

New Types of Engagement – Memory Identity and Narrative

De Silva Joyce and Gaudin state that the image within visual communication contexts fulfils three functions:

1) How an image conveys aspects of the real world.
2) How an image engages with the viewer.
3) How an image achieves its intention and affects the viewer through the arrangement of elements.[297]

These frameworks can be applied to online images where the social aspects of image apprehension are evident with people exchanging images that are composed in ways designed to achieve desired effects to garner attention and to announce their presence within an online social context.

There are other contexts of image usage, such as blogs, news media sites, product catalogues and search engine results pages, which encourage particular approaches to the decoding of meaning and purpose in an image. It is beyond the scope of this chapter to discuss and compare the many different genres and situations where the dissemination and consumption of images occur and align them with appropriate interpretive theories. The important premise is to illuminate previous and new interpretive theories in the context of a broader overview of the

296 J. C. Alexander, "Iconic Consciousness: The Material Feeling of Meaning," *Thesis Eleven* 103, no.1 (2010): 11, https://doi.org/10.1177/0725513610381369.

297 Helen de Silva Joyce and John Gaudin, *Interpreting the Visual: A Resource Book for Teachers* (Putney: Phoenix Education, 2007), 18.

changing nature of image usage practices.

A study by Jackson into social media practices in the Flickr community indicates image production and consumption mediated by technology cannot be wholly understood through conventional systems of visuality or "observable and measurable communication circuits" such as the semiotics of signification and representation.[298] However, there are some aspects of personal photographs shared on social media that mirror conventional image interpretation systems such as constructing "memory, identity and creating narrative."[299]

The formation of memory is increasingly structured by digital networks. Images are experienced in a connective environment and constructed "on the fly," a metaphor described by Hoskins as a version of memory that depends on and builds upon previous moments out of which it emerges acquiring new characteristics "with and in each passing moment." [300] The past and the future are brought into the "visual present" interacting with the individual and the collective in private and the public online spaces, allowing for a new kind of memory.[301] This dynamic engagement with images through networked environments allows for new forms of production and consumption that are mediated by technology in ways that are not easily explained using conventional systems of visuality.[302] New ways of thinking about the image are emerging. Is it possible to apply earlier semiotic theories previously used to understand printed images to online images?

Signs, Symbols and the Printed Image

To provide some context to this question we can look to examples of interpretation from two

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298 Grace, *Culture, Aesthetics and Affect in Ubiquitous Media*, 10.

299 Van House, "Flickr and Public Image-Sharing," 2718.

300 Andrew Hoskins, "Digital Network Memory," in *Mediation, Remediation and the Dynamics of Cultural Memory*, eds. Astrid Erll and Ann Rigney (Berlin: de Gruyter, 2009), 94, https://doi-org.ezproxy.uws.edu.au/10.1515/9783110217384.

301 José van Dijck, "Flickr and the Culture of Connectivity: Sharing Views, Experiences, Memories," *Memory Studies* 4, no. 4 (October 2011): 402. https://doi.org/10.1177/1750698010385215.

297 Van House, "Flickr and Public Image-Sharing," 2718.

notable semioticians Roland Barthes and Ferdinand de Saussure.

Firstly, an example of connotation is in Barthes's interpretation of the Panzani advertisement in the "Rhetoric of the Image." [303] This approach imagines the image to be an analogical representation presenting a system of signs rather than considering the image as an arrangement of unconnected symbols. Barthes uses this example to explain the existence of an analogical code that offers "connotation," meaning and interpretation through lived experience as opposed to one that is resistant to meaning or representation.

Saussure's model of the sign associates the sign as the "whole," a result of the association of the signifier with the signified. Interpretation, in this case, consists of two components: a "sign vehicle" (signifier) and its meaning ("signified").[304] Saussure makes the distinction in linguistic terms: A sign is not a link between a thing and a name, but between a concept [signified] and a sound pattern [signifier]. Peirce describes a sign as "something which stands to somebody for something in some respect or capacity. It addresses somebody, that is, creates in the mind of that person an equivalent sign, or perhaps a more developed sign."[305]

In the following example, we use this distinction to describe the photographic image: There exists the signified [the meaning derived from the photographic image] and the signifier [the object being represented]. They work in combination with the composition of elements within the image which also aid signification, resulting in a final concept in the viewer's mind, their psychological and personal impression of the image. Personal viewpoints and universal aspects of meaning are found in semiotic principles as being specific to a particular culture learned over time and through instances of use.[306]

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303 Roland Barthes, "Rhetoric of the Image", in *Image-Music-Text: Essays*, trans. Stephen Heath (London: Fontana Paperbacks, 1984), 33.

304 Chandler, *Semiotics: The Basics*, 14–15.

305 Charles S. Peirce, "Logic as Semiotic: The Theory of Signs," in *Philosophical Writings of Peirce*, ed. Justus Buchler (New York: Dover Books, 1955), 99.

306 Kress and van Leeuwen, *Reading Images*, 4.

These theories have developed through the analysis of analogue images appearing in earlier media especially in texts, as argued by Hansen.[307] There are certain complexities when attempting to apply these theories to the online image. For example, the ubiquitous presence, ease of manipulation, speed of dissemination and multitasking situations within which people access images on a myriad of devices does not always allow for singular focussed and sustained attention toward an image. Therefore, elements making up the representational object may be missed, subjected to interference by external stimuli such as competing images, interface elements, incoming alerts and messages, resulting in the possibility of shallow interpretation. The meaning that would normally be derived from the image if it were viewed in the more stable print form, which encourages more contemplation and focus, may be very different when viewed online.

The literature reveals a shift in thinking from earlier interpretive theories which predominantly relied on studying the function of images appearing in earlier forms of technology such as print or television. Ways of thinking about the image have changed as images are captured, distributed and consumed in new contexts enabled by technology. There are new uses for images, particularly in social media where arguably new knowledge is constructed through new social practices. For example, there are modes of self-representation performed through the ubiquitous selfie image that did not exist in Barthé's, Saussure's or Peirce's time. We can consider the example of the photographer using a camera phone to capture photos of themselves as a form of self-expression to communicate an emotional state[308] sometimes motivated by a desire to be liked[309] and remediated into new contexts of online social visibility and connection'[310]

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307 Hansen, *Embodying Technesis. Technology Beyond Writing*, 14.

308 Michele Zappavigna, "Social Media Photography: Construing Subjectivity in Instagram Images," *Visual Communication* 15, no. 3 (30 June 2016): 286, https://doi-org.ezproxy.uws.edu.au/10.1177/1470357216643220.

309 Kathrynn Pounders, Christine M. Kowalczyk and Kirsten Stowers, "Insight into the Motivation of Selfie Postings: Impression Management and Self-esteem," *European Journal of Marketing* 50, no. 9/10 (September 2016): 1880, https://doi.org/10.1108/EJM-07-2015-0502.

310 Sonja Vivienne, and Jean Burgess, "The Remediation of the Personal Photograph and the Politics of Self-Representation in Digital Storytelling," *Journal of Material Culture* 18, no. 3 (September, 2013): 282, https://doi-org.ezproxy.uws.edu.au/10.1177/1359183513492080.

New Understanding Through the Remediation of Media

Bolter and Grusin suggest that, through a process of remediation, computer graphics, virtual reality, and the worldwide web are characterised by borrowing from and reshaping earlier media such as painting, photography, television, and film. Earlier media are refashioned and embedded in new digital media's cultural contexts.[311] This can be seen when observing image usage as part of online social discourse – an extension of personal photography which gradually emerged in the twentieth century as a social practice that revolved around families wanting to save their experiences as photographic moments or autobiographical remembering – "life as it was."[312] This occurred in analogue form with printed photographs displayed in albums for future reference or communal reminiscing. The social use of photography reveals the image as an element of communication and as a means of sharing experience.[313.]

These types of image practices may be understood using traditional semiotic theories considering the image still has certain representational qualities as well as providing a variety of interpersonal and interpretational possibilities depending on the mode of use and the viewer's cultural and personal view of the world.

In other instances, traditional theories applied out of context with certain types of new media may not suffice when we attempt to discuss the representational aspects of images, particularly when their form is affected through the technological mediation of screens and photo capture devices which preconfigure their technical and sometimes aesthetic aspects. In these scenarios, the effects of technology affect the visual experience. These include the automatic interpolation of transmitted light through image sensors, the multitude of device types, media environments and information streams and social expectations of images. This suggests traditional interpretive

311 Jay David Bolter and Richard Grusin, *Remediation: Understanding New Media*, (Cambridge, Mass: MIT Press, 1999) 22.

312 van Dijck, "Digital Photography: Communication, Identity, Memory," 58.

313 Ibid., 59.

theories alone are not enough and should be expanded to incorporate changing technological and social practices that can also be used alongside or acquiesced to newer theories of affect and neuroscience.

Where Did the Meaning Go?

When referring to the printed image some scholars, including Barthes, suggest meaning resides within the photograph realised through recognition and response to its constituent parts – the signs perceptible form signifying meaning. These parts are the interrelated connotative and denotative properties of the image based on grammatical rules.[314] Sekula's pre-internet observations describe a photograph's meaning as being reliant on its context, having its own language and taking its semantic properties from conditions that reside within the image itself.[315] He acknowledges that this is not where interpretation ends but the beginning. The image arrives before the viewer as matter. The decoding of the image's semantic properties is dependent upon its part in concrete discourse, an external set of conditions and presuppositions for its readability.[316]

The photographic image may begin life unmediated and uncoded, subject to external conditions. In the contemporary these conditions are more numerous with the image created and consumed across digital networks enabled by devices and operating systems, appearing on websites, blogs and shared in online social interactions. In these contexts, the image assumes different properties and elicits different affects and reactions, some dictated by cultural and social convention, others afforded by specific technologies or processes inherent in machine-human interaction, in varying degrees of combination as it continues its temporal journey. The photographic image is no longer fixed in time or material in appearance. "It has undergone

314 Barthes, "Rhetoric of the Image," 82.

315 Alan Sekula, "On the Invention of Photographic Meaning," in *Thinking Photography: Communications and Culture*, ed. Victor Burgin (London: Palgrave, 1982), 85.

316 Ibid., 85–86.

progressive dematerialisation while gaining more complex technical and consequentially social systems to sustain it."[317]

The Mediative Effects of Viewing Environment

If we consider the definition of mediating as "middle" or acting through a mediating agency[318] and the image passing through this "middle," then by differences in presentation the digital viewing environment would have a distinct mediating effect and point of difference compared to print formats. In one modality the image appears as pixels on a screen produced by lines of code translated digitally to the bits and bytes that correlate with binary numbers. In the other, the image appears as a printed matrix of dots produced through a photomechanical process necessitated by the requirements of offset printing. Both create the illusory manifestation of the image through their characteristic technical processes. At this stage the appearance, the foundational structure, "pre-reading" of the image is different, therefore one could assume differences in apprehension. Hayles suggests images appearing on computers are transitory, constantly refreshed by the scanning electron beam that forms an image on the screen giving "the illusion of stable endurance through time."[319]

Can images viewed under such different conditions be understood in the same way? Participants in this study were asked to compare their viewing experiences with digital screen and printed formats. Their responses indicated differing experiences between the two but similar perception of the subject matter being viewed, which is covered in Chapter Five. Other aspects of interpretation to consider include the effects of external stimuli and multitasking on the

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317 Paul Hertz, "Recombinant Media Chaos: The Image after New Media," *The International Journal of the Image* 4, (2014): 3, https://independent.academia.edu/search?q=Recombinant%20Media%20Chaos.

318 *Merriam-Webster Dictionary*, s.v. "mediate", ACCESS DATE?, https://www.merriam-webster.com/dictionary/mediate

319 N. Katherine Hayles, "Print Is Flat, Code Is Deep: The Importance of Media-Specific Analysis," *Poetics Today* 25, no.1 (Spring 2004): 70, muse.jhu.edu/article/54949.

viewing experience. These are usually more prevalent in digital viewing modes[320] affecting attention, cognition and engagement and encouraging fragmented reading of texts through an interactive and hyperlinked media environment.[321]

Linear and Loose Narrative

The expediting of viewing images on digital screens requires the manipulation of mouse and keyboard or fingers and screen that call in to play an intricate ensemble of hardware, software and interface elements. Every computing product is composed of smaller objects usually used in sequence to provide functionality, such as windows, menus, scrollbars and hyperlinks. Each of these objects has at least one action to engage a user into a pattern of interaction, in turn influencing behaviour. Miquel-Ribe calls this multitasking. It can happen either with multiple objects or with compound objects. [322]

These interactive objects allow us to interpret narrative through the navigation of pre-scripted paths through hyperlinked data. The narrative is created through a series of processes and possibilities including hyperlinks, navigation choices and search engine algorithms, images pushed to us through data where the image's use and meaning are actuated through human and computer processes.

In the online sense, the narrative is removed from its linear conception historically told from a single perspective such as in print. The narrative becomes polychronic, de-territorialised and pluralised by the viewer,[323] with meaning occurring through experience and interactive contexts

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320 Yan Liu and Xiaoqing Gu, "Media Multitasking, Attention, and Comprehension: A Deep Investigation Into Fragmented Reading," *Educational Technology Research and Development* 68, no.1 (February, 2020): 67, http://ezproxy.uws.edu.au/login?url=https://www.proquest.com/scholarly-journals/media-multitasking-attention-comprehension-deep/docview/2216582671/se-2?accountid=36155.

321 Ibid., 68.

322 Marc Miquel-Ribe, "From Attention to Participation: Reviewing and Modelling Engagement with Computers," *arXiv* (November 2017): 8, https://arxiv.org/abs/1711.00304.

323 Neil C. M. Brown, Timothy S. Barker and Dennis Del Favero, "Performing Digital Aesthetics: The Framework for a Theory of the Formation of Interactive Narratives," *Leonardo* 44, no. 3 (2011): 213, MIT Press Stable URL http://www.jstor.com/stable/20869452.

as the viewer is exposed to new emergent technologies.

The structural tools of human-computer interaction mediate our experience with images on a micro-level. They offer new ways of exploring the narrative in images and texts through hyperlinked text and images[324] and this occurs within broader techno-social structures. Digital information flows of which images are an important part are presented through non-linear, networked paradigms affecting organisation of information and encouraging new ways of interaction within this paradigm.[325] This is a hypermedia environment of images, text, sounds and video where visual space provides for multiple acts and forms of representation possible, described by Bolter and Grusin thus:

> Representation is conceived of not as a window on the world, but rather as 'windowed' itself – with windows that open on to other representations or other media. The logic of hypermediacy multiplies the signs of mediation and in this way tries to reproduce the rich sensorium of human experience.[326]

Using the term text to broadly define the content of which the image is a part, we can observe these new ways of interacting with texts offer a different type of experience to that of interacting with printed texts. This poses the question of what happens when conventional ways of thinking about printed texts are applied to online texts, "what happens when the book is replaced by the computer memory and hypertextual linking?"[327] Indeed, the online version of the *Australian Geographic* magazine that was used for data gathering is a case in point of a transitional moment in the history of hypertext. The printed version of the magazine was converted to an interactive hypertextual space (see Chapter 3).

These interactive human-computer processes present the digital image as something that

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324 Helen Jackson, "Knowing Photographs Now: The Knowledge Economy of Photography in the Twenty-first Century," *Photographies* 2, no. 2 (September 2009): 180, https://doi.org/10.1080/17540760903116622.

325 Martin Lister, Jon Dovey, Seth Giddings, Iain Grant, and Kieran Kelly, "New Media and New Technologies," in *New Media: A Critical Introduction*, 2nd ed. (London: Routledge, 2008), 29, https://doi.org/10.4324/9780203884829.

326 Bolter and Grusin, *Remediation: Understanding New Media*, 33–34.

327 Martin Lister et al., "New Media and New Technologies," 29.

cannot be viewed solely through semiotic codes, traditional methods of display and ways of seeing associated with established visual cultures.[328]

The human and computer processes occurring before and during the act of viewing are far more convoluted than those required for viewing images in print where there are fewer choices presented and the simple act of page-turning can bring the next or previous image into view. These are differences that may affect apprehension and have little to do with semiotics. Hayles posits computer simulation of previous analogue media differs profoundly in many ways from print in its physical properties and dynamic processes. These differences occur on many different levels and are important factors to consider when discussing images because producers and consumers of electronic content become more adept at "exploiting the medium's specificity."[329]

Indexical to Digital

This is a shift in focus from the indexical qualities of images. Jackson suggests education practice addressing images and image-making needs to acknowledge the changing cultural and social landscape in which the construction and reception of images is taking place.[330] Print, although not obsolete, is no longer the default medium of communication. "Assumptions, presuppositions, and practices associated with it are now becoming visible as media-specific practices rather than the largely invisible status quo."[331]

The initial static representational qualities of the image presented in print mediums are less evident in a digital online form. The photograph described by Kress and van Leeuwen as representing a "frozen moment in time at its initial conception"[332] belies the image in all its variances. This metaphor can no longer be applied to the photographic image as it populates a

328 Lev Manovich, *The Language of New Media* (Cambridge, MA: MIT Press, 2001), 16–17.
329 Hayles, "Print Is Flat, Code Is Deep," 69.
330 Jackson, "Knowing Photographs Now," 170–71.
331 Hayles, *How We Think*, 1–2.
332 Kress and van Leeuwen, *Reading Images*, 157.

multitude of devices, consumed in movement through physical and virtual media spaces and online communities. Images can be searched, retrieved from databases, presented as search engine recommendations, collecting likes and tags as they travel through digital networks and are subject to a multiplicity of reproduction and potentiality. This is a new type of image requiring new ways of interpretation.

Narratives unique to the digital environment take precedence over signification and representation in images. Understanding meaning is no longer fixed to traditional semiotic interpretive theories. Rubinstein posits photographic meaning is derived from a combination of actions and occurrences each influencing the other. These begin from the photograph's moment of exposure, the copies, prints and iterations that follow from it to the image's appearance through internet technologies and its exposure to a multitude of possibilities of alteration and manipulation.[333] Indexical and representational possibilities are lost through these transformative techno-social processes as the photograph transitions to digital format.[334] Johnston refers to these processes as systems of human-machine interaction that give rise to distributed perceptions and the image "attains a new status" or at least must be conceived in new ways.[335]

Although the literature presents new possibilities of reading images within emerging technological and social contexts, it is equally important to acknowledge the usefulness of previous semiotic approaches when studying image usage and apprehension. Used in the appropriate contexts they can help construct meaning and provide important insights into the evolutionary path of photographic image interpretation. They are rooted in an archetypal ontology of how humans interpret signs and sign systems. From the phenomenological

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333 Daniel Rubinstein and Katrina Sluis, "Concerning the Undecidability of the Digital Image," *Photographies* 6, no.1 (June 2013): 154, https://doi-org.ezproxy.uws.edu.au/10.1080/17540763.2013.788848.

334 Peter Osborne, "Infinite Exchange: The Social Ontology of the Photographic Image," *Philosophy of Photography* 1, no. 1 (2010): 63, https://doi.org/10.1386/pop.1.1.59/1.

335 John Johnston, "Machinic Vision," *Critical Inquiry* 26, no. 1 (Autumn, 1999): 46, http://www.jstor.org/stable/1344144.

standpoint, this extraction of meaning from images is governed by social and cultural processes. These ways of interpretation are still used by us in communication to reach an understanding of the way the world is. Hayles acknowledges the digital image has its roots in analogue ontology, reappearing on screen in this form after being assembled by digital code as part of the digital process.[336]

The Changing Image

Scholars have identified changes in photographic image usage as they are repurposed in digital networked form. Different theories of interpretation have been put forward that break with traditional semiotic theories. Some express the change in a more emphatic tone with William J. Mitchell claiming the digital image has "radically and permanently displaced" traditional notions of how we view photography.[337] Rather than a permanent displacement of traditional ways of seeing, we can view the discussion surrounding the changes from analogue to digital images in a more moderate but no less forceful tone, as there is no doubt these changes are momentous. However, the nature of the change should be viewed not as displacement but as expansion and augmentation of previous visual culture and possibilities of interpretation into new areas of sociality and affective and neuroscientific possibilities.

The Computer as Image Maker

Another layer of understanding the possibilities of visual apprehension is provided by technological mediation. Hansen refers to this as a splitting or "doubling" of perception of the machine [computer] and human. This is a duality of vision, one a machinic form of common sight and the other a human form tied to the representation of the visible. This duality sometimes

336 Hayles, "Print Is Flat, Code Is Deep," 71.

337 William J. Mitchell, *The Reconfigured Eye: Visual Truth in the Post-Photographic Era* (Cambridge, MA: MIT Press, 1994), 20.

combines through human and machine interaction to create a singular form of affect."[338]

Although not an integral part of this study, machinic form of vision should be noted because it highlights developing trends of the dislocation of vision from humans placing visual cognition within a machine context. This has given rise to the presentation of a different type of reality, an image constructed from data inside a computer, photographed using a virtual camera also inside a computer. This is a process of absolute computer mediation, the automation of human vision and imaging – computer vision. Augmented Reality (AR) is an example of this where the computer uses sensors and algorithms to determine the position and orientation of a camera. 3D graphics are then rendered from the viewpoint of the camera and the resulting computer-generated images are superimposed over the user's view of the physical world. Artificial Intelligence (AI) provides another aspect to computer vision, a science involving computational models of the human visual system where computers can gain high-level understanding from digital images automating tasks previously ascribed to the human visual system.[339] This is an example of the automation of the human mental functions of vision, hearing, reasoning, problem-solving.[340]

Manovich referred to antecedent manifestations of this "automation" as mechanisation of sight, an extension of photography, imaging physical reality and perspectival vision captured through lenses.[341] Human sight is replaced and image analysis is delegated to a computer through technologies of image processing and pattern recognition where pattern matching can be used to recognise elements in a photograph. Reality and representation are occurring through algorithms, automating the translation of images.[342]

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338 Mark B. N. Hansen, "Seeing with the Body: the Digital Image in Postphotography," *Diacritics* 31, no. 4 (Winter 2001): 61, https://www.jstor.org/stable/1566429.

339 T. S. Huang, "Computer Vision: Evolution and Promise," *CERN School of Computing,* (1996): 1, http://cds.cern.ch/record/400313/files/p21.pdf

340 Lev Manovich, "Automation of Sight: From Photography to Computer Vision," Paper presented at conference Photography and the Photographic: Theories, Practices, Histories, University of California at Riverside, April 1994, http://manovich.net/content/04-projects/014-automation-of-sight-from-photography-to-computer-vision/11_article_1997.pdf.

341 Ibid., 2.

342 Manovich, "Automation of Sight: From Photography to Computer Vision," 9.

William J. Mitchell's post-photography discussions differentiate between algorithmic and nonalgorithmic images. The latter are principally images that are "automatically constructed from data about the object, involve fewer or even no intentional acts and provide more trustworthy evidence of what was out there in front of the imaging system." [343] The automation of the analogue process of imaging physical reality and the performance of human functions such as observation, effort and decision are described by Manovich as a process of "mechanisation."[344]

A recollection by Mark Hansen of a scene from *Bladerunner* illustrates this point – the moment when a computer can "see" in a way completely different to human optical, spatial and temporal visual conditions. The form of computer vision Hansen speaks of reifies human ways of seeing volume and spatial relationships in an image and give way to the possibility of manipulating the entire data space and all possible images within it.[345] Further in feedforward, Hansen analyses how remotely sensed data call into play elements of sensibility that greatly affect human selfhood without ever belonging to the human.[346]

These examples demonstrate the relocation of vision from the human observer to the algorithmic possibilities and data sets of the computer. Crary states "most of the historically important functions of the human eye are being supplanted by practices in which visual images no longer have any reference to the position of an observer in a real, optically perceived world."[347]

These are virtual images, a data set, not a depiction of the real; [348] "a virtual world recorded

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343 Mitchell, *The Reconfigured Eye*, 30.

344 Manovich, "Automation of Sight: From Photography to Computer Vision," 2.

345 Hansen, "Seeing with the Body," 57.

346 Mark B. N. Hansen, *Feed-Forward: On the Future of Twenty-First-Century Media* (Chicago: University of Chicago Press, 2015), 6.

347 Jonathon Crary, *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century* (Cambridge, MA: MIT Press, 1990), 2.

348 Hansen, "Seeing with the Body," 57.

by a virtual camera."[349] Are these images able to be understood through established semiotic codes?

Disconnect Between Human and Image

This process of mechanisation can be observed as a process of deterritoralisation which Virilio defines as displacement experienced by the individual in contemporary life, where conventional perceptions give way to a conceptual disorientation.[350] In computer-mediated interaction, this occurs as the brain enters a technological environment where external autonomous agents (code, algorithms, camera sensors, etc.) operate in the online networked environment assuming intelligent functions previously performed by the human brain. The selection of, or even the interpretation of, information[images] is no longer performed exclusively or primarily through human cognition.[351]

We are interacting with the results of computational analysis. This can be observed when we take a photograph with a camera phone application. The application's algorithms automatically choose the photo's exposure, adjust the contrast of the photo and also identify the type of scene and objects in the photo. The world is being represented through data structures and algorithms described by Manovich as the "computerisation of culture"[352] where the ontology of the technical image is removed from the perceptual analogy to which it had been bound since the invention of photography.[353]

What Is an Image Now?

The question is more rhetorical rather than one designed to generate a definitive answer. It

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349 Lev Manovich, "Database as a Genre of New Media," *AI & Soc* 14, no. 2 176–183 (June, 2000), https://doi-org.ezproxy.cqu.edu.au/10.1007/BF01205448.

350 Eftychia Mikelli, "Deterritorialisation,"*The Virilio Dictionary*, ed. John Armitage (Edinburgh: Edinburgh University Press, 2013), 68, https://www.academia.edu/1377803/The_Virilio_Dictionary.

351 Hansen, "Seeing with the Body," 60.

352 Manovich, "Database as a Genre of New Media," 176.

353 Hansen, "Seeing with the Body," 79.

would be difficult to attempt to answer such a question in a singularly unique way. The proliferation of images, their differences, their flexibility and susceptibility to manipulation brought about by digitisation poses complexities in our attempts to understand the present nature of the image. Bellour claims images are now characterised more by the "fissures and combinations and uncertainty of form than any inherent quality they offer as individual objects."[354]

Images can sometimes be ill-defined and lacking in presence. In a digital multimedia environment, these images can sometimes be reduced to surface effects, visualised as interface. They compete with sound, video and text ultimately erasing the differences among individual media where everything becomes a standardised series of digitised numbers read by a machine allowing for any medium to be translated into any other. [355]

Images may be presented to us in different ways, calculated as data by computers or previously realised by the bringing together of light and chemical emulsion. The resulting form, irrespective of technical processes, is presented to humans as indexical. It is us who engage in the act of perception and interpretation of visual stimuli. The result is a range of possibilities mediated by cultural and personal bias, social online norms, machinic intervention, affective responses to visual and tactile stimuli and neurological responses. These interventions result in a very different image, one for which it would be challenging to assign a fixed definition.

The Image and the Coexistence of Body and Technology

The affective dimension constitutive of human perception has been previously mentioned and is one where vision is influenced through the embodied capacities of the body's responses to

354 Raymond Bellour, "Double Helix," in *Electronic Culture: Technology and Visual Representation*, eds. Timothy Druckrey and Rosanne Allucquère Stone (New York: Aperture, 1996), 173–74.

355 Friedrich A. Kittler *Gramophone, Film, Typewriter,* trans. G. Winthrop-Young and M. Wutz (California: Stanford University Press, 1999), 1.

the tactility of devices.[356] This reveals another aspect of affect, one that recognises the body is coevolving with technology, undergoing self-modification through its encounter with automated vision and delivering an embodied or human component to visual perception.[357] This includes the effect on perception of bodily processes such as tactility, awareness, memory, and temporality. Pereira discusses technology's impact on cultural communication, observing that the phenomena of digital devices as an extension of the body create a symbiotic relationship between humans and machines.[358] The constant attachment to devices and information flow is more significant in younger people representing a generational shift in cognitive styles,[359] where thoughts and information are no longer structured and increased impulsivity in perception and action occurs encouraging new types of cultural behaviours.[360]

This implies that the brains in young people growing up in media-rich environments are becoming wired differently from those of people who did not come to maturity under that condition, resulting in hyperattention characterised by switching focus rapidly among different tasks, preferring multiple information streams and seeking high levels of stimulation.[361] The reliance of digital devices encourages more impulsiveness, activity and perception amongst younger people but less structured thinking about information.[362] This behaviour is not only demonstrated by younger generations, with Carr claiming the online setting promotes "cursory reading, hurried and distracted thinking and superficial learning" [363] but is also observed in other generations as we interact with the ubiquitous streams of digital information in a fragmented way.[364]

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356 Hansen, "Seeing with the Body," 61.

357 Ibid., 61–62.

358 Luís Moniz Pereira, "Cyberculture, Symbiosis, and Syncretism ," *AI & Society* 33, no. 3 (August 2018): 447, https://doi.org/10.1007/s00146-017-0715-6.

359 Hayles, "Hyper and Deep Attention," 187.

360 Pereira, "Cyberculture, Symbiosis, and Syncretism," 448.

361 Hayles, "Hyper and Deep Attention," 187.

362 Pereira, "Cyberculture, Symbiosis and Syncretism," 450.

363 Nicholas Carr, *The Shallows: What the Internet is Doing to Our Brains* (New York: Norton, 2020), 116.

364 Liu and Gu, "Media Multitasking, Attention, and Comprehension," 67.

Biological plasticity has implications for the way we understand and interact with images. New generations may become genetically predisposed to interacting with images in new ways requiring new paradigms of understanding our "reading" of images, ways not entrenched in traditional semiotic frameworks.

What Next?

There are now many more manifestations of the image than during the predigital era, many more socially based image usage practices and more display technologies capable of presenting the image in unique ways. Images can be experienced in embodied activities using Virtual Reality, or as virtual overlays to the physical world as experienced in Augmented Reality. Holographic images can be viewed from all directions. At a cursory glance, these images appear as digital representations of their analogue antecedents. Beneath the surface, however, there are underlying layers of digitality that have changed the nature of the image from what it once was in printed media. For example, metadata now attached to the image enables the cataloguing and searching of images, descriptive tags both computer and human-generated, an aspect that is "fundamental to photo-sharing and social networking sites."[365]

Through metadata, images are "data mined, categorized, and evaluated by computer algorithms". They are increasingly considered as part of a "knowledge economy" creating a dependence on computer algorithms for what we see and know about. Sluis argues the independent "1990s web surfer has largely been replaced by the dependent searcher." As computers perform "cognitively sophisticated acts of interpretation, evaluation, judgment, synthesis and analysis,"[366] tasks previously accomplished by humans, the image is presented as an assemblage of data representing an "object" in "codified bitstream form" and has become

365 Daniel Rubinstein, "Tag, Tagging," *Philosophy of Photography* 1, no. 2 (2010): 198, https://doi.org/10.1386/pop.1.2.197_7.

366 Hayles, "Print is Flat, Code is Deep," 29.

"operation and process rather than a representation."[367]

Images are increasingly used in the "operation and process" of online social communication. We initiate and address these acts of communication toward other humans through images made possible through a duality of human and computer interaction. At first, there is the human intent, the genesis for communication, of creating and sharing images which, in turn, are encoded by the computer's processing unit and displayed on-screen via transmitted light. Appended with metadata, new and extended topologies of the image are created. According to Rubinstein and Sluis, these properties challenge earlier concepts of representation as photography becomes an "encoded discourse with the visual becoming mathematical and algorithmic" – "undecidability is now a key property of the networked image."[368] Hayles supports the notion of computer mediation in our interaction with images in the context of online human communication, observing, when working in a digital environment or at the level of code, the addressees are dual; humans and "intelligent machines." This digital mediation by code has implications about how visual language operates and what forms are being expressed. This example suggests, in some situations, a move away from the linguistically based floating signifier [images functioning primarily as a vehicle for absorbing viewer-imposed meanings]. Hayles is referring to Lacan's model of signifier and signified highlighting the inadequacy of linguistic-based theories to fully explain the situation in which language itself is underlaid by code.[369]

Mediation by code was evident in the following participant examples, affecting attention and interpretation and present as responses to the way images are delivered and presented in digital environments:

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367 Ingrid Hoelzl and Rémi Marie, "From Softimage to Postimage," *Leonardo* 50, no.1 (2017): 72–73, https://doi.org/10.1162/LEON_a_01349.

368 Rubinstein and Sluis, "Concerning The Undecidability Of The Digital Image," 151.

369 N. Katherine Hayles, "How We Became Posthuman: Ten Years On: An Interview with N. Katherine Hayles," *Paragraph 33*, no. 3 (November 2010): 327, http://www.jstor.org/stable/43151854.

a) Shallow reading of images: “On a smartphone and tablet you’re not really putting a lot of attention into the images, you’re just skimming through content mostly.” (7s) “There’s not much depth in the meaning it’s just great fast and fast and furious kind of thing.” (13p)

b) Representation of colour: “The man in the [printed] magazine didn’t look very happy but now that it’s brighter on the computer it gave it a happier feeling.” (4s)

4.3 The Image as Fauxtography

Fauxtography: the practice of creating false photographs by using software: [370]

> Any discussion of “manipulated” photography must begin with the recognition that photography itself is an inherent manipulation – a manipulation of light, a process with many steps and stages, all subject to the biases and interpretations of the photographer, printer, editor, or viewer. Photography is not absolute “reality.” It is not unqualified “truth.” It is not purely “objective.” It was never any of those things, and it has been subject to distortion.[371]

It is difficult to disagree with this statement considering the increased possibilities and ease with which photographs can be both altered by the technologies of capture and further manipulated by us using photo editing applications and professional-level software such as Adobe Photoshop™. Indeed, the techniques and procedures of generations of professional compositors and image editors have been virtualised into common smartphone apps. Anyone with access to image editing apps can alter an image to a point of difference from the original and share them across the internet where the process can be easily replicated by recipients if desired.

Lévy describes the consequences of this process as the disappearance of the image as a “signature”. The established differences between photographer and viewer that may have existed

370 *Macmillan Dictionary*, s.v. “fauxtography”, ACCESS DATE?, https://www.macmillandictionary.com/dictionary/british/fauxtography

371 Thomas H. Wheeler, *Phototruth or Photofiction? Ethics and Media Imagery in the Digital Age*, (New York: Routledge, 2002), 3, https://ebookcentral.proquest.com/lib/cqu/detail.action?docID=237099.

in analogue photography have given way to "a reading writing continuum that extends from the designers of the technology and networks to the final recipient, each one contributing to the activity of the other." [372]

Wheeler's declaration also prompts us to ask some important questions. If photography is not "absolute reality" then what does it present to us? The literature reveals the image as presenting us with many types of realities, virtualities and actualities. Indeed, as we encounter and engage with digital images and other products of computed information we find our literal and physical world suffused by "information patterns"[373] where signified physical material reality and tangible space disappear.[374]

Despite Wheeler's claim, due to the nature of the medium, institutional and social factors surrounding its use – which will be explored further in this chapter – photography still lends itself in some contexts to expectations of representing the real.[375]

The previous section compared new and evolving speculative image visual language theories with those of traditionally based semiotics. The very notion of semiotic interpretation places the epistemic search for meaning based on representation. It seeks to systemise the relationship between objects in the world, observers of those objects (subjects), the textual and representations so famously questioned by René Magritte.

372 Pierre Levy, *Collective Intelligence: Mankind's Emerging World in Cyberspace* (Cambridge, MA: Perseus Books, 1997), 366.

373 N. Katherine Hayles, *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics* (Chicago: University of Chicago Press, 1999), 13.

374 Martin Lister and Jon Dovey, *New Media: A Critical Introduction*, 2nd ed. (London: Routledge, 2009), 54.

375 Olga Shevchenko, "Photographs and Their Many Lives," *Slavic Review* 76, no.1 (Spring, 2017): 90, https://doi.org/10.1017/slr.2017.12.

The Photograph, a Positivist View

Photography viewed through a positivist paradigm is one where the photograph is considered a literal representation of reality, a depiction of the object or event appearing before the lens captured by the photographer at a particular moment in time. A materialisation of nineteenth-century technology, photography is defined by philosophical concerns of that time as an agent of "taxonomy and veracity."[376] The perception of the truthful character of photography representing evidence and reality and having the power to see and record were attributes invested upon it by the "power of the state apparatus." This notion supported "positivist, controlling, colonial and patriarchal discourses" and infixed the photograph with a sense of authoritative credence."[377]

However, the meaning of a photograph is shaped by a multitude of factors, both internal and external to the image itself. In part "photographic practice depends on the institutions and agents which define it and set it to work."[378] We can find examples of this in Tagg's "Burden of Representation" where he argues the status of a photograph as evidence – a legacy of its deployment as part and parcel of the apparatus of state power and surveillance. Photography is "a flickering across a field of institutional spaces," the uses of photographs received in the hands of police, in penal and mental institutions, as well as in institutions of social reform.[379]

Gomez and Meyer place emphasis on photography as a "materialisation of a series of assemblages", the agency that takes place when a set of technologies, meanings, uses, and practices align. The representational aspects are less important.[380] Therefore, it may not be helpful to use the binary argument of truth or falsity in terms of what meanings and what degrees

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376 Matthew Lindsey, "A Culture of Texts," in *A Companion to Photography,* ed. Stephen Bull (Newark: John Wiley and Sons, 2020), 163.

377 John Tagg, *The Burden of Representation* (Basingstoke: Macmillan Education, 1988), 64.

378 Shevchenko, "Photographs and Their Many Lives," 90.

379 Tagg, *The Burden of Representation,* 77.

380 Cruz and Meyer, "Creation and Control in the Photographic Process," 204,.

of reality are realised through photographs. Photography is the operation of the judgements that the photographer makes about representations. It is also about the representations and judgements they want their audience to make.[381] The photograph can also be considered as the photographer's decision that this particular event is worth recording or this particular object has been seen.[382]

Let us consider the following premise: photographs are records of things seen which is always subjective from both the photographer's and the viewer's point of view. From the phenomenological standpoint, this shifting bias makes it very difficult to grasp what truth is, and unless there is human intent to falsify an original photograph or manipulate what has appeared before the camera and has subsequently been digitised, materialised or whatever, the rhetoric of truth and falsity, real and unreal may be superfluous bifurcations. Indeed, as the quantum quandary shows, even the act of observation may change the trajectories of possible outcomes. This literature has relevance for the participant-provided data discussed in Chapter 5.5: Digital Fauxtography.

The Photograph: A Quantum of Truth?

The "quantum of truth" is highly subjective and always travels with the spectator. Berger posits the quantum of truth in an "impersonal" photograph must still depend upon the general categories already in the observer's mind. Rather than someone's attempt at presenting reality, every photograph is a means of testing, confirming and constructing a total view of reality with photography playing its role in the ontological proposition of what constitutes reality.[383]

Historically analogue images are understood through concepts such as the physical indexical

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381 Kress and van Leeuwen, *Reading Images*, 155.

382 John Berger, "Understanding a Photograph," *New Society* (4 July 1968): 572, http://ezproxy.uws.edu.au/login?url=https://www.proquest.com/magazines/understanding-photograph/docview/1307091019/se-2?accountid=36155.

383 Ibid., 573.

connection to reality where a photographic image or elements within that image imply or present something that stands "unequivocally for this or that existing thing."[384] This is expressed in the theoretical concepts of semiotics or, in its broader definition, the study of signs and sign systems[385] (see Chapter 4). These signs are interpreted and given meaning by the viewer helping them construct their reality.

We cannot overlook the importance of semiotics in the context of this discussion. The photograph's representational and indexical qualities have accompanied it in its analogue form and continue to do so in varying degrees in its digital form. Understanding the image in semiotics allows us to critically observe an area of change brought about by recent photographic practices, new media and the affordances of applications that facilitate the manipulation of images. Kember draws upon the notion of the photographic image as irrefutable evidence of a moment in time where proof of the existence of an object or person appearing before the camera was made possible by the optical phenomena of light refracted through the lens of a camera. The cone of vision is then inverted as it passes through the lens, just like the human eye resulting in an image focussed onto the negative.[386] This is a position argued by scholars such as Susan Sontag ("A photograph passes for incontrovertible truth that a given thing has happened"),[387] Trachtenberg ("Photographs confer nothing less than reality itself")[388] and Peirce ("Photographs are composed of actual traces of something that exists or once existed.")[389] These viewpoints are a continuation of early paradigms that had their beginnings with the development of analogue

384 Charles Sanders Peirce, *Collected Writings*, 8 vols., eds. Charles Hartshorne, Paul Weiss and Arthur W Burks (Cambridge, MA: Harvard University Press, 1938–1958), 4.531, quoted in Daniel Chandler, *Semiotics for Beginners*, www.cs.princeton.edu/~chazelle/courses/BIB/semio2.htm.

385 Daniel Chandler, *Semiotics for Beginners*, www.cs.princeton.edu/~chazelle/courses/BIB/semio2.htm.

386 Sarah Kember, "The Shadow Of The Object: Photography and Realism," *Textual Practice* 10, no.1 (1996): 152, https://doi.org/10.1080/09502369608582242.

387 Susan Sontag, *On Photography* (Middlesex: Penguin Books, 1979), 174.

388 Alan Trachtenberg, "Albums of War: On Reading Civil War Photographs," *Representations* 9 (1985): 1, https://doi.org/10.2307/3043765.

389 Albert Atkin, "Peirce's Theory of Signs," *Stanford Encyclopedia of Philosophy*, Winter 2011 Edition, https://stanford.library.sydney.edu.au/archives/win2011/entries/peirce-semiotics/.

photography. William J. Mitchell observes that the development of chemical photography occurred in a century of realism and positivism[390] where a photograph was considered evidence of the existence of something, "an interpretation stencilled off the real like a footprint", enabled by the photographic process of the registering of light waves reflected by objects onto film or glass plate, rendering the original subject matter as a material artefact, evidence of its original.[391]

Technological developments throughout history have always encouraged new ways of thinking, such as the change from dominant religious thought to those proffered by the positivist scientific thought dominant in the early to mid-eighteenth centuries. Sontag argues, in mid-nineteenth century discourse, images have an unlimited authority in society that stems from the properties peculiar to images taken by cameras.[392] Credence could no longer be given to realities understood in the form of images but to the "illusory" notion that realities are understood to be images.[393]

Reality in The Twenty-First Century?

We have established the reasons behind the early discourses claiming photographs represented reality. Questions of interest to this study are: Have there been changes in the understanding of reality? Is it understood differently when viewing analogue photographic images appearing in printed mediums compared to their digital counterparts appearing in an online environment? Kember supports the view that reality is a self-imposed construct. This is further emphasised through the transition from analogue to digital photography where the contractedness of the real becomes more apparent – "reminding us that the whole world only ever existed in our heads." [394]

390 Mitchell, *The Reconfigured Eye*, 20.
391 Ibid., 154.
392 Sontag, *On Photography*, 153.
393 Ibid., 153.
394 Kember, "The Shadow of The Object," 155.

The discourse surrounding the representation of reality via the photographic image and the nature of that reality has expanded to incorporate the effects on a person's reading of an image by new technologies and resultant photographic image practices. Technological advancements in photo-editing software offer the ability for a person to easily create and manipulate images thereby altering their original reality. Online image practices have introduced another level of complexity of understanding what reality is, what types of reality are out there and how they are represented.

Jackson asserts images have been re-contextualised, appropriated and displaced from their original contexts and assigned new meanings by their associations with other appropriated images, technologies and online social media environments. These are "image formats entrenched with information paradigms" where creators and consumers of content are less interested in the image's objective meaning of reality and more interested in subjective practices of memory. [395] This occurs through interactive and dynamic interfaces adding an experiential dimension to the interaction with images. However, Jackson acknowledges through a "Vygotskyian perspective" that how we engage with digital images are shaped both by past practices and new activities and behaviours assisted by new technologies.[396]

The Twenty-First Century presents us with many more sources from which images are generated, news sources, personal blogs, social media, corporate and educational websites. Images appear on a wider variety of devices and technologies, desktop computers, smartphones, laptops, tablets, augmented and virtual reality. The photograph is a "materialisation of a series of assemblages."[397] The question must be asked: can we associate any degree of legitimacy as to the truth value of one or a combination of these "assemblages" over the other?

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395 Jackson, "Knowing Photographs Now," 179.

396 Ibid., 180.

397 Cruz and Meyer, "Creation and Control in the Photographic Process," 3.

Kress and van Leeuwen claim people make sense of images in the context of social institutions which to different degrees and different ways regulate what may be said with images, how it should be said and how it should be interpreted.[398] Although the question of truth and reality remains contentious, if we seek a purposeful interaction with the image as information, at some point in the decoding process we have to decide on the amount of credibility proffered, to "trust some of the information we receive." This can be achieved by acting on "textual cues" within the image indicating what is or isn't regarded as trustworthy. Kress and van Leeuwen refer to these as "modality markers" developed out of the key values, customs, beliefs and social needs of the groups within which we interact. This can be described as different modalities of truth (truth value or credibility of a statement about the world).[399] For example, higher modalities (more truthful) may be associated with educational institutions and lower modalities (less truthful) associated with blogs.

Deception and Manipulation

William J. Mitchell argues that one needs to consider how photographs and "pseudo photographs" are used, how their potential uses are established and how photographs are appropriated and exchanged in a narrative context to understand why this falsification occurs.[400] Farid argue peoples' belief in what they see has been eroded because altering digital imagery has become so ubiquitous, particularly in the fashion and entertainment world where it has come to be expected.[401] Photography has thus become fauxtography – the manipulation of visual images, especially news photographs, which can convey an ambiguous or "outright false sense of the

398 Kress and van Leeuwen, *Reading Images*, 114.

399 Ibid., 155.

400 Mitchell, *The Reconfigured Eye*, 191–192.

401 Hany Farid, "Seeing is Not Believing," *IEEE Spectrum* 46, no. 8 (August 2009): 44, https://doi.org/10.1109/MSPEC.2009.5186556.

events they seem to depict."[402] Refer to Chapter 5.5: Digital Fauxtography.

What type of reality is represented by computer-generated images? Manovich claims the production of illusionistic images has become the domain of mass culture, media technologies, photography, film and video, alluding to computers as "digital illusion generators." [403]

Photographers have always understood the manipulative possibilities of the medium. What was once performed by darkroom techniques of dodging, burning and masking, for example, is now executed more readily with photo-editing software such as Adobe Photoshop™, introducing the possibility of reinterpreting the image as it appears in edited form. These techniques allow for the emphasis of, or even the removal of, chosen elements from an image. Cropping and airbrushing or retouching, double exposure and staging or restaging events were also pre-digital methods of manipulating existing imagery.[404]

The ease of access to and use of photo manipulation possibilities is particularly prevalent on smartphones. The smartphone is unique to previous photographic technologies. It offers three important elements in the one device – the making, processing (including editing and manipulation) and distribution of images. The ease at which this can be done and the availability of editing software inbuilt into digital devices has made user-generated content possible and has made people more aware of photographic falsification.[405]

People who are taught and are familiar with photo-editing software, such as Photoshop, and the undetectable alterations to news photos made possible using this software, are increasingly inclined to become more permissive of photo doctoring themselves and therefore more acceptable of news-photo alteration.[406]

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402 Stephen Cooper, "A Concise History of the Fauxtography Blogstorm in the 2006 Lebanon War," *American Communication Journal* 9 (June, 2007): 1, https://www.researchgate.net/publication/229018349_A_Concise_History_of_the_Fauxtography_Blogstorm_in_the_2006_Lebanon_War

403 Manovich, *The Language of New Media*, 177–178.

404 Martha Rosler, "Image: Simulations Computer Manipulations: Some Ethical Considerations," *Women Artists Slide Library Journal*, no. 29 (1989): 18, https://search-ebscohost-com.ezproxy.uws.edu.au/login.aspx?direct=true&db=vth&AN=34015048&site=ehost-live&scope=site.

405 Cruz and Meyer, "Creation and Control in the Photographic Process," 1..

406 Qingjiang (Q. J.) Yao, David D. Perlmutter and Josie (Zhaoxi) Liu," What Are Shaping The Ethical Bottom Line?: Identifying Factors Influencing Young Readers' Acceptance of Digital News Photo Alteration," *Telematics and Informatics* 34 (2017): 131, https://doi.org/10.1016/j.tele.2016.04.010.

These expectations formed from encounters with digitally enhanced images may be conditioning us to accept the possibility that photographs are altered to some degree. New generations growing up in an age where the photographic image is seen as fluid and manipulable may not even contemplate the photograph as a purveyor of evidential authority and truth.[407] The implications of this may be more pertinent to particular contextual uses of the photograph such as supporting news stories, uses in surveillance and pragmatic applications such as insurance claim evidence and identity photos for passport and licenses.

Recent technological advancements have made it easy to create what are now called "deep-fakes." This term refers to a range of hyper-realistic digital falsification possibilities of images, video, and audio.[408] Deep-fake technology leverages machine-learning algorithms to insert faces and voices[409] and superimpose images into video and audio recordings enabling the creation of authentic-looking digital impersonations.[410] This has implications for the creation of wholly invented images, video and audio that is increasingly difficult to detect.

In many cases, viewers already know that photographers or their subjects are capable of deception. Wheeler suggests this knowledge does not interfere with the average readers' basic faith of a photo's ability to reflect aspects of the real world. To a certain extent this is confirmed by the findings in this study (see Chapter Five: Discussion).

In the context of photojournalism, Wheeler claims "phototruth" is not based on a reader's conviction that photography is reality: "Viewers will believe in its truth as long as they believe it

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407 Barbara E. Savedoff, "Escaping Reality: Digital Imagery and the Resources of Photography," *The Journal of Aesthetics and Art Criticism* 55, no. 2 (Spring, 1997): 21, https://doi-org.ezproxy.uws.edu.au/10.2307/431264.

408 Bobby Chesney and Danielle Citron, "Deep Fakes: A Looming Challenge for Privacy, Democracy, and National Security," *California Law Review* 107, no. 6 (December 2019): 1757.

409 Samantha Cole, "We Are Truly Fucked: Everyone Is Making AI-Generated Fake Porn Now," Motherboard: Tech by Vice, 25 January 2018, https://www.vice.com/en/article/bjye8a/reddit-fake-porn-app-daisy-ridley.

410 Marie-Helen Maras and Alex Alexandrou, "Determining Authenticity of Video Evidence in The Age of Artificial Intelligence and in The Wake of Deepfake Videos," *The International Journal of Evidence & Proof* 23, no. 3 (2019): 255, https://doi-org.ezproxy.uws.edu.au/10.1177/1365712718807226.

corresponds in a meaningful way to reality."[411]

It is not the purpose of this chapter to attempt to define reality or truth but to introduce relevant literature regarding their ontological projection onto photographic discourse. However, from a phenomenological perspective, we accept the influence of prior experience on our interaction with objects in turn constructing and imposing our view onto those objects as they seem to be and not necessarily as they are.[412] Therefore "our truth" is not a claim of objective validity toward an object that exists independently of us. Baudrillard suggests the reality of facts is not implicit in images and media messages because they are a result of a selection of a range of points of view; a "broken down reality" of elements that are brought together from the perspective of the author or photographer who imposes their choice of compositional elements and photographic techniques onto the subject.[413] The resulting possibilities are a "simulacrum" or a semblance of signs, a copy for which there is no original.[414] This condition poses the dichotomy of signs concealing something (truth) and signs that conceal that there is nothing – metaphor has replaced the object and substance with no clear distinction between reality and "simulacra."[415] Reality is "indexical imagination" because the image as a sign can only "point" to something.[416] The knowledge of the image manipulation possibilities of software to some degree affect image perception. Dzenco claims digital imaging technology theoretically disrupts previous notions of the indexical connection between photographic images and reality.[417]

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411 Wheeler, *Phototruth or Photofiction?*, 5.

412 Jens Rasmussen, "Constructivism and Phenomenology, What Do They Have In Common, And How Can They Be Told Apart?" *Cybernetics and Systems* 29, no. 6 (1998): 554.

413 Jean Baudrillard, *Simulations*, trans. Paul Foss, Paul Patton and Philip Beitchman (New York: Semiotext(e), 1983): 120, https://archive.org/details/simulations0000baud/page/12/mode/2up.

414 Liz Wells, *Photography: A Critical Introduction* (London: Routledge 1997), 28.

415 Ibid.,12.

416 David Bate, "The Indexical Imagination", in *A Companion to Photography*, ed. Stephen Bull (Newark: John Wiley and Sons, 2020), 89.

417 Corey Dzenko, "Analog To Digital: The Indexical Function of Photographic Images," *Afterimage* 37, no. 2 (Sep/Oct 2009): 1, http://ezproxy.uws.edu.au/login?url=https://www.proquest.com/scholarly-journals/analog-digital-indexical-function-photographic/docview/212089461/se-2?accountid=36155.

However, notions of indexical connections and earlier notions of reality traditionally associated with printed photographic images are still present today as evidenced by participant responses in this study.

In this study, when asked the following question, "Do you assume photos in print are representations of reality? Explain your reasons", some participants echoed the historical notion of the photographic printed image as representing reality. For example:

> "If you look at a photo that's printed you would assume it's real. Printed photos have for generations been in newspapers. People are used to seeing pictures in newspapers and whatever they see in newspapers they generally believe. They have a cognitive bias that printed pictures are meant to be real." (7s)

When the same question was contextualised to the online medium, participants stated people are less likely to believe what they see.

> "People Photoshop things a lot. People get sceptical of images they see online. On my Facebook, it is hard to believe some photos that you see. You can't really be sure online of what is true and what's not." (6s)

Sutton and Downes claim digital photography's ability to manipulate data has "destroyed the photograph's privileged connection" to the object.[418] There is no anchor to reality, a lack of physical connection between a digital photograph's subject and image has occurred, moving the semiotic relationship towards iconic and symbolic representation.[419]

Messaris also suggests that photographs have lost whatever claim they may once have had as mechanical recordings of reality, becoming a type of picture wholly under the control of the human creator.[420] Based on participant responses we can observe some truth to Messaris's claim, the decoupling of reality and the image, but we must clarify the image in this case as being "digital". If printing technologies continue to exist and are experienced at some point by current

418 Daniel Downes, *Interactive Realism: The Poetics of Cyberspace* (Montreal: McGill-Queen's University Press, 2005), 2, ProQuest Ebook Central.

419 Ibid., 64.

420 Downes, *Interactive Realism: The Poetics of Cyberspace*, 106.

generations, the notion of reality can still be associated with the image in the printed context. However, this may not apply to younger generations who may not have been exposed to print and analogue photography and associated notions of truth and reality.

Shifting Realities

Pictorial representations of reality are subjective and research shows that the camera does not always represent a fixed reality or truth as demonstrated in the selective editing of images.[421] Computer manipulated and simulated imagery has further contributed to this sense of "fluid reality". Actuality may be illusory. According to Kember the "loss of the real" is not possible due to digital technology because the real is always already lost through the act of representation. This occurs because the photographic image, rather than capturing, only constructs an image idea of the real.[422]

Rather than claiming digital technology's causal effect on the "loss of the real" the following participant comments indicate there are types of reality, "fake reality" and fluid reality. Participants were asked, "Do you assume photos online are representations of reality? Explain your reasons." From the responses it can be ascertained that independent of interpretation or representation, the medium and the device used for viewing create a "reality bias" before the possibility for any form of further interpretation to progress. For example:

> "No and I think purely because of Instagram. That's something not connected at all to the subject itself. Those images are trying to trump up a fake reality or there's filters on them or they're done in such a way that it's not reality." (10s)

Seeing is Believing?

In a photojournalistic sense Rossler emotively posits the question of how to address the instability posed to truth by computer-manipulated photographic imagery when the veracity of

421 Paul Messaris, "Visual Literacy in the Digital Age," *Review of Communication* 12, no. 2 (April 2012): 10, https://doi-org.ezproxy.uws.edu.au/10.1080/15358593.2011.653508.

422 Kember, "The Shadow of The Object," 145.

the unmanipulated photograph has been "under attack for a couple of decades?"[423]

This is a discussion that relates to media organisations and photographic journalists' ethical and professional role in the truth status of the photograph. Although not an integral part of this chapter it is acknowledged that when discussing images as representations of reality, news organisations have an ethical responsibility to represent the "truth" and photographic images coming from such organisations should offer the closest representation to reality.

Newton argues photojournalism or "visual journalism" in present media, as offering "the only credible source of reasonably true images about world culture."[424] The photograph as evidence is a "convention" rather than implicit in the medium.[425] "Reality-type" news images maintain their relationship to the real and their context of presentation, "a newspaper or television broadcast, is a context of veracity."[426]

An important aspect when discussing "fauxtography" is that the acceptance of what is real or false comes from a persons' everyday experiences. Viewers will assign truth to a photograph if they believe it corresponds in a meaningful way to their reality.[427] We can use personal photography to illustrate this point. Photographs of families, friends, and vacations are viewed as legitimate documents that capture and represent events and scenes in meaningful ways. They represent evidence of "the way we once looked and the way the world once worked."[428]

Barthes illustrates this in *Camera Lucida*, relating an act of sociality through sharing photos: "Show your photographs to someone - he will immediately show you his: 'Look, this is my

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423 Rosler, "Image: Simulations, Computer Manipulations," 18.

424 Julianne Newton, *The Burden of Visual Truth: The Role of Photojournalism in Mediating Reality* (Mahwah, NJ: Lawrence Erlbaum, 2000), 1, ProQuest Ebook Central, https://ebookcentral.proquest.com/lib/cqu/detail.action?docID=408956.

425 Mervi Pantti and Stefanie Sirén, "The Fragility of Photo-Truth: Verification of Amateur Images in Finnish Newsrooms," *Digital Journalism* 3, no. 4 (2015): 497, https://doi.org/10.1080/21670811.2015.1034518.

426 Newton, *The Burden of Visual Truth*, 89.

427 Wheeler, *Phototruth or Photofiction?*, 5.

428 Wheeler, *Phototruth or Photofiction?*, 4.

mother; this is me as a child,' etc.; the photograph is never anything but an acknowledgement of look, see, here it is."[429]

This reality according to Mitchell relies on the plausibility, believability and personal importance of the image in accordance with a person's "ideological framework and existing knowledge structure." The meaning and truth of an image is reliant upon its position within particular discourses[430] including being subject to a person's cultural identity.[431]

The Online Image – Altered Reality

In other applications, the truth and falsity argument may be superfluous with the photograph engaged with in a more experiential way and as a means for personal and connective "visual" action in social media spaces. The fluidity of the multiple and immediate narratives, visual derivatives, re-appropriation, and remixes contributed by other interested viewers expands the frame of reference within which images are traditionally viewed.[432] Photographs are conspicuous in the social media environment and, as such, are subject to the emotion and judgement they arouse. They are important social and cultural entities, historically refigured, no longer materially stable, deriving their meaning from the contexts in which they are shared and viewed.[433]

The photograph in social media environments plays quite a different role to those in print. The context, medium, origin, form and the surrounding visual and textual grammatical structures are quite different to photographs appearing in print media. The devices used to capture an image for use in print are different with traditional single-purpose DSLR or SLR cameras generally being the preferred option. Using this type of camera encourages a calculated and focussed intent

429 Roland Barthes, *Camera Lucida: Reflections on Photography* (London: Vintage, 1993), 5.

430 Mitchell, *The Reconfigured Eye*, 220.

431 Sekula, "On the Invention of Photographic Meaning", 84.

432 Mona Kasra, "Digital-Networked Images as Personal Acts of Political Expression: New Categories for Meaning Formation," *Media and Communication* 5, no. 4 (2017): 51, https://doi.org/10.17645/mac.v5i4.1065.

433 Nicholas Thomas, *Entangled Objects: Exchange, Material Culture, and Colonialism in the Pacific* (Cambridge, MA: Harvard University Press, 1991), 125.

on purpose, subject matter and composition. In comparison photographs taken with camera phones for social media environments generally happen more frequently and without prior planning. The resulting photo would be quite different between the two devices. The camera phone photo may be used to perform basic memory functions such as recording the location of a parked car in a shopping centre, visually presenting a personal item for online sale[434] or for self-representation on social media in the form of "the selfie" which Frosh describes as a "trace of action rather than indexical of reality" and is part of communicative or conversational practice.[435]

The many approaches to photographic image-making construct different ontologies of the image: on the one hand, the image is an evidential document and on the other hand, the image is more like an inter-textual site of discursive relationships. Both approaches may treat images as representational or pictorial forms, meaning that images are taken to represent something, regardless of whether this is thought to "mirror" or "construct" that object.[436]

The different modes of image capture create the possibility of multiple interpretations by different viewers accessing the image at different points of dissemination, the architecture of which shapes the possible and preferred meanings of images compared to other modes of classification, such as the album, gallery, archive, newspaper or database.[437] Reality can never simply be claimed by associating indexicality to what appears before the camera's lens because the photographic image has always been inserted within other contexts that have given it meaning; "it is never met in isolation."[438]

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434 Talal N. Albannai, "Conversational Use Of Photographic Images On Facebook: Modeling Visual Thinking On Social Media," diss. (University of North Texas, 2016), 31, https://search-proquest-com.ezproxy.cqu.edu.au/docview/1870784372?accountid=10016.

435 Frosh, "The Gestural Image: The Selfie," 1609.

436 Martin Hand, "Visuality in Social Media: Researching Images, Circulations and Practices," in *The SAGE Handbook of Social Media Research Methods*, eds. Luke Sloane and Anabel Quan-Haase (London: SAGE Publications, 2018): 7, DOI: https://dx.doi.org/10.4135/9781473983847.

437 Ibid., 6, DOI: https://dx.doi.org/10.4135/9781473983847.

438 Martin Lister, "Introduction," in *The Photographic Image In Digital Culture*, ed. Martin Lister (London: Routledge, 1995), 12.

The Authoritative Image

The image may be inscribed with a sense of authority when viewed in certain environments, such as an accompaniment to a newspaper article, with more credibility given to the nature of its representation. This sense of authority comes from, if we are to transpose Taggs' observations of the "state", to the News organisation which guarantees the authority of its images to represent truth.[439] According to participants in this study, the printed medium offers a more believable environment compared to online (see Chapter 5.5). A factor contributing to this view is the acknowledgement of editorially oriented proofing processes designed to ensure the credibility of news stories in printed publications, particularly newspapers, which also extends to their web-based equivalents. Most news organisations strive to maintain "professional allegiance to ideals of impartiality and truth": [440]

> Images in our pages, in the paper or on the Web, that purport to depict reality must be genuine in every way. No people or objects may be added, rearranged, reversed, distorted or removed from a scene (except for the recognised practice of cropping to omit extraneous outer portions). Adjustments of colour or grey scale should be limited to those minimally necessary for clear and accurate reproduction, analogous to the "burning" and "dodging" that formerly took place in darkroom processing of images. Pictures of news situations must not be posed.[441]

We could posit the authority of the image as a presenter of truth is dependent upon the source of the image. Some offer more credence than others such as reputable news sources, government and educational institutions. In essence, the idea of truth is a perceived one and resides in the mind of the viewer. The belief that an unbiased approach to taking photographs produces more truthful representation is disputed. When discussing documentary photography Abbott claims

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439 Tagg, *The Burden of Representation*, 150.

440 Ashley Holmes, "Syncretism in Narrativity, Visuality and Tactility: A Case Study of Information Visualization Concerning a News Media Event," *Reconstruction: Studies In Contemporary Culture* 8, no. 3 (2008):2, https://www.researchgate.net/publication/290196053_Syncretism_in_narrativity_visuality_and_tactility_a_case_study_of_information_visualization_concerning_a_news_media_event.

441 The New York Times, "Guidelines on Integrity," 25 September 2008, https://www.nytimes.com/editorial-standards/guidelines-on-integrity.html.

stylistic choices are made not as an embellishment but as "an integral part of the photographer's interpretative program, helping to endow the stories with experiential significance."[442] Yao, Perlmutter and Liu claim vigorous investigation reveals that the very idea of keeping the ''reality," or truth, in the photos undistorted may not be fully realised.[443]

Wheeler argues the creators and the readers of images share a set of assumptions or the reader's "qualified expectation of reality" and these assumptions provide the foundation for photography's "long-lived credibility." [444]

Participant responses in this study indicate the level of importance attached to the credibility of that image bears a relationship to the contextual placement of that same image. If an image is used as part of a news editorial, then one would expect the image not to be doctored whereas if the image appears as part of a blog or within a social media context there may be lesser degrees of credibility attached or expected. This is discussed further in Chapter 5.5.

Expectations of Reality

The understanding of the relationship between the perception of reality through the photographic image, both online and in print media, is integral to understanding the role photographic images play in conveying meaning and what type of realities they enable to be experienced.

User-generated content (UGC) has created the possibility of news image creation by "non-professionals" who, using camera phones, can capture a "first visual draft of history", events that are then disseminated to the wider photostream.[445] The distinction between professional and public images is becoming increasingly unclear. This creates the potential for any image from

442 Brett Abbott, *Engaged Observers: Documentary Photography Since The Sixties* (Los Angeles: J. Paul Getty Museum, 2010), 25.

443 Yao, Perlmutter and Liu, "What Are Shaping The Ethical Bottom Line?" 125.

444 Wheeler, *Phototruth or Photofiction?* 131.

445 Yao, Perlmutter and Liu, "What Are Shaping The Ethical Bottom Line?" 125.

known or unknown, reliable or unreliable sources to gain global prominence via social media and the internet.[446]

> I am not any more inclined to believe a photograph in a newspaper compared to the online version of that newspaper. While the online version is transcoded through data "its indexical link theoretically broken" as a viewer one does not gain less or different information from the online newspaper and digital images.[447]

Andén-Papadopoulos and Pantti offer another perspective. Photographs are more closely linked to journalism's truth claim by virtue of assuming a discursive authority based on "eye-witnessing,"[448] traditionally the realm of professional journalism. The outsourcing of journalism by professional news organisations to non-professionals whose imagery supports the organisations' claim of journalistic authority expresses the perceived indexical relationship between photography and reality – of "having-been-there".[449]

Original or Copy?

A person assigns a higher value to a photograph if it is the original compared to copies of the same photograph. Mitchell states originals are valued over copies because their status is primary rather than secondary evidence of a scene or occurrence. However, a digital image file is more problematic having no unique negatives; only by metadata such as date is it distinguishable.[450]

In digital recording media, there is no equivalent to the permanently archived, physically unique photographic negative. The only difference between an original file and a copy is in the

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446 David D. Perlmutter and Lisa E. Silvestri, "Commentary: In the Visual-Digital World, Taking Seriously the Once-Prosaic 'Home Mode'," *Visual Communication Quarterly* 20, no. 3 (2013): 126, https://doi.org/10.1080/15551393.2013.820584

447 Fred Ritchin, *In Our Own Image: The Coming Revolution in Photography* (New York: Aperture, 1990), 4.

448 Kari Andén-Papadopoulos and Mervi Pantti, *Amateur Images and Global News*, (Bristol: Intellect Books, 2012):100, ProQuest Ebook Central, https://ebookcentral.proquest.com/lib/cqu/detail.action?docID=830094.

449 Maria Nilsson and Ingela Wadbring, "Not Good Enough? Amateur Images in the Regular News Flow of Print and Online Newspapers," *Journalism Practice* 9, no. 4 (2015): 485, https://doi.org/10.1080/17512786.2015.1030135.

450 Ibid., 49.

metadata recording time and date of creation[451] and continual mutation and proliferation of digital variants lessen the individual authorial prestige associated with the original.[452]

Summary

This section has articulated different theoretical discourses related to the photographic image's ambiguous relationship with truth, falsity and reality. It is an important aspect of this study considering the association these ontological markers have with the epistemological approach of semiotics and the theory's structural elements such as indexicality, signs, signifiers, connotation and denotation. These concepts still have a role to play when discussing "Fauxtography" and the photograph.

However, new and diverse theories are emerging, as discussed in section 4.6. These theories examine the image in new digital contexts, not representative of anything material but existing through data sequences[453] and algorithms,[454] the very nature of which allows for easier manipulation and total fabrication, as in the case of "deepfake" phenomena. We need to also acknowledge the way images are consumed in the twenty-first century through "communicative, spatial, temporal and performative modes"[455] where the content of the image is not necessarily fixed to a referent and is open to shifting interpretations or "realities".

The literature in this chapter contextualises this study's examination of changes in the apprehension of two-dimensional photographic images resulting from the shift from traditional forms of printed communication and information dissemination to digitally based information exchange and communication systems, devices and applications. It reveals the image as part of a complex and fluid visual communication ecosystem made up of a myriad of elements,

451 Mitchell, *The Reconfigured Eye*, 51.
452 Ibid., 52.
453 Jackson, "Knowing Photographs Now," 173.
454 Hoelzl and Marie, "From Softimage to Postimage," 72.
455 Jackson, "Knowing Photographs Now," 180.

technological and human, interacting with each other to different degrees of effect and dependent on context.

The photograph is captured at the beginning of this coaction, presenting a selected moment in time and place. The process involves the photographer making a choice in the kinds of persons, objects, and features that are presented, how these are represented, the style of the photograph and the editing. All these decisions, whether made consciously or not by the photographer or by the technology of photography, or both, shape how viewers are encouraged to see those moments in time, and how they come to view and think about the subject matter the photograph appears to document.[456]

This occurs before all other interactions we have with the image which are further affected by the mediating nature of the types of technologies, institutions and social norms that have a bearing on how we apprehend the image. Truth, falsity and reality are not fixed entities in this interlocution and "Fauxtography" has varying degrees of all three.

Many scholars agree that the nature of the photograph is highly interpretive and "unreliable" as a presenter of fixed truth. Ritchin claims photography is as unreliable as any other medium even without the addition of digital technology. It is ambiguous, culturally specific and heavily dependent on contextualisation by text and layout.[457]

Sekula and Mendelson support this view, suggesting the photograph has many possible meanings depending on the production of the image, the context for viewing the image, and the viewer. [458] The photograph is context-dependent, a message reliant on external conditions to be read." [459]

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456 Cobley and Machin, "Semiotics," 133.

457 Fred Ritchin, *In our Own Image*, 81.

458 Alan Sekula, "On the Invention of Photographic Meaning," in Vicki Goldberg, *Photography in Print: Writings from 1816 to the Present (*Albuquerque: University of New Mexico Press, 1988), 4.

459 Andrew L. Mendelson, "On The Construction of Meaning," in *Handbook Of Research On Teaching Literacy Through The Communicative And Visual Arts, Volume II*, eds. James Flood, Shirley Brice Heath and Diane Lapp (New York: Routledge, 2008), 27.

Worth claims photographs "in and of themselves are not propositions that make true or false statements". Pictures are not representations or correspondences with or of reality but constitute a reality of their own.[460] Despite Worth's mixed metaphors, there is support for the first statement with "truth being in the eye of the beholder." Kress and van Leeuwen articulate modalities of truth or the available repertoire of semiotic choices for levels of commitment or truth.[461] They argue a photograph can only claim to show whether a given visual proposition represented is true or not and that truth is a construct of semiosis and that social groups carry with them their own truths arising from the values and beliefs of that group. Only when the message directed to that group forms a relevant expression of these truths can the truth within the photograph be realised.[462]

The literature has also shown the digital image is much more open to manipulation than its analogue predecessor through its malleable data-based structure. Despite this, we must acknowledge that as the digital image is reassembled from code to appear as a structured assemblage of pixels that visually represent "something" on screen, an indexical connection to its referent is still possible, inherited from its analogue predecessor. Part Two progresses the discussion from the theoretical to the technological aspects of image usage.

PART TWO: THE IMAGE AND TECHNOLOGY

4.4 The Image and the Technological Affect

Section 4.4 is included as a published paper. Structural contributions from the co-author and the publication's reviewers are acknowledged (see page v).

460 Sol Worth, *Studying Visual Communication*, ed. Larry P Gross (Philadelphia: University of Pennsylvania Press, 1981), 10, https://archive.org/details/studyingvisualco00wort.

461 Cobley and Machin, "Semiotics," 145.

462 Kress and van Leeuwen, *Reading Images*, 155.

Technicity

As discussed in the section 4.1, knowledge and meaning are socially constructed[463] and meaning is interpreted and negotiated amongst people within a particular social context[464] and not set solely by technology, although the process may be more easily facilitated by it. Engagement with multiple technologies, media platforms, webpages, social media, video games and music clips all converging on one device is something that occurs "within the brains" of individuals and through their social interactions with others.[465]

Traditional and Technical Images

Flusser identifies two types of images, one that is traditional – observations of objects arising from depiction – and the second type, technical – computations of concepts arising through a "peculiar hallucinatory power that has lost its faith in rules."[466] Flusser seeks to clarify the ontological position between traditional and technical images, or images that are "not surfaces but mosaics" assembled from particles that exist in films, videos, television and computer screens.[467]

Technical images are "completely new media"; they mean in a completely different way from traditional images and are experienced less as concrete objects and more through abstract and continually shifting experiences. There is a new way of life emerging around "technical images."[468] The process of viewing these "technical images" is different from viewing traditional images, one where gestures summon "the ethereal particles into mosaic-like combinations" to

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463 Flick, *An Introduction to Qualitative Research*, 339.

464 Patton, *Qualitative Research: Evaluation Methods*, 114.

465 Henry Jenkins, *Convergence Culture: Where Old and New Media Collide* (New York: New York University Press, 2006), 3.

466 Vilém Flusser, "To Abstract," in *Into the Universe of Technical Images*, trans. Nancy Ann Roth (Minneapolis: University of Minnesota Press, 2011): 10, *ProQuest Ebook Central*, https://ebookcentral.proquest.com/lib/cqu/detail.action?docID=673646.

467 Ibid., 5–6.

468 Ibid., 7.

form the image, which Flusser refers to as "computations of concepts that can only be perceived with the help of instruments or keys."[469] Lévy describes this process in terms of the "virtual" and "actual" image where virtualisation is digitalisation and actualisation is display. An image is virtual if its origin is a digital description in a computer's memory where binary code needs to be translated for the image to be perceived or "actualised" on a screen or to be printed onto paper. The image is virtual on the hard disk and actual on the screen.[470] Hoelzl and Marie describe digital images as no longer being "hard images," solid representations of a solid world but an unstable algorithmic configuration of a database, "soft images."[471]

These scholars concur that the very structure of the image has changed with digitisation. The image has become an entity communicated in bits and bytes made apparent in a rasterised pixel array appended with computer and user-generated metadata, such as time, location, device used to capture the image, descriptive keywords, information about the author and image, and copyright detail. The result is a different kind of image. William J. Mitchell states that the photographic image fixed on silver-based photographic emulsion has been "radically and permanently displaced by the digital image."[472]

The Haptic Image

Digital images can be engaged in new ways. On tablets, smartphones and other touch-enabled devices, one can interact with them by touch gestures, such as the pinching and spreading of the fingers to change the image's scale. Pressing on and dragging the image left or right with the finger may bring another into view or image may be rotated by touching the surface of the screen and moving the image with two fingers in a clockwise or anti-clockwise

469 Flusser, "To Abstract," 10.

470 Pierre Levy, "Welcome to Virtuality," *Digital Creativity* 8, no.1 (April 1997): 6, https://doi-org.ezproxy.uws.edu.au/10.1080/09579139708567068.

471 Hoelzl and Marie, "From Softimage to Postimage," 72.

472 Mitchell, *The Reconfigured Eye*, 20.

direction. Some touch gestures have taken on socially constructed meanings such as swiping right or left on dating profile images inferring approval or disapproval respectively. These haptic gestures provide immediacy and instant involvement with images.

In this study to ascertain the quality and nature of their online viewing experience, Graphic Design students were asked the following question: "Do you think viewing images on digital devices such as smartphones, tablets and desktop computers has altered the way people interpret images? If so in what ways?"

The haptic image is an augmented image through its interactive tactility. Participants mostly referenced these tactile affordances offered by technology as a positive experience, as evidenced by a touch gesture or a mouse click performed on an image presenting the possibility of revealing hidden contextual information that can provide a richer more meaningful interaction with an image. The ability to hyperlink images can also offer the ability to create "anchored meaning"[473] decided upon by the author using descriptive text that can reduce the ambiguity of meaning in an image. However, this digital tactility can also lead to frustration when the viewer has to wait for the image to download from the server before it appears on screen, a factor that more sophisticated technology (e.g. high speed internet) resolves.

Screen Real Estate and Luminance

Technical images can exhibit visual qualities such as luminance, a more intense saturation of colour due to the phenomenon of the transmission of light via the process of electromagnetic radiation through computer screens and monitors. McLuhan identified this phenomenon in relation to TV monitors where the viewer is besieged by a barrage of light impulses viewing the image, not as a photograph but a pseudo three-dimensional sculptural contour. On the screen, the images appear by light transmitted through the surface rather than light reflected off it.[474]

473 Roland Barthes, *Image Music, Text*, trans. Stephen Heath, (London: Fontana Paperbacks, 1984), 39.
474 McLuhan, *Understanding Media: The Extensions of Man*, 313.

The visual phenomena of light radiating through computer screens offer the potential for increased engagement. Participants indicated aspects of brightness, vibrancy and glow increase the potential for attention, appeal, noticeability and memorability (see Chapter 5.3). These visual sensory qualities make an image more noticeable amongst surrounding stimuli.

The Transient Image

Images move through different contexts, material or digital, from one locality to another.[475] The image does not reside in a fixed location, at first appearing and then being replaced depending on the flow of input and output of data to and from a database, or, as Hoelzl et al state, appearing as a "soft image" where the image is no longer a concrete denotation of an object within the world.[476]

Images exhibit physicality or permanency in print and a transient impermanency online. Henning refers to the movement of the electronic images as a "flow" through various environments that will shift and change, where the viewer is encouraged to consume quickly and move along, recognising electronic images as forms of externalised dehumanised perception where the image is optical and kinetic but not reducible to representation.[477]

Sociality

The Participatory Image

Individuals are active audiences participating within emerging technological channels. The individual's role has moved beyond the passive consumption of media served up by older technologies such as television, newspapers and magazines. Individuals are now able to control

475 Sarah Pink, "Sensory Digital Photography: Re-thinking 'Moving' and the Image," *Visual Studies* 26, no.1 (March, 2011): 6–7, https://doi-org.ezproxy.uws.edu.au/10.1080/1472586X.2011.548484.

476 Hoelzl and Marie, "From Softimage to Postimage," 72.

477 Michelle Henning, "Image Flow: Photography on Tap," *Photographies* 11, no. 2–3, (2018): 143, https://doi-org.ezproxy.uws.edu.au/10.1080/17540763.2018.1445011.

how and from where and when they receive information, becoming creators and co-creators of content for consumption.[478]

Digital technologies allow individuals to sample and remix content and distribute it through personal digital spaces such as Facebook, Instagram, Flickr, Snapchat and Pinterest. These activities have become ways of "performing" identities as part of peer group communication rather than communicating detailed one-dimensional personal statements.[479] These activities are performed within online networked communities where users are socially engaged, relying on the collaboration of and between members to generate and inform image-based content.[480] The digital image has become an integral part of this communication environment where communication and information sharing occurs within online communities of likeminded people.

Participants indicated the importance of the creation, sharing and receiving of images from their online social network. When asked the following survey question, "What is the source of the images you share online?", 80% of Graphic Design students surveyed said the most important source of images they share online is of their creation. Sixty per cent said that images sourced from friends were nearly as important. Uploading to a social networking site was considered the most important way of sharing images.

An "image culture" has occurred characterised by technical images.[481] Flusser describes this as the traffic between people by the way of images rather than between people and images.[482] In Flusser's construction, images are used as dialogue, exchange of information and the generating of new information – people exchanging information through images.

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478 Don Tapscott, *The Digital Economy: Promise and Peril in the Age of Networked Intelligence* (New York: McGraw-Hill, 1996), 63.

479 Bronwyn T. Williams and Amy A. Zenger, "Introduction: Popular Culture and Literacy in a Networked World," in *New Media Literacies and Participatory Popular Culture Across Borders*, eds. Bronwyn T. Williams and Amy A. Zenger (New York: Routledge, 2012), 2.

480 Jackson "Knowing Photographs Now," 173–174.

481 Vilém Flusser, "To Scatter," 67.

482 Ibid., 68.

Private and Public Space

The unique nature of online image-sharing spaces encourages particular ways of image consumption. The nature of these spaces is both public and private. There are many modes of online social networking and digital engagement where image exchange takes place, including text messaging, shared photos, podcasts, streaming videos, wikis, blogs and discussion groups. Providers include Facebook, Twitter, MySpace, Flickr, Snapchat, Instagram, WhatsApp and Pinterest. They all share an emphasis on audience participation, people actively taking part in constructing their own truths in contexts or environments crafted to promote particular kinds of truth. A digital image is uploaded to project an image in a person's mind of how someone wants something to be. This type of participation emphasises experiential involvement and relationships.[483]

On Facebook you can choose who can see your messages or posts, sharing them with friends and public audiences by using the audience selector link.[484] This link also offers a custom option where communication can be shared with specific people.[485] These platforms can be considered extensions of traditional spaces like the lounge room or cinema. These are shared spaces where people interact with and speak to each other through images and text, personal spaces within the public sphere of the World Wide Web. Grace describes these online visual encounters between humans and media as a "rich everyday aesthetic that is neither wholly private nor wholly public.[486]

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483 Edward Comor, "Digital Engagement: America's Use (and Misuse) of Marshall McLuhan," *New Political Science* 35, no. 1 (2013): 10, https://doi.org/10.1080/07393148.2012.754666.

484 "When I post something on Facebook, how do I choose who can see it?", Facebook (help centre), DATE ACCESSED?, https://www.facebook.com/help/120939471321735.

485 "Can people see who I'm sharing with on Facebook?", Facebook (help centre), DATE ACCESSED?, https://www.facebook.com/help/196729973725708?helpref=related.

486 Grace, *Culture, Aesthetics and Affect in Ubiquitous Media*, 44.

Technology has provided people with new ways to communicate where the image is being used to engage in a social dialogue where the taker of the image can construct the identity they wish to present through the selection, digital manipulation and editing of images afforded by the availability of different types of social media platforms, image editing technologies and digital devices, in particular smartphones.[487] The act of taking photographs is increasingly becoming a tool for an individual's identity formation and communication.[488] The digital image has become a social object.

Ubiquity and Access

Mobility and Place

Images are mobile; they move through different spaces and are accessed via various distribution channels and different locations. These channels are located in architectural space and through screens within the built environment. Acts of spectatorship occur both in the public sphere and in the private sphere of the home.

The image is consumed in movement across public and private spaces because media itself has become mobile; it is consumed across devices, platforms and technologies, including print, digital and street furniture and outdoor signage. Screens are being increasingly placed into cars, kitchen appliances, shopping centres, bus stops and aeroplane seats.

When choosing a desktop computer to view images a more conscious decision with a more considered and directed purpose occurs that often relates to work or study activities. This offers the potential for deeper engagement with images and more time to contemplate the meaning.

Pervasiveness and the Networked Image

Rubinstein and Sluis describe the digital image as the "networked image". It is an image

487 Michael O'Shaughnessy, Jane Stadler and Sarah Casey, *Media and Society*, 6th ed. (South Melbourne, Victoria: Oxford University Press, 2016), 76.

488 van Dijck, "Digital Photography: Communication, Identity, Memory," 61.

with associated metadata that becomes oriented towards being read not by humans but by computers.[489] The "networked image" does not deliver a singular identity to the screen, but rather an image of the agglomeration generated by the network.[490] The digital image is part of a process by which the "networked image" reproduces itself and also changes as it accumulates metadata, tags and likes, a growing and changing mass of data.[491]

This agglomeration indicates a type of contemporary image delivery and engagement process we have with images where digital images are delivered in bursts on computer screens existing simultaneously in different places and are experienced as multiples.[492]

Participants indicated that the mass of image data available and accessed from multiple devices has encouraged a different type of engagement process and have acknowledged these new ways of image engagement and their resultant effects on the viewing experience. These effects, such as attentional, are discussed further in Chapter 5.2: Visual Noise and Disrupted Sensibilities.

The contradistinction to attentional effects is "hyperacuity"[493] or the observer's sensory capabilities to "locate relevant stimuli"[494] thus overcoming environmental and situational limitations. This is still possible under certain conditions. Image ubiquity also provides the coincidental benefit of increased literacy and knowledge amongst viewers as they are introduced to new visual representations of the world that they would not normally be exposed to without the ubiquity of images enabled by technology (see Chapter 5.2).

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489 Rubinstein and Sluis, "Concerning the Undecidability of the Digital Image," 153.

490 Ibid., 156.

491 Henning, "Image Flow: Photography on Tap," 135.

492 Ibid., 133.

493 Hany Farid and Mary J. Bravo, "Image Forensic Analyses that Elude the Human Visual System," *Proceedings of SPIE - The International Society for Optical Engineering* (February 2010):1, https://doi.org/10.1117/12.837788.

494 Russel L. De Valois and Karen K. De Valois, *Spatial Vision* (Oxford: Oxford University Press, 1990), 173.

Visual Clutter

Technology has heightened the phenomenon of visual noise, which Baskinger defines as elements that interfere with the relationship of an object to its intended user and environment. Visual noise is also defined as 'loud, harsh or confusing images' that interfere with or prevent perception.[495] Rosenholtz, Yuanzhen and Nakano describe this as clutter or "the state in which excess items, or their representation or organisation, lead to a degradation of performance at some task.[496] Clutter can also impair visual search performance and result in decreased object recognition due to obstruction and reduced articulation of the content being viewed.[497] Henning highlights "the familiar trope" existing in contemporary visual culture texts of too much information, too many images, a barrage of visual stimuli that produce an immobilised apathetic observer "bingeing on a diet of endless and instant imagery facilitated by electronic media."[498] In such an environment, McLuhan's ideal of the pre-modern ability of a person to balance the visual and aural senses to intimately connect with and make sense of things – in other words, the ability to study images in detail – is diminished. [499]

Stiegler proposes that technology has created a form of "industrial exploitation" of the image and has enabled a "blinding ubiquity" that has eliminated the possibility of seeing images where individuals are prevented from forming "aesthetic attachments to singularities or singular objects."[500] This increasing volume and speed of information being disseminated using digital

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495 Mark Baskinger, "Visual Noise in Product Design: Problems + Solutions," (University of Illinois at Urbana-Champaign, 2001), 2, http://com119.tripod.com/Visual_Noise.pdf. WEBSITE NO LONGER EXISTS

496 Ruth Rosenholtz, Li Yuanzhen and Lisa Nakano, "Measuring Visual Clutter," *Journal of Vision* 7, no. 17 (2007): 3, https://doi.org/10.1167/7.2.17.

497 Jeremy M. Wolfe, "Guided Search 2.0: A Revised Model of Visual Search," *Psychonomic Bulletin & Review* 1 (1994): 210, https://doi-org.ezproxy.uws.edu.au/10.3758/BF03200774

498 Henning, "Image Flow: Photography on Tap," 138–39.

499 Comor, "Digital Engagement," 14.

500 Bernard Stiegler, *Symbolic Misery, Volume 1: The Hyper Industrial Epoch*, trans. Barnaby Norman (Cambridge: Polity Press, 2014), 84.

technologies have eclipsed the "pre-modern" ability to listen with care.[501] A pertinent discussion of aspects of cognitive and affective emotional detachment to the image is included in Chapters 5.2, 5.3: Discussion and 6.1.3: The Devaluation of the Image.

Participants agreed that technological and social processes enabling digital images from multiple sources to populate screens and compete for our attention have altered the way people interact with images. Their ability to engage singularly and deeply with them has been reduced.

Participants agreed that peoples' reduced attention span, brought about in part by time pressures and having to partition and allocate their cognitive efforts between competing digital channels, devices and content types, reduced the effectiveness of images to hold their attention.

An image needs to be imbued with extremely remarkable qualities to have a memorable impact on the viewer within the digital environment. Flusser states the interaction between "technical" images and people has succumbed to entropy[502] because all images have become monotonous. Participants felt images have had their importance reduced (devalued) because of their very ubiquity.

Hyper and Deep Attention

To counter Henning and McLuhan's observation of the viewers' inability to intimately connect with an image because of interference of external stimuli occurring in the digital environment, Fredette suggests that there is a developing selectivity of the perceptual process that may counter the effects of what the viewer sees as excessive visual stimulation.[503] The perception of viewers' is so developed that they can instantly scan and find the information they are looking for. This selectivity of perception occurring in visually cluttered environments is

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501 Comor, "Digital Engagement," 14.

502 Vilém Flusser, "To Interact," in *Into the Universe of Technical Images*, trans. Nancy Ann Roth (Minneapolis: University of Minnesota Press, 2011): 59, ProQuest Ebook Central.

503 Barbara W. Fredette, "Use of Visuals in Schools: Curriculum and Instruction," in *Visual Literacy: A Spectrum of Visual Learning*, eds. David M. Moore and Francis M. Dwyer (New Jersey: Educational Technology Publications, 1994), 237.

identified as a generational shift in cognitive styles from deep attention to hyper attention. This is the difference of being able to extend concentration on a single object, taking no notice of outside stimuli, or being able to multitask while engaging with multiple information streams.[504]

William J. T. Mitchell identifies a "barrage of visual stimuli" where most images pass by and through us so quickly that we scarcely notice them. However, he has also acknowledged there is the possibility of some images being noticed in such an environment: "They are fast food for the eyes and mostly junk food but some of them demand more attention and even the trivial or overlooked ones have this potential waiting to be tapped." [505]

Therefore the "blinding ubiquity" suggested by Stiegler and Henning's theme of too much information, too many images (see Visual Clutter), can be countered by the changing nature of engagement with the visual, a selective perception occurring particularly with young viewers as suggested by Hayles.[506]

Participants indicate an ability to singularly focus on an image when required. This may not be a conscious effort but a cognitive process of the brain or "automatic senses."[507] When viewing images surrounded by multiple external stimuli, there is the possibility for immediate comprehension while not necessarily enabling retention of what one has seen.[508]

Deep attention can be facilitated depending on the device and environments used to access images, such as a desktop computer at home, work or study, which is more inducive to deep attention (see Mobility and Place, page 122. In addition, smartphones induce hyper attention and are used in situations where multiple foci compete for attention, such as ambient outdoor noise, face-to-face communication, social media alerts and news bulletins.

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504 Hayles, "Hyper and Deep Attention," 187.

505 Asbjørn Grønstad and Øyvind Vågnes, "What do Pictures Want? Interview with W. J. T. Mitchell," *Image & Narrative* (November 2006), https://www.visual-studies.com/interviews/mitchell.html.

506 Hayles, "Hyper and Deep Attention," 187.

507 Participant 9s.

508 Participant 1p.

Summary

Technology has enabled a new type of image, the "technical image" with new characteristics that can be virtual – the image residing in a computer's memory – and actualised. The image is made visible through the calculation in real-time by a program from a model and a flow of input data.[509] This has allowed for a new digital tactility of the image, allowing a certain amount of viewer control of the online viewing experience.

Digital images are consumed through new usage practices within social media platforms. They are visualised via new viewing experiences afforded by technology. Images are rendered on screens using a sequence of numbers understood by computers and represented as pixels to form an image transmitted through electromagnetic light from a computer screen. Some participants have described the effect of this representation has been described by some participants as being vibrant and luminous, increasing engagement and memorability.

Technology has given transient nature to digital images. They are constantly in movement affected by dimensions of time, place, viewing and communication purpose. They move from person to person, are shared across digital communities, between social media platforms, transmitted from one digital device to another, transferred from database to website, from computer to storage device. Moreover, they can instantly appear and disappear.

4.5 Does Size Matter

Does the size of an image affect apprehension when viewed? Is bigger better? What affordances does size offer the viewer? Various technologies facilitate and favour certain modes of viewing from large format (desktop computer, large format print) to smaller formats (tablets and smartphone). Extensive studies have been conducted concerning screen size, focussing on various types of viewer screen interaction such as gaming and immersive experience in virtual

509 Levy, "Welcome to Virtuality," 6.

environments,[510,511] comparisons of smartphone and large screen viewing of feature films,[512] media content,[513] and film and television[514] and video.[515] Other research has been conducted studying effects of screen size and information structure on mobile phone users.[516]

In the many interactions we have with digital devices, screen size plays a critical role in determining the quality of the media experience. Large screens on smartwatches are found to be more effective in promoting hedonic (perceived attractiveness) and pragmatic (perceived control) qualities than small screens.[517] These findings support research conducted on other digital devices such as smartphone and desktop screens, indicating the immersive nature of large displays results in a greater feeling of presence or a sense of "being there."[518] For example, Grabe et al.'s research suggests viewers' evaluation and processing of mediated messages are

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510 Jinghui Hou, Yujung Nam, Wei Peng and Kwan Min Lee, "Effects of Screen Size, Viewing Angle, and Players' Immersion Tendencies on Game Experience," *Computers in Human Behavior* 28, no. 2 (2012), https://doi.org/10.1016/j.chb.2011.11.007.

511 Jonathan Bakdash, Jason Augustyn and Dennis Proffitt, "Large Displays Enhance Spatial Knowledge of a Virtual Environment," in *Proceedings of the 3rd Symposium on Applied Perception in Graphics and Visualization* (New York: Association for Computing Machinery, July 2006), https://doi-org.ezproxy.uws.edu.au/10.1145/1140491.1140503.

512 Kata Szita and Brendan Rooney. "The Effects of Smartphone Spectatorship on Attention, Arousal, Engagement, and Comprehension," *I-Perception* 12, no. 1 (January 2021), 2, https://doi.org/10.1177/2041669521993140.

513 Maria Elizabeth Grabe, Matthew Lombard, Robert D. Reich, Cheryl Campanella Bracken and Theresa Bolmarcich Ditton, "The Role of Screen Size in Viewer Experiences of Media Content," *Visual Communication Quarterly* 6, no. 2 (Spring, 1999), 4, https://doi.org/10.1080/15551399909363403.

514 Benjamin H. Detenber and Byron Reeves, "A Bio-Informational Theory of Emotion: Motion and Image Size Effects on Viewers," *Journal of Communication* 46, no. 3 (September, 1996), 68-69, https://doi-org /10.1111/j.1460-2466.1996.tb01489.x

515 Nipan Maniar, Emily Bennett and Diane Gal, "The Effect That Screen Size has on Video-Based M-Learning," in *Fifth Annual IEEE International Conference on Pervasive Computing and Communications Workshops* (PerComW'07), (White Plains, NY: IEEE, 2007), 145–148, https://doi.org/10.1109/PERCOMW.2007.112.

516 Minhee Chae and Kim Jinwoo, "Do Size and Structure Matter to Mobile Users? An Empirical Study of the Effects of Screen Size, Information Structure, and Task Complexity on User Activities with Standard Web Phones," *Behaviour & Information Technology* 23, no. 3 (May, 2004): 165–81, https://doi.org/10.1080/01449290410001669923.

517 Ki Joon Kim, "Shape and Size Matter for Smartwatches: Effects of Screen Shape, Screen Size, and Presentation Mode in Wearable Communication," *Journal of Computer-mediated Communication* 22, no. 3 (May, 2017): 133, https://doi-org.ezproxy.uws.edu.au/10.1111/jcc4.12186.

518 Bakdash, Augustyn and Proffitt, "Large Displays Enhance Spatial Knowledge," 59.

affected by screen size, indicating that larger screens "promote perceived realism of media content and perceptions of presence."[519]

Size and Attention

Studies indicate screen size has positive effects on the following cognitive areas: "recall of information[520], arousal,[521] a sense of presence,[522] and comprehension."[523] These effects need to be considered when attempting to understand a viewer's apprehension of images. However, screen size is external to the image and its message. Altering structural presentation attributes may enhance the viewing experience but does not change the inherent nature of a message. From a phenomenological viewpoint, this is left for each viewer to interpret and be affected in their own way. Detenber argues "the nature of a display system can have symbolic significance but has nothing to do with the meaning of the mediated messages."[524] The latter part of this claim is supported by participant comments in this study regarding the positive effect of larger screen size over smaller screen sizes when viewing images. This provides for more effective comprehension of a message but does not necessarily affect intended or applied meaning. The display system mediates the viewing experience and any symbolic signification is realised when the viewer encounters the image. It may make the viewing experience easier or more difficult depending on screen size.

Silvera, Josephs and Giesler investigated the possibility that the physical size of an object

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519 Grabe et al., "The Role of Screen Size," 4–5.

520 Eric Redlinger, Bernhard Glas, and Yang Rong, "Impact of Screen Size on Cognitive Training Task Performance: An HMD Study," *International Journal of Psychophysiology* 166 (August, 2021): 167, https://doi.org/10.1016/j.ijpsycho.2021.06.003.

521 Hou, Nam, Peng and Lee, "Effects of Screen Size," 622.

522 Matthew Lombard, and Theresa Ditton, "At the Heart of It All: The Concept of Presence," *Journal of Computer-Mediated Communication* 3, no. 2 (September, 1997): 1, https://doi-org.ezproxy.uws.edu.au/10.1111/j.1083-6101.1997.tb00072.x.

523 Szita and Rooney, "The Effects of Smartphone Spectatorship," 2.

524 Benjamin H. Detenber, "The Effects of Motion and Image Size on Affective Responses to and Memory For Pictures," diss. (Stanford University, 1995): 13, https://ezproxy.cqu.edu.au/login?url=https://www.proquest.com/dissertations-theses/effects-motion-image-size-on-affective-responses/docview/304232042/se-2?accountid=10016.

can influence aesthetic preferences. In a series of studies abstract stimuli were used – randomly paired geometric shapes and symbols, alphanumeric characters, Chinese characters and inkblot stimuli – in an attempt to identify an association between size and preference.[525] The results supported the hypothesis that larger objects would be preferred over smaller objects.[526] It was considered to be of value in this study to simulate such a study using actual photographic images of different subject matter and composition. This would allow an investigation to determine what effects screen size has on image apprehension and would place the study in the context of human visual communication.

As discussed previously, screen size can influence the perceived positivity of the semantic content of an image where viewers will prefer meanings associated with larger images.[527] Positive influence of size on preference judgements for viewing images tends to override the effect of interference from external stimuli. This influence is reduced when the cognitive load is reduced.[528] This may also provide a positive viewing experience on smaller screens where the image occupies a larger proportion of the screen real estate. In other words, an uncluttered environment of solitary and singular interaction with the image can present as a positive experience.

Belton observes that our experience of digital images on tablets and smartphones is different from that of our experience of moving photographic and televisual images. The display of these images involves a greater variation in screen size. "On a big screen, a film fills our field of vision and becomes a world for us to enter, a world that is bigger than life."[529] This is not only

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525 David H. Silvera, Robert A. Josephs and Brian R. Giesler, "Bigger Is Better: The Influence Of Physical Size On Aesthetic Preference Judgments," *Journal of Behavioral Decision Making* 15 (July, 2002): 189, https://doi-org.ezproxy.cqu.edu.au/10.1002/bdm.410.

526 Ibid., 193–194.

527 Ibid., 195.

528 Silvera, Josephs and Giesler, "Bigger is better," 197.

529 John Belton, "Psychology of the Photographic, Cinematic, Televisual, and Digital Image," *New Review of Film and Television Studies* 12, no. 3 (July 2014), 24, **Error! Hyperlink reference not valid.**n.

experienced through moving images. A two-dimensional image viewed on a large desktop computer screen can offer the viewer a similar sensation of immersion. This may depend on the type of image being viewed and may indicate a size threshold where an immersive experience begins regardless of whether the image is moving or stationary. Larger image sizes can intensify viewing experiences and, together with the affordance of being able to zoom into a scene, a richer, more immersive experience than would be possible at smaller screen sizes is created.

Positive Influence of Screen Size

Substantial work in the fields of psychology and communication has consistently found that an increase in screen size positively influences various cognitive and affective domains of user perceptions, including presence, enjoyment, satisfaction, immersion, and realism.[530]

Larger screen sizes lead to a greater sensory experience by "increasing the number of perceptual channels that process information." This provides viewers with a stronger sense of reality and experience than that of a small screen.[531] Chae and Jinwoo posit that smaller screens present the user with a "higher cognitive load" affecting users' navigation activities and perceptions.[532]

The paradox to Chae's proposition is that smaller screens can offer an immersive and enjoyable experience on a more personal level than could be achieved from larger screens. Certain factors lessen the cognitive load when viewing content on smaller screens, such as discrete navigational elements and minimalist interface design, compared to large screen devices such as desktop computers.

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530 Matthew Lombard, Robert D. Reich, Maria Elizabeth Grabe, Cheryl Campanella Bracken, and Theresa Bolmarcich Ditton, "Presence and Television: The Role of Screen Size," *Human Communication Research* 26, no. 1 (January 2000): 75–98, https://doi-org.ezproxy.uws.edu.au/10.1111/j.1468-2958.2000.tb00750.x.

531 Ki Joon Kim and S. Shyam Sundar, "Does Screen Size Matter for Smartphones? Utilitarian and Hedonic Effects of Screen Size on Smartphone Adoption," *Cyberpsychology, Behavior, And Social Networking* 17, no. 7 (2014): 467, https://doi.org/10.1089/cyber.2013.0492.

532 Chae and Jinwoo, "Do Size and Structure Matter," 170.

Larger Images Evoke a Sense of Presence

Presence concerns "the degree to which a medium can produce seemingly accurate representations of objects, events, and people – representations that look, sound, and/or feel like the "real" thing."[533]

However, other characteristics of visual displays also encourage a sense of presence, including the following:

- Image quality, image size and viewing distance together determine the proportion of a user's visual field occupied by an image.[534]
- Motion[535] and colour[536], variables related to the perception of dimensionality.
- The use of a variety of camera techniques such as close up shots and panning and zooming. [537]

Larger images have been shown to evoke a variety of more intense presence-related responses.

> Participants who watched the large-screen television thought the movement in the scenes: was faster, experienced a greater sense of physical movement, enjoyed the movement to a greater extent, and found the viewing experience more exciting than participants who watched the same scenes on a small television screen. Participants who watched the large screen were also more aroused, as measured by electrodermal activity, during viewing.[538]

Lombard et al.'s findings can be transposed to the two-dimensional image, measuring level of comprehension and effectiveness of images in communication when comparing screen sizes.

The MAIN model acronym helps us understand four broad affordances that come with viewing content on digital media. Tests at the Media Effects Research Laboratory at Penn State

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533 Lombard and Ditton, "At the Heart of It All," 5.

534 Matthew Lombard, "Direct Responses to People on the Screen: Television and the Illusion of Nonmeditation," diss., Order No. 9414609 (Stanford University, 1993), 149, https://ezproxy.cqu.edu.au/login?url=https://www.proquest.com/dissertations-theses/direct-responses-people-on-screen-television/docview/304063096/se-2?accountid=10016

535 Detenber, "The Effects of Motion and Image Size," iv.

536 Phillip J. Marlow, Karl R. Gegenfurtner, and Barton L. Anderson, "The Role of Color in the Perception of Three-dimensional Shape," *Current Biology* (2022): 1, https://doi.org/10.1016/j.cub.2022.01.026.

537 Lombard et al., Presence and Television," 81.

538 Ibid., 75.

University identified the following affordances as having significant psychological effects – Modality (M), Agency (A), Interactivity (I), and Navigability (N). These affordances indicate cognitive heuristics about credibility assessments when viewing screen-based content.[539] In this study we are concerned with screen size, which is sufficient to trigger changes in user perceptions. According to the model, size may serve as a salient modality cue that implies the technology's availability of particular functions and action capabilities. This may translate to being able to view an image at a higher resolution, larger dimensions or in more detail by zooming in. Cognitive heuristics (or mental shortcuts) are then triggered to shape user judgments about the quality and credibility of the underlying content.[540]

Kim and Sundar posit large screens are likely to have stronger effects on the affective dimension of trust compared to small screens, because heuristic processing involves lesser cognitive demand, has a more immediate automatic impact on apprehension and is further affected when the "being-there" and "realism heuristics" are triggered by the larger screen size[541] allowing the viewer to focus on easily noticed and easily understood cues.[542]

A different cognitive process occurs when viewing information conveyed via small-screen smartphones than those with larger screens. Information on smaller screens is likely to be processed systematically requiring greater motivation to interact with content, therefore increasing the cognitive load. [543] This may have an adverse effect on information processing.

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539 S. Shyam Sundar, "The MAIN Model: A Heuristic Approach to Understanding Technology Effects on Credibility," in *Digital Media, Youth, and Credibility,* eds. Miriam J. Metzger and Andrew J. Flanagin, The John D. and Catherine T. MacArthur Foundation Series on Digital Media and Learning (Cambridge, MA: The MIT Press, 2008), 78–79.

540 Ki Joon Kim and S. Shyam Sundar, "Mobile Persuasion: Can Screen Size and Presentation Mode Make a Difference to Trust?" *Human Communication Research* 42, no. 1 (January, 2016): 46, https://doi-org.ezproxy.uws.edu.au/10.1111/hcre.12064.

541 Kim and Sundar, "Mobile Persuasion," 49–50.

542 Shelly Chaiken and Alison Ledgerwood, "A Theory of Heuristic and Systematic Information Processing," in *Handbook of Theories of Social Psychology: Volume 1*, eds. Paul Van Lange, Arie W. Kruglanski and Tory E. Higgins (London: SAGE Publications, 2011): 247, https://dx.doi.org/10.4135/9781446249215.n13.

543 Ibid., 246.

Immersive Experience

A study by Rigby et al. investigating the effect of screen size on the level of immersion experienced by participants when watching film content demonstrated the experience of viewing content on medium or large screens was better than viewing the same content on smaller screens, indicating larger screens offered a greater sense of immersion."[544] Grabe et al. supports the benefits of larger screens, arguing there is substantial evidence that larger screens promote perceived realism of media content.[545] A message's size, strength and/or location, therefore, determines the dominance of that message and the immersion a viewer feels particularly when the "image saturates (occupies) more of the perceiver's field of vision."[546]

Although the literature supports people favouring content viewed on large screens and exhibiting more intense responses to large images, this preference may vary depending on the genre or the viewing context. Lombard et al. suggest the intensity experienced is consistent with the notion that viewers respond to non-mediated objects, events and people. In their study, the genres that yielded the most consistent results favouring large screen size included:

> Commercials, action-adventure, and reality, while the talk shows and drama programs produced no effect. The programs which elicited more intense responses had shorter shots, sudden movement especially from point of view camera angles and impact. This abrupt change, novelty, and movement (interestingly all formal features) may have particularly strong impact on the large screen. [547]

This suggests other characteristics within the media being viewed, apart from image size, impact

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544 Jacob M. Rigby, Duncan P. Brumby, Anna L. Cox and Sandy J.J. Gould, "Watching Movies on Netflix: Investigating the Effect of Screen Size on Viewer Immersion," *MobileHCI '16: Proceedings of the 18th International Conference on Human-Computer Interaction with Mobile Devices and Services Adjunct* (New York: Association for Computing Machinery, 2016), 714–721, https://doi.org/10.1145/2957265.2961843.7.

545 Grabe et al., "The Role of Screen Size," 4.

546 Tae-Yong Kim, "The Memory and Persuasion Effects of Presence in Television Advertisement Processing," diss. (The University of North Carolina at Chapel Hill, 1996), 10, https://search-proquest-com.ezproxy.cqu.edu.au/dissertations-theses/memory-persuasion-effects-presence-television/docview/304265440/se-2?accountid=10016.

547 Matthew Lombard, Theresa B. Ditton, Maria Elizabeth Grabe and Robert D. Reich, "The Role of Screen Size in Viewer Responses to Television Fare," *Communication Reports* 10, no. 1 (1997): 104, https://doi-org.ezproxy.uws.edu.au/10.1080/08934219709367663.

the level of intensity and immersion experienced during the viewing process. This may include interpersonal distance, viewing distance and shot length (close-up vs. long).

Affordances of Screen Size

Grabe et al. suggest the following affordances are associated with larger screen sizes.

1) Greater perceptions of realism and presence.
2) Increased enjoyment of viewing experiences.
3) Favourable evaluation of picture quality.
4) Greater intensity of response.
5) Greater arousal.
6) Increased attention and memory.[548]

Other aspects may mitigate the preference for viewing on larger screens such as the following:

1) Content that emphasises the physical (spatial relationships, movement, etc.) are more likely to be influenced by screen size than responses to content that emphasises the psychological.
2) Particularly intense content may minimise the influence of the size of the image.
3) Social context of the viewing experience influences the preference for large and small screens to an extent that small screens might be preferable in personal settings whereas large screens serve shared public or small group viewing experiences better.[549]

When comparing movie viewing on smartphones and large screens, Szita and Rooney found screen size did not affect the perceived level of engagement. This indicates handheld smartphone screens impact viewing experiences differently than stationary screens of various sizes.[550]

548 Grabe, et al., "The Role of Screen Size," 7.
549 Grabe, et al., "The Role of Screen Size," 7.
550 Szita and Rooney, "The Effects of Smartphone Spectatorship," 15.

Smartphone viewing can offer a more personal viewing experience which may be enhanced by close interpersonal space with the screen and the personal nature of smartphones allowing for more intimate and memorable interactions. These are circumstances that neutralise the "bigger is better" heuristic. Furthermore, with handheld portability offering the ability to customise viewing orientation and engage in close viewing encounters, the smartphone can provide the user with a rich viewing experience that can enhance apprehension.

This experience can be further enhanced through haptic affordances allowing users to control stimulus intensity (e.g. luminance, image size and volume).[551] These interactions produce a "holistic experience that involves the screen and its presence in the physical environment relative to the viewer's body and senses."[552]

Distractions and Gaze Dispersion Affect Size Heuristics

An intimate viewing experience provided by smartphones may be interrupted by external distractions such as incoming calls, social media alerts and multitasking scenarios that parallel spectatorship. With the smartphone, the viewer's attention can be divided between the content on-screen and physical space[553] which may affect viewing experience and practices and in this sense bigger may be better in stationary, designated viewing environments such as the cinema theatre or the home/work/study situation.[554] Further to this, a physiological factor which may adversely impact the viewing experience on a larger screen is the amount of dispersion of gaze needed to cover the screen. Viewing on a larger screen while producing a larger retinal image results in a greater proportion of the image staying outside the "fovea, the area that provides sharp vision."[555]

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551 Kata Szita. "New Perspectives on an Imperfect Cinema: Smartphones, Spectatorship, and Screen Culture 2.0," *NECSUS_European Journal of Media Studies* 9, no. 1 (2020): 34, https://mediarep.org/handle/doc/15286.

552 Ibid., 39.

553 Szita and Rooney, "The Effects of Smartphone Spectatorship," 2.

554 Szita, "New Perspectives on an Imperfect Cinema," 40.

555 Szita and Rooney, "The Effects of Smartphone Spectatorship," 14.

Summary

In many instances, viewing images at larger sizes in both print and online environments leads to greater perceived image quality, richer and immersive engagement, memorability and a stronger sense of presence. This is not a definitive attestation when considering the unique personal affordances of smartphone viewing. We need to be cognisant that content is increasingly being consumed on mobile devices. An increasing number of images are inhabiting this space aided by camera phone technology. Rather than consider size as a heuristic in these environments, we should consider user experiences such as immersion and presence as more pertinent factors enhancing image apprehension.

4.6 The Online and The Printed Image

This section examines existing literature relating to comparisons in the apprehension of photographic images comparing print and digital formats. The purpose is to ascertain to what extent previous research has explored the differences between these two formats. It provides an opportunity to uncover gaps in the literature and extend research into this area.

Photographic images operate in a broad ecology of technologies, media and human agency, which in various combinations create unique modes of presentation. The nature of these interactions inflect the way images are perceived and, more importantly, apprehended. There is no "neat" way to experience an image.

> The search for a single set of properties of a photograph belies the diversity of the medium and the vigour of the debate that this multifaceted nature brings, as it is precisely the polysemic nature of the photographic medium that continues to engender a dynamic body of theory, practice and criticism.[556]

The image is no longer static as it was in the printed medium. The digitalisation of the image has allowed for many more possible options of presentation across a diverse range of devices,

556 Joanna Sassoon, "Photographic Materiality in the Age of Reproduction," in *Photographs Objects Histories: On the Materiality of Images*, eds. Elizabeth Edwards and Janice Hart (New York, NY: Routledge, 2004), 199.

platforms and online social interactions: "The image is 'multi-platform' and open to a variety of playbacks: static and moving, printed out or projected."[557]

How can we understand the photographic image in these dynamic and diverse environments? What are the differences in apprehension resulting in the shift from traditional printed communication and information dissemination to digitally based information exchange and communication systems, devices and applications? Part of the process toward understanding the nature of these changes from visual representation to the image as data on screens is to investigate particular aspects of how photographs are presented and apprehended comparing the printed and the digital image.

Very little research has been done comparing differences in apprehension between images viewed online and in print. Much of the comparative research has focussed on the differences associated with reading digital versus printed texts. This includes research by: Gregory on attitudes and usage practices toward e-books;[558] Barron on comparison of reading between digital and print;[559] Liu and Gu on investigations into fragmented reading, multitasking, attention and comprehension in the online environment;[560] and Ross on examination of e-texts and print-based texts.[561]

Some of the literature reveals digital technologies encourage us to approach online texts with a different mindset compared to reading print, a cognitive shift from contemplating and

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557 Ingrid Hoelzl and Rémi Marie, *Softimage: Towards a New Theory of the Digital Image* (Bristol: Intellect Books, 2015), 113.

558 Cynthia L. Gregory, "'But I Want a Real Book': An Investigation of Undergraduates' Usage and Attitudes toward Electronic Books," *Reference and User Services Quarterly* 47, no. 3 (Spring, 2008): 266–273, http://ezproxy.uws.edu.au/login?url=https://www.proquest.com/scholarly-journals/i-want-real-book-investigation-undergraduates/docview/217899046/se-2.

559 Naomi S. Baron, "Reading in a Digital Age," *Phi Delta Kappan* 99, no. 2 (October 2017): 15–20, https://doi-org.ezproxy.uws.edu.au/10.1177/0031721717734184.

560 Liu and Gu, "Media Multitasking, Attention, and Comprehension," 67–87.

561 Bella Ross, Ekaterina Pechenkina, Carol Aeschliman and Ann Marie Chase, "Print versus Digital Texts: Understanding the Experimental Research and Challenging the Dichotomies," *Research in Learning Technology* 25 (2017):4-5, https://doi.org/10.25304/rlt.v25.1976.

understanding to finding information.[562] Ross suggests students prefer to read printed texts and comprehension and recall may be similar when reading print and e-texts. However, when reading online texts, distractions such as negotiating hypertext as well as the complexities of skimming and scanning techniques may impede digital text comprehension and recall.[563]
Gregory's study revealed students preferred the tactile "tangible" nature of the physical book over the digital format,[564] while Liu and Gu found that in a digital environment, fragmented reading tends to lead to low quality of understanding and attention.[565]

Subrahmanyam et al. compare the effects of the medium on reading, multitasking and synthesis of information between screen and paper-based texts. While multitasking had a more significant effect on performance than the medium itself, there was no difference in reading comprehension or in the "synthesis of information" when accessing the information on screen compared with paper. The findings related to "a persuasive report that required critical thinking."[566]

Placing the image into the above contexts can offer insight into how we negotiate images in print and online environments. Some image-related research has been done in this area.

Picture consumption comparisons in print and online modes of delivery are made by Frey, Farnand and Cost[567] and the impact of printed and online photographic images on political

562 Baron, "Reading in a Digital Age," 19.

563 Ross et al., "Print versus Digital Texts," 86.

564 Gregory, "But I Want a Real Book," 270.

565 Liu and Gu, "Media Multitasking, Attention, and Comprehension," 83.

566 Kaveri Subrahmanyam, Minas Michikyan, Christine Clemmons, Rogelio Carrillo, Yalda T. Uhls and Patricia M. Greenfield, "Learning from Paper, Learning from Screens: Impact of Screen Reading and Multitasking Conditions on Reading and Writing among College Students," *International Journal of Cyber Behavior, Psychology, and Learning* 3, no. 4 (2013): 22, doi: http://dx.doi.org.ezproxy.cqu.edu.au/10.4018/ijcbpl.2013100101.

567 Franziska Frey, Susan Farnand and Frank Cost, "Print versus Screen Presentation Medium-Dependent Picture Consumption," *International Symposium on Technologies for Digital Photo Fulfillment* 3 (January 2012): 47, https://doi.org/10.2352/ISSN.2169-4672.2012.3.0.28.

campaigns are discussed by Padil and Azahari.[568]

Some salient points to come from Padil and Azahari's study are as follows:

a) Integrity can be associated with printed images.[569]

b) Colour saturation in online images made them more attractive.[570]

c) The social nature of online images as part of a communication thread can have positive effects.[571]

Attempts to understand how people interact with information presented in different communication mediums have been made, with Liu indicating changes in reading habits due to the nature of the digitisation of documents. These include more time spent on "browsing and scanning, keyword spotting, one-time reading, non-linear reading, and reading more selectively." There was also a trend toward "shallower, more fragmented, and less concentrated reading."[572]

It could be argued that images are also interacted with in "shallower and more fragmented ways." The end of the single and singular image seems to announce the irrelevance of approaches that treat the image as representation as well as of practices of close reading.[573]

The Digital and Printed Image

Flusser describes the material qualities of the photograph bound to paper, something flyer-like, able to be held but without value, as it becomes a reproduction, one of many copies of the original "classical photographs – bromide prints."[574] The value then is in the information they carry on their surface and not as representational objects, their significance encoded by the

568 Md. Nagib Padil and Mustaffa Halabi Azahari, "The Impact of Photographic Images in Print and Online Media for Political Campaign in Malaysia," *International Journal of Social Science and Humanity* 4, no. 3 (May 2014):214-215, http://www.ijssh.org/papers/349-A00051.pdf

569 Ibid., 216.

570 Ibid., 217.

571 Ibid., 218.

572 Ziming Liu, "Reading Behavior in the Digital Environment: Changes in Reading Behavior over the Past Ten Years," *Journal of Documentation* 61, no. 6 (2005): 700, https://doi.org/10.1108/00220410510632040

573 Henning, "Image Flow: Photography on Tap," 134.

574 Vilém Flusser, *Towards a Philosophy of Photography* (London: Reaktion Books, 2006), 52–53.

distribution channels within which they appear.[575] There is recognisable materiality in digital images. This is evident in the process of algorithmic operations and binary coding supported by infrastructure and hardware. It is these artefacts with a specific material and tactile density that makes images materially viable.[576]

The change between forms of representation becomes a complex cultural process. The photograph moves beyond a basic translation of reality detached from its mechanical physical representation on paper or from the material to pixel. Meaning is then "derived from relationships that are external to the photographic object." [577]

Edwards and Hart indicate the aspect of projection being at the heart of image production where the photographic image decoupled from the recording medium is considered in forms of playback, static, dynamic and projected.[578]

Each type of media has its own display qualities offering its own unique symbol systems to which we respond in particular ways:

Radio – auditory representations.

Television – auditory, iconic, and visual representations.

Computer games – auditory, iconic, visual, dynamic, social and spatial representations.

Printed Media – visual, iconic.

Digital Media – visual, iconic, auditory, dynamic and social.

These qualities encourage "medium-specific representational skills" that we internalise and use when interacting with content. [579] These "medium-specific" qualities can be considered as offering different affordances. Liu describes the advantages and limitations of printed media and

575 Ibid., 56.

576 Sergio Martínez Luna, "Still Images? Materiality and Mobility in Digital Visual Culture," *Third Text* 33, no. 1 (2019): 46, https://doi.org/10.1080/09528822.2018.1546484.

577 Sassoon, "Photographic Materiality in the Age of Reproduction," 198.

578 Hoelzl and Marie, "Softimage: Towards a New Theory," 14.

579 Subrahmanyam et al., "Learning from Paper, Learning from Screens," 2.

digital media, observing electronic media as more useful for searching and paper-based media preferred for the consumption of information.[580] Printed media is preferred for in-depth reading, whereas in an increasingly information-rich digital environment, readers (particularly younger readers) use a variety of reading strategies, such as browsing, "keyword spotting" and non-linear reading.[581] Liu posits computers and the internet are preferred by "expert readers" for quick and fragmented reading such as searching and skimming while print is preferred for intensive reading.[582]

There is potential for all reading to be fragmented. Printed content allows for continuous and discontinuous reading, imaginary and reflective immersion and fragmented and sustained reading.[583] Online reading practices can lead to fragmenting information where information is accessed in a random and disorganised fashion and therefore, processing occurs in a disconnected manner as their learning focus becomes unintentionally interrupted.[584]
Stein and Smith also identify the fragmentation of information in the digital environment. Content is presented in "small bits" consumed rapidly and frequently causing shifts in cognitive and behavioural patterns toward short attention spans.[585]

These reading practices are a part of broader online engagement practices that can be applied to online images which can also be accessed in a fragmented manner, such as swiping from one image to the next, following non-linear hyperlinked paths from screen to screen, having attention diverted from the viewing task by social media prompts and so forth.

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580 Liu, "Reading Behavior in the Digital Environment," 700.

581 Ibid., 709.

582 Liu and Gu, "Media Multitasking, Attention, and Comprehension," 69.

583 Elli Bleeker, "On Reading In The Digital Age: Establishing the Paradigms in a Hyperbolical Discussion," thesis (Amsterdam: Stichting Lezen, 2010), 19, https://issuu.com/stichtinglezen/docs/bleeker_scriptie.

584 Liu and Gu, "Media Multitasking, Attention, and Comprehension," 68.

585 Suzanne Stein and Scott Smith, "Trends," in *Media Futures*, ed. Gregory van Alstyne (Toronto: Strategic Innovation Lab, 2011), 32, https://www.academia.edu/4470602/2020_Media_Futures.

Printed texts can also be scanned and browsed. Hillesund distinguishes between expert and novice readers when describing the following reading behaviours of expert readers in print: sustained discontinuous reading such as flicking through the pages and scanning for keywords or "immersive reflective reading where readers become involved in the content". For this immersive state to occur in online reading, Hillesund suggests the technology should not be so conspicuous, that the user should not be exposed to distraction. [586]

Effects of Multi-tasking and Medium on Synthesis of Information

The user can become susceptible to distraction when multi-tasking. This affects efficiency rather than comprehension, as found in two studies conducted by Subrahmanyam et al. The first, in which participants read an easy and difficult passage on paper and then the same task was performed on a laptop or tablet while either multitasking or not multitasking. Neither multitasking nor medium was found to affect comprehension. However, there was a loss in efficiency due to multitasking where those who multitasked took longer to read both passages.[587] In the second study, participants were asked to synthesise source material in multiple texts to write a one-page evidence-based report. Participants read the source texts in the following three situations: paper, computer screen without Internet or printer access, and computer screen with Internet and printer access. The study found no differences in report quality or efficiency between participants who accessed materials on paper compared to those who accessed them on the computer.[588] "The medium used did not make a difference either in reading comprehension or in the synthesis of information for a persuasive report that required critical thinking."[589]

586 Terje Hillesund, "Digital Reading Spaces: How Expert Readers Handle Books, the Web and Electronic Paper," *First Monday* 15, no. 4 (April 5, 2010), https://firstmonday.org/article/view/2762/2504

587 Subrahmanyam et al., "Learning from Paper, Learning from Screens," 1.

588 Ibid., 1.

589 Ibid., 22.

Viewing Preferences – Print versus Screen

Related antecedent research was conducted prior to this study. In 2009 and 2010, an experimental study was commissioned by the Print Industry Centre at Rochester Institute of Technology on the effects and preferences of presentation medium on picture consumption by college-aged adults. The research is presented as three related projects aiming to identify and understand the differences in how information is consumed from print on paper versus computer display. Some questions asked were: "Are information consumption and retention different based on the viewing medium? Does the medium preference change depending on whether people look at a magazine or at photographs they took?" [590] The following is an overview of the outcomes of the three projects.

Project One: Experiments were conducted to detect differences in picture consumption of the observers' images in print and digital mediums. The results showed a majority of participants preferred printed images to those viewed on a screen.[591]

The main reasons given for the preferences for prints were:

a) Prints were preferred due to their quality and their bright, shiny saturated colours.[592]

b) Opportunity to flip through them, to be able to zoom in and out and to move them around made prints preferable.[593]

It must be noted that when Frey et al.'s research was conducted (2009–2010), the quality of projection and resolution of computer monitors and tactile interaction built into computers had not yet developed to the standards currently available.

590 Franziska Frey, Mariela Rodriguez-Adames, Ya-fang Tsai, Frank Cost and Susan Farnand, *Print versus Screen – Presentation Medium-dependent Picture Consumption*, (2010), 3, https://scholarworks.rit.edu/books/88.

591 Frey et al., *Print versus Screen*, 4.

592 Ibid., 17–18.

593 Ibid., 18.

Part Two: The objective of this part of the project was to identify and understand differences in how information is consumed from print on paper versus computer display, which characteristics of these media are relevant in this comparison and, if given a choice, will people select to read printed images in a photo book or electronic images on a screen?[594]

To examine how people interact with photos in print versus on-screen and their preference of modality when given a choice,[595] the following metrics were used: information retention, time taken to view images, preferences for visually consuming information, and distribution of visual gaze as measured by eye trackers. [596] Other aspects of the experience were measured to determine the relative contribution of factors such as gloss, colour and print layout to the efficacy of viewing information as print on paper versus on-screen: "Information retention, time used to view images, and preference for visually consuming information were also evaluated." [597]

Results confirmed people preferred the hard copy rendition of the photobook over the screen PDF version when given the choice for image accessibility and tangibility. Neither the time used to view the photo books nor information retention were affected by the medium in which the photobook was seen.[598]

The level of interaction was measured in two ways:

Behavioural – Will people choose one medium over the other?

Cognition – How much time will they spend with the content? How much do they remember?

A test to determine recall and recognition was administered after each participant was shown the photo book. The results were as follows:

There were no fundamental differences in the way people interact with photographic content presented in print versus on-screen. Cognition: The amount of time spent reading the content

594 Ibid., 35.
595 Ibid., 38.
596 Ibid., 34.
597 Ibid., 35.
598 Frey et al., *Print versus Screen*, 34.

and how much people remembered were not related to the medium modality. Behavioural: Overall, participants preferred the printed book to the PDF. However, of those shown the PDF, more selected it.[599]

While these findings suggest there were no important differences between the print and screen groups of observers, the results of Part Three hint at differences that may be important concerning individual images or image layouts. Frey et al. suggest "further work involving image content with a more balanced mix of text and pictorial imagery might prove useful in exploring these findings further."[600]

Part Three: Previous research comparing print and screen reading for work-related purposes found that print offered advantages regarding annotation[601], navigation[602] and spatial layout[603], and that spatial location[604] is important for readers, leading to increased comprehension. In this part of the Print versus Screen Study, observer eye movements were tracked as they viewed images in print and on computer screens. This experiment consisted of having an equal number of participants view printed and electronic versions of a photo book. The book used in this experimentation was the same book that was used in the experimentation by Tsai and Cost in Part Two of the Frey, Farnand and Cost study – a magazine-style publication that was heavy on image content.[605]

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599 Ibid., 44.

600 Ibid., 35.

601 Kenton O'Hara and Abigail Sellen,"A Comparison of Reading Paper and On-line Documents," in *CHI '97: Proceedings of the ACM SIGCHI Conference on Human Factors in Computing Systems* (New York: Association for Computing Machinery, March 1997), 336, https://doi-org.ezproxy.uws.edu.au/10.1145/258549.258787

602 Annette Adler, Anuj Gujar, Beverly L. Harrison, Kenton O'Hara and Abigail Sellen, "A Diary Study of Work-related Reading: Design Implications for Digital Reading Devices," in *CHI '98: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (New York: ACM Press/Addison-Wesley Publishing, January 1998): 242, https://doi-org.ezproxy.uws.edu.au/10.1145/274644.274679

603 Lucia Terrenghi, David Kirk, Abigail Sellen, and Shahram Izadi, "Affordances for Manipulation of Physical versus Digital Media on Interactive Surfaces," in *CHI '07: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (New York: Association for Computing Machinery, April 2007), 1164, https://doi-org.ezproxy.uws.edu.au/10.1145/1240624.1240799

604 O'Hara and Sellen,"A Comparison of Reading Paper and On-line Documents," 221.

605 Franziska Frey, Mariela Rodriguez-Adames, Ya-fang Tsai, Frank Cost and Susan Farnand. "Print versus Screen—Presentation Medium-Dependent Picture Consumption." (2012):48, http://scholarworks.rit.edu/books/88

Time spent with the images, information retention, image modality preference, and gaze distribution were evaluated. The research found important differences between how the observers viewed the printed and screen versions of the photo book. The screen group exhibited more fixations per image for many of the images early in the book (though not spending more time with the image but moving their eyes around more for each image). The print group spent more time looking at each region that caught their attention before moving on to the next image.[606]

Information on metrics such as image mode preference, time taken to view, and image content recall was also collected. It was found that observers strongly preferred the print over the PDF version of the photo book to view the images.[607] The most mentioned attributes for those that selected the print version were accessibility and tangibility. They felt it would be easier to show family and friends, that a computer would not be needed to view it, and that it was easier to flip through. They also cited tangibility, stating that they liked to have something to hold.[608]

Frey et al.'s study did not find any fundamental differences in the way people interact with photographic content comparing screen and print mediums. The medium modality did not affect how much people remembered or the amount of time spent reading the content. Overall, participants preferred the printed book to the digital PDF: "However, of those shown the PDF, more selected it."[609]

The study had its limitations with participants viewing digital images on 12-inch computers in digital book form (PDF format). The printed images were viewed in a 7-inch by 9-inch landscape-format saddle-stitched printed publication. Therefore important factors affecting image apprehension, such as external distractions, multitasking tendencies when interacting with

606 Ibid., 51.
607 Frey et al., *Print versus Screen*, 48.
608 Ibid., 49.
609 Ibid., 44.

digital devices, differences in device size and media contexts such as social media versus blogs, were not investigated.

Suppose we are to broaden the discourse surrounding photographic image usage; In that case, the conditions within which we consume images should be considered in discussions as well as phenomenological aspects of the many possible ways we can experience images.

The Cultural Importance of the Book

A study by Gregory investigating undergraduate student usage and attitudes toward eBooks included discussions related to the tactility of certain mediums. Results showed students preferred the physical book over its digital format, using language such as "hold," "tangible," and "like to have a book in hand/hold and take home" as reasons for their preference. Students also stated they understood what they were reading better from the printed page and were less likely to be distracted by other aspects of computing, such as e-mail or instant messaging.[610]

The physicality of the book is an important symbol of our culture and Levy describes it as symbolising the weight of history, cultural authority and modes of knowing,[611] where the reader is:

> Sensing the importance of the surrounding environment supporting the book and the reader's body the light, the air, the furniture features coming together to produce a unique reading experience. Where the reader achieves a state of transcendence …. reading for information transcending the physical properties of the document and reading for experience aiming to enter the reading itself. [612]

Levy discusses reading a book as having a "sacred quality," an "aliveness and attentiveness that encourages a quality of attention and care that is brought to bear by it rather than the nature of the object of study." He draws parallels to the religious roots of the book – the codex embraced

610 Gregory, "But I Want a Real Book," 270.

611 David M. Levy, *Scrolling Forward: Making Sense of Documents in the Digital Age* (New York: Arcade Publishing, 2000), 117.

612 Ibid., 115.

by Christian communities.[613] Reading requires a directed gaze attending to specific properties of the artifact at hand. Levy describes this attention as "the taking possession by the mind of one out of several trains of thought. Focalisation implies withdrawal from some things to give attention to others.[614]

Levy describes the differences between printed and digital communication. One is the divided nature of the digital, initially inaccessible and uncommunicative until the bits and bytes are summoned by the human, enabling the image to be realised and displayed on-screen or printed out on paper. The paper document is a tangible and physical object with "the communicative marks inscribed directly on the writing surface." It always resides in a location, a shelf, a desk or a briefcase. Its digital counterpart exists in two forms: the digital representation of bits stored on a hard drive, server or the cloud (in the case of images stored as jpeg, tiff, png files) and the tangible, visible form produced from it.[615] A further comparative description is offered, one that binds the digital irrevocably to its technology yet releasing the book from its method of creation. Paper is heavy, stable, bound, physical and independent from the technology that was used in its manufacture, "taking leave from the printer and the bindery."[616] Bits are light, its perceptible form always created "just-in-time, on the spot" and susceptible to modification. The digital document is tied to a "set of technological conditions, hardware and software in order to maintain a visible and useful presence.".[617]

Summary

Levy presents some crucial differences between paper-based and digital documents in which the photographic image is present as part of the communication process. Each of these forms of

613 Levy, *Scrolling Forward*, 105.
614 Ibid., 103.
615 Ibid., 138.
616 Ibid., 152.
617 Ibid., 152.

information dissemination has their particular technical processes allowing for the realisation of content and, in the context of this study, the photographic image. The differences between the two forms of representation are described along with the associated human responses, such as reading with greater intensity and duration in print[618] and the ubiquity of digital content contributing to the "fragmentation of our lives and disconnecting us from tasks."[619]

Other scholars focus on aspects such as shallow processing of information in digital learning environments,[620] information retention and comprehension comparing print and digital[621] and reading differences between online and print formats.[622] There is very little research comparing the photographic image in printed and digital contexts. This study is to place the photographic image in the context of print and digital communication mediums to determine what the presentation differences mean for our apprehension of images.

PART THREE: BODY, MIND AND IMAGE

4.7 Neuroscience and the Phenomenology of Body, Mind and Image

In the previous section, we discussed the image relative to the cognitive processes of recall and retrieval of memory and the role these cognitive functions play in the apprehension and remembering of viewed images.

This section extends the discussion by examining literature relating to other cognitive processes predominantly considered part of the realm of scientific research. These include

618 Ibid., 104.

619 Ibid., 102.

620 Gal Ben-Yehudah and Yoram Eshet-Alkalai, "Print versus Digital Reading Comprehension Tests: Does the Congruency of Study and Test Medium Matter?" *British Journal of Educational Technology* 52, no. 1 (January 2021): 436, https://doi-org.ezproxy.uws.edu.au/10.1111/bjet.13014.

621 Geoffrey Haddock, Colin Foad, Victoria Saul, Will Brown and Rose Thompson, "The Medium Can Influence the Message: Print-based versus Digital Reading Influences. How People Process Different Types of Written Information," *The British Journal of Psychology* 111, no. 3 (2020): 443–59, https://doi-org.ezproxy.uws.edu.au/10.1111/bjop.12415.

622 Debra Moss Curtis and Judith R Karp, "In a Case, on the Screen, Do They Remember What They've Seen? Critical Electronic Reading in the Law Classroom," *Hamline Law Review* 30, no. 2 (2007): 252.

neurological processing of external stimuli, in this case, the image, and how perceptions of experiences play a key role in interpreting new experiences.

How are our bodies and minds adapting to digital environments and what does the increasing coalescence of human and digital form mean for our apprehension of images? What are the connections between first-person subjective experience, the nervous system and the brain when it comes to visualisation?

To better address these questions, an investigation of the literature is presented through pertinent theories of the brain's impact on behavioural aspects of the nervous system concerning the physical, mental and emotional aspects of human experience when viewing images in a digital environment. These theories are chosen for their relevance to the research questions and their potential to provide a neuropsychological perspective into how people apprehend images in such environments with respect to technological impact. These are the environments where a change in cognitive functioning is most significant. This literature review serves to augment earlier semiotic-based theories and indicate connections between the biological and the phenomenological processes occurring when we interact with images.

Humans and Computers: A Physical Relationship

An initial observation indicates the physical relationship between humans and computers. Computer interfaces require certain types of physical interactions and gestures such as swiping, tapping, pinching, clicking the mouse and moving a cursor, as examples. Hayles suggests existing neural pathways may be strengthened by frequency of use and new ones created so that the very form and function of the brain changes all the time.[623] We are learning to do, see and read things differently and with more expert, nuanced interpretation due to the changes in our

623 Hayles, *How We Think*, 2.

neural pathways. This influences our interpretation of the world through a combination of the following factors:

- Bodily movements required to access screen-based information
- Associated brain motor functioning processes
- Physiological function of visual processing
- The resulting causal relationships between external stimuli [images] and the way these are processed by the brain.

The nature of vision, how the brain processes visual stimuli and what kinds of interactions lead to what types of perception is the subject of extensive clinical research.[624] Investigating the relationship between technology, cognitive and somatosensory processing of visual information, and the subsequent phenomenological experience, are salient aspects of this study. They have been derived from the literature and supported by some of the findings (see Chapter 6). These characteristics of human visual perception via technology can be applied to understanding how we apprehend photographic images.

The following neuroscientific theories are presented as appropriately supporting the investigation of the research questions. They also provide the possibility of expanding the discourse surrounding photographic image practices to include relevant aspects of the ways our physiology and nervous system respond to images and their environments.

Visual Psychophysics

How do external physical stimuli affect our interactions with, and comprehension of, images? Visual Psychophysics or the study of visual perception in Vision Science, examines the relationship between the physical stimulus in the outside world and the connection to human

624 Zhong-Lin Lu and Barbara Dosher, *Visual Psychophysics: From Laboratory to Theory* (Cambridge, MA: MIT Press, 2013), 5–6, ProQuest Ebook Central.

action.[625] It is a scientific field of study that can help our understanding of how external stimuli affect the way we view and use images. It is important to consider how these external influences affect our visual capabilities. What type of cognitive responses are generated and how and to what intensity? What drives us to engage with or ignore images? These responses result from the relationship between preceding perceptual processes involving corporeality and the subconscious and the later ones of semantic decoding and phenomenological experience (see Figure 6.6. ACIVA Model of Visual Apprehension, Chapter 6: Interpretation).

Vision is enabled through optical, physiological, chemical, and neural processes. The standard scientific practice has been to consider the meanings and qualities of visual phenomena as extraneous to these material qualities. [626] However, there is an increasing body of work, both from scientific (Khachouf et al.,[627] Zeki,[628] Luck et al.[629]) and philosophical (Hansen,[630] Malibou,[631,] Massumi,[632] Hayles[633]) fields seeking to validate and articulate connections between the objective and subjective in visual phenomena. Albertazzi along with Bagdasaryan and Le Van Quyen[634] argue the phenomenological results of our physiological awareness of the world. There are links between phenomenological interpretation and brain functions that consider the

625 Ibid., 3.

626 Liliana Albertazzi, *Handbook of Experimental Phenomenology: Visual Perception of Shape, Space and Appearance* (New York: John Wiley & Sons, 2013), 41.

627 Khachouf, Poletti, and Pagnoni, "The Embodied Transcendental," 7.

628 Semir Zeki, "A Theory of Micro-consciousness," in *The Blackwell Companion to Consciousness*, eds. Max Velmans and Susan Schneider (Malden, MA: Blackwell Publishing, 2007), https://doi-org.ezproxy.cqu.edu.au/10.1002/9780470751466.ch46.

629 Steven J. Luck and Edward K. Vogel, "Visual Working Memory Capacity: From Psychophysics and Neurobiology to Individual Differences," *Trends in Cognitive Sciences* 17, no. 8 (2013), https://doi.org/10.1016/j.tics.2013.06.006.

630 Hansen, "From Fixed to Fluid," 84.

631 Catherine Malabou, *What Should We Do with Our Brain?* (New York: Fordham University Press, 2008).

632 Brian Massumi, *Parables for the Virtual: Movement, Affect, Sensation* (Durham, North Carolina: Duke University Press, 2002), ProQuest Ebook Central.

633 Hayles, *How We Think*, 1.

634 Juliana Bagdasaryan and Michel Le Van Quyen, "Experiencing Your Brain: Neurofeedback as a New Bridge Between Neuroscience and Phenomenology," *Frontiers in Human Neuroscience* 7 (2013):1, https://doi.org/10.3389/fnhum.2013.00680.

importance of people's kinesthetic experiences toward images. Both scholars acknowledge the difficulties in understanding how one affects the other, with Albertazzi stating:

> Meaning, qualities, and values of our surroundings are necessarily products of our eyes, brains, memories, and imaginations. If visual phenomena begin this way, then phenomenology seems only an entertaining diversion from the sciences of neurophysiology and cognitive science. If visual phenomena are products of the physical, chemical, physiological, and neural mechanisms of the eye and brain, then understanding how organisation, meaning, quality, and value arise from these material mechanisms really is a really hard problem.[635]

The following two examples illustrate this "hard problem." The first is the effect of reflection and absorption of the light by the eye and the estimated portion of light that reaches the retina. How does this influence the way images are comprehended? From the time the eye sees an image to the time it appears into consciousness, it has been coded in temporal sequence at several levels in the visual system.[636] How does this process impact the way meaning is understood? Judging how we perceive and interact with objects in the visual world involves understanding all the components and processes that make up these interactions.

In a second example, Hansen describes the process of seeing as the conception of the mental image (the one formed in the brain), beginning with the image we see, which is then transmitted to and processed by the brain. He argues the result is "a completely different kind of image - our perceptual image of the world outside."[637] Hansen is referring to the process whereby in the sequence of seeing, at some point the mental image is converted to the phenomenological image. However, what happens during the conversion process and how does this very process affect our phenomenological apprehension of the image? This suggests an important connection between the neurological and the phenomenological that could be further examined through combined scientific and social sciences studies offering the possibility for valuable insights into the

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635 Albertazzi, *Handbook of Experimental Phenomenology*, 43.

636 R. Lachman, J. L. Lachman and E. C. Butterfield, *Cognitive Psychology and Information Processing: An Introduction* (Hillsdale, NJ: Erlbaum, 1979), 127, https://doi-org.ezproxy.uws.edu.au/10.4324/9781315798844.

637 Hansen, "From Fixed to Fluid," 84.

relationship between the brain, viewer, the image and the techno- visual representational ecosystem.

Zeki posits "processing sites in the visual brain are also perceptual sites."[638] This assumes that thought, perception and understanding are shaped by embodied action, which can influence our semantic judgments toward images. Cognition is not a purely internal, computational, and disembodied act. Dovey and Kennedy argue the notion of a disembodied viewer is imagined and "created by particular ways of conceptualising the relationship between texts and readers."[639]

Visual Masking and the Temporal Aspects of Perception

The neurological examination of visual processing reveals the temporal and spatial aspects of visual processing. These aspects are part of the phenomenon of visual masking which can be used as investigative tools to explore the effect of these aspects on viewing and perception. Visual masking is generally concerned with how stimuli are registered in the mind and includes the examination of "feature, object and scene representations, attentional control mechanisms, and phenomenal awareness."[640] Visual masking occurs when the visibility of an image being viewed (the target) is reduced by the presence of another image or stimuli, referred to as a "mask". The target may not be visible or may appear lighter or have reduced contrast. Visual masking can help in understanding the relationship of human perception, cognition, and the dynamics of unconscious and conscious processing. Ansorge et al. note that visual information can be processed without awareness. [641]

638 Zeki, "A Theory of Micro-consciousness," 581.

639 Jon Dovey and Helen W. Kennedy, *Game Cultures: Computer Games as New Media.* Issues in Cultural and Media Studies (Maidenhead, Berkshire: Open University Press, 2006), 106.

640 Bruno G. Breitmeyer, "Visual masking: Past Accomplishments, Present Status, Future Developments," *Advances in Cognitive Psychology* 3, no. 1–2 (July 2008): 9, https://doi.org/10.2478/v10053-008-0010-7.

641 Ulrich Ansorge, Gregory Francis, Michael H. Herzog and Haluk Öğmen, "Visual Masking and the Dynamics of Human Perception, Cognition, and Consciousness: A Century of Progress, A Contemporary Cynthesis, and Future Directions," *Advances in Cognitive Psychology* 3, no. 1, (2007): 2, https://doi.org/10.2478/v10053-008-0009-0.

This is significant because it seems that perception can occur autonomously on a subconscious level before higher-order processing due in part to external visual noise interrupting and influencing the visual process. We are receiving information that we are not actively aware of in the moment. Our judgement toward a target image may be influenced by what we see before, during and after the act of viewing without our awareness. Visual masking may account for our experience and awareness when considering external stimuli such as incoming texts and calls (see Table 4.2 below). There are occasions where an image may have qualities pertinent to the viewer allowing it to become visible despite masking effects. Unconscious processes ("automatic senses") operating in the brain may favour one image amongst many. This may be due to salient characteristics within that image and validates visual inputs by motor consequences before the conscious representation of these inputs.

Table 4.2. Temporal Dimensions of Visual Masking		
Temporal Dimension	Definition	Effect
Forward Masking (The mask precedes the target).	An Image or stimuli viewed before the previous one (target).	Can disrupt conscious perception.[642] An image (backward mask) presented or viewed after the initial target object disrupts the processing of the initial target image[643] and diminishes the visibility of the image's characteristics such as brightness, shape or colour, sometimes preventing their visibility.[644] This has the potential to influence the semantic processing of an image.[645]
Backward Masking (The mask follows the target).	An Image or stimuli viewed after the previous one (target).	During backward masking, the viewer might not see an image, but this image could still "impact and influence their subjective feelings and physiology" toward the following image.[646] This means that, phenomenologically, despite not registering in one's consciousness, the image can still

642 Breitmeyer, "Visual masking: Past Accomplishments," 15.

643 Bruno G. Breitmeyer and Haluk Öğmen, "Visual Masking," *Scholarpedia* 2, no. 7 (2007), doi:10.4249/scholarpedia.3330.

644 Werner Klotz and Neumann Odmar, "Motor Activation without Conscious Discrimination in Metacontrast Masking," *Journal of Experimental Psychology: Human Perception and Performance* 25, no. 4 (1999): 976, https://doi.org/10.1037/0096-1523.25.4.976.

645 Ansorge et al., "Visual Masking and the Dynamics of Human Perception," 2.

646 Michelle Yarwood, "Backward Masking," in *Psychology 425* (Penn State University: Affordable Course Transformation, n.d.), https://psu.pb.unizin.org/psych425/chapter/backward-masking/

Table 4.2. Temporal Dimensions of Visual Masking		
		transfer some of its features subconsciously to the mask.[647]
Simultaneous Masking (The mask and target are shown together).[648]	Two or more images or stimuli are viewed at the same time. Further stimuli could include pop-up windows or interface navigational cues appearing over or at the same time as the image being viewed.	During simultaneous masking, the visibility of the image may be reduced depending on other stimuli that are presented simultaneously.[649] The degree of visibility can also be influenced by variations in spatial grouping[650] and size[651] of surrounding elements.

Awareness and interpretation occur through motor responses which in turn shifts the viewer's attention from the act of "flicking" toward a particular image. This may lead the way to semantic interpretation or a return to the search ("flicking") process. There are different temporal dimensions associated with visual masking: forward, backward and simultaneous masks. These dimensions suggest a temporal impact and the effect on perception when viewing images with the "target" referring to the image being viewed.

Masking theory is also described as having two spatial dimensions: pattern masking and metacontrast (see Table 4.3). The temporal dimensions and spatial dimensions can control the degree of conscious registration of a stimulus [image].

647 Breitmeyer, "Visual masking: Past Accomplishments," 10.

648 Frouke Hermens, Michael H. Herzog and Gregory Francis, "Combining Simultaneous With Temporal Masking," *Journal of Experimental Psychology: Human Perception and Performance* 35, no. 4 (August, 2009): 977, https://doi.org/10.1037/a0014252.

649 Ibid., 977.

650 Frouke Hermens, Frank Scharnowski and Michael H. Herzog, "Spatial Grouping Determines Temporal Integration," *Journal of Experimental Psychology: Human Perception and Performance* 35, no. 3 (June 2009): 607, https://doi.org/10.1037/a0013706.

651 Mauro Manassi, Bilge Sayim and Michael H. Herzog, "Grouping, Pooling, and When Bigger is Better in Visual Crowding," *Journal of Vision* 12, no. 13 (September 2012): 9, https://doi.org/10.1167/12.10.13.

Table 4.3. Spatial Dimensions of Visual Masking		
Spatial Dimensions	Definition	Effect
Pattern Masking (when the target and mask locations overlap).	Can occur when using a masking stimulus that consists of visual noise or by structure when using a masking stimulus that consists of a tonal range similar to the target.[652] Pattern masking is determined by both luminance contrast and structural uncertainty.[653]	In the context of image viewing, this presents the visual system with two kinds of spatial-temporal conflict between the original image being viewed and the arrival of the stimuli or next image "mask". This diminishes the cognitive ability to process the first image.[654]
Metacontrast (occurs when a "temporally proximal but spatially non-overlapping stimulus" (mask) diminishes detection of a preceding target stimulus.[655]	Metacontrast masking refers to the suppressing effects on visibility of "a briefly flashed target stimulus by a similarly brief and spatially adjacent mask stimulus that follows the target.[656]	Attributes within the target (the image being viewed), such as luminance, spatial frequency and visual extent, are important factors for increasing the visibility of the target. These factors can prevent the mask from diverting attention away from the target and increasing attention toward the target.[657]

Visual masking indicates characteristics of images are experienced as visual sensation relative to the presence of other stimuli appearing at intervals of time. These stimuli can be of "different sensory types and origin moving through time and space,"[658] perceived at a conscious and unconscious level and indicate the interconnectedness of the visual sense with other senses when viewing images. This is a micro-temporal, cognitive experience – a brief period of information processing, lasting for "several tens to a few hundreds of milliseconds" following the viewing of a visual stimulus before a motor response or a cognitive operation is generated and the object

652 Andrew M. Colman, "Pattern Masking," in *A Dictionary of Psychology*, 4th ed. (Oxford: Oxford University Press, 2015), https://doi.org/10.1093/acref/9780199657681.001.0001.

653 Jinjian Wu, Weisi Lin, Guangming Shi, Xiaotia Wang, and Fu Li, "Pattern Masking Estimation in Image With Structural Uncertainty," *IEEE Transactions on Image Processing* 22, no. 12 (2013): 4892.

654 Vincent Di Lollo, James T. Enns and Ronald A. Rensink, "Competition for Consciousness Among Visual Events," *Journal of Experimental Psychology* 29, no. 4 (2000): 483.

655 Bruno G. Breitmeyer, *Visual Masking. An Integrative Approach* (New York: Oxford University Press, 1984), 219.

656 Bruno G. Breitmeyer, Evelina Tapia, Hulusi Kafalıgönül and Haluk Öğmen, "Metacontrast Masking and Stimulus Contrast Polarity," *Vision Research* 48, no. 23–24 (2008): 2433. https://doi.org/10.1016/j.visres.2008.08.003

657 John Shelley-Tremblay and Arien Mack, "Metacontrast Masking and Attention," *Psychological Science* 10, no. 6 (1999): 514. https://doi.org/10.1111/1467-9280.00197.

658 Hansen, "From Fixed to Fluid," 84.

being viewed is consciously perceived.[659] As indicated in Table 4.1, this period can occur before, after, or simultaneously at the onset of a visual stimulus [image] and precedes the person's motor response to the image being viewed. This means conscious registration of an image requires its prior processing. This occurs when material images are transformed into sensory representations and before they become macro-temporal images to be processed at later and higher conscious levels.[660]

A multifaceted process is occurring during visual masking that indicates the coaction of the brain's visual processing and the phenomenological possibilities for understanding human and technical modes of vision.[661] Stiegler provides a holistic assessment of these processes, including a social aspect to this convergence of neurological and phenomenological experience suggesting "communication can be conceived as the articulation between the nervous, technical and social systems which constitute the total human act"[662] (see Chapter 4.1).

Various types of visual processing occur prior to the act of perception that can influence human sensibilities, something beyond the ability for direct human intervention. This highlights a need to develop a more extensive ecological theory of visual perception, an expanded philosophical discussion with image apprehension at its centre.[663]

Shallow and Deep Attention

As with the physical aspects of interacting with technology, the proliferation of many different pathways of incoming information is also encouraging us to engage with images in new

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659 Bruno G. Breitmeyer, *The Visual (Un)conscious and Its (Dis)contents: A Microtemporal Approach*, (Oxford: Oxford University Press, 2014), 37.

660 Breitmeyer, *The Visual (Un)conscious and Its (Dis)contents*, 40.

661 Hansen, "From Fixed to Fluid," 94.

662 Bernard Stiegler, "The Disaffected Individual in the Process of Psychic and Collective Disindividuation," working paper for *Ars Industrialis* Seminar "Suffering and Consumption" (25 February 2006), trans. Patrick Crogan and Daniel Ross (August 2006), https://arsindustrialis.org/disaffected-individual-process-psychic-and-collective-disindividuation.

663 Mark B. N. Hansen, "The Operational Present of Sensibility," *The Nordic Journal of Aesthetics* 24, no. 47 (2015): 52, https://doi.org/10.7146/nja.v24i47.23054.

ways, switching attention from one information source to another, or "multi-tasking."[664] This leads us to ask, what is the relationship between multitasking and cognition and how does this affect our apprehension of images? "How rich or thin is the content of a perceptual experience and what particular relevance is it for representationalism?"[665]

Some studies indicate that the flood of pervasive information streams and multitasking leads to shallow reading rather than a deep and sustained focus on content. A study conducted by Ophir, Nass and Wagner between heavy and light media multitaskers showed heavy media multitasking resulted in more difficulty filtering out irrelevant environmental stimuli suggesting distraction is caused when engaging with multiple streams of media.[666]

A study by Peng et al. measured the brain's electrical activity over time before and after internet and non-internet related activities and associated levels of multitasking. Poorer overall cognitive performance was noted when multi-tasking was associated with using the internet to find goods to buy. However better performance was demonstrated when reading magazines to find goods to buy due to the absence of online distractions. [667] The ubiquitous presence of visual and textual information highlights the cognitive effort required when accessing information from multiple sources. This can adversely affect attention and the ability to concentrate and absorb information. There are situations, however, such as viewing images in digital environments where the brain's capacity to focus attention on certain stimuli is quite strong.

The possible effects of visual masking on attention arising from ubiquitous information

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664 Joseph Firth, John Torous, Brendon Stubbs, Josh A. Firth, Genevieve Z. Steiner, Lee Smith, Mario Alvarez-Jimenez, John Gleeson, Davy Vancampfort, Christopher J. Armitage and Jerome Sarris. "The 'Online Brain': How The Internet May be Changing our Cognition," *World Psychiatry* 18, no. 2 (June, 2019): 120, https://doi.org/10.1002/wps.20617.

665 Kristine Mette, "Perception of High-Level Content and the Argument From Associative Agnosia," *Review of Philosophy and Psychology* 9, no. 2 (2018): 302, https://doi:org.ezproxy.uws.edu.au/10.1007/s13164-017-0364-1.

666 Eyal Ophir, Clifford Nass, and Anthony D. Wagner, "Cognitive Control in Media Multitaskers," *PNAS* 106, no. 37 (2009): 15584, https://www.jstor.org/stable/40484765.

667 Ming Peng, Xianke Chen, Qingbai Zhao and Zongkui Zhou, "Attentional Scope Is Reduced by Internet Use: A Behavior and ERP Study," *PloS One* 13, no. 6 (2018): 3, https://doi.org/10.1371/journal.pone.0198543.

streams and the attentional strength of a salient image overriding masking effects through the cognitive process of autobiographical memory were of interest in this study (see Section 4.5). External stimuli, informational elements and cognitive processes combine, either obstructing information processing – "not absorbing all the information" – or bringing the unconscious into consciousness – "I remember that one."

Information is Realised Differently Online Compared to Print

We are accessing and experiencing information differently online than print-based media.[668] Neuroimaging investigations reveal associations between online-related cognitive impacts and structural changes in the brain, including effects of multitasking, "rapid attention shifting, distractibility, reduced deliberations and impaired executive control abilities." [669] These changes in cognitive behaviour to our digital environment impact on the ways we interact with and understand images. Small and Vorgan posit that these interactions can result in significant changes in brain functioning where the brain can create new neural pathways allowing us to develop alternative ways to "learn and think."[670]

Concerning technology, multi-tasking is evident in a person's inclination to access different information streams for brief periods by alternating between different computer windows, clicking on hyperlinks and performing searches. Yeykelis, Cummings and Reeves found 75% of on-screen content was being viewed for less than one minute. This was considered driven by the desire for informational rewards. Anticipatory arousal increase was detected leading up to the switching of information streams and peaking at the moment of the switch.[671] This indicates a

668 Hayles, "Print Is Flat, Code Is Deep,"30.

669 Kep Kee Loh and Ryota Kanai, "How Has the Internet Reshaped Human Cognition?" *The Neuroscientist* 22, no. 5 (October, 2016): 506, https://doi-org.ezproxy.uws.edu.au/10.1177/1073858415595005.

670 Gary W. Small and Gigi Vorgan, *IBrain: Surviving The Technological Alteration of The Modern Mind* (New York: HarperCollins, 2008), 64.

671 Leo Yeykelis, James J. Cummings and Byron Reeves, "Multitasking on a Single Device: Arousal and the Frequency, Anticipation, and Prediction of Switching Between Media Content on a Computer," *Journal of Communication* 64, no.1 (February, 2014): 185–186, https://doi-org.ezproxy.uws.edu.au/10.1111/jcom.12070.

sensory to neurological correlation when seeking out and processing information. Wise and Reeves' study showed a viewer's ability to control the onset of an image (conducted using emotional pictures) affects the amount of engagement with content and the allocation of cognitive resources required for encoding. In other words, when the viewer reacted to the computer-controlled onset of an image, they showed less physiological arousal (considered an artifact of the physical act of mouse clicking) but rated the pictures as more "arousing and positive." The opposite was the case when the viewer controlled the onset of the image. This was considered a result of a diminished sense of "surprise."[672]

The cognitive and physical demands of controlling how we view images bring about responses separate from those elicited by the image alone. The study by Wise and Reeves demonstrated the significance of user control as a structural feature of interactive media,[673] how this influences cognitive processes toward the amount of attention we give to images, the way we encode images and the different levels of arousal experienced when we chose to view the image compared to it being "unexpectedly" presented to us.

A different reading process occurs when looking at information online compared to print. Liu's study showed people's browsing and scanning behaviours increased while sustained attention decreased when reading online and less time was spent on in-depth and concentrated reading.[674] Print was preferred as a medium for in-depth reading with strategies such as "browsing and keyword spotting" preferred for the "information-abundant" online environment.[675]

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672 Kevin Wise and Byron Reeves, "The Effect of User Control on The Cognitive and Emotional Processing of Pictures," *Media Psychology* 9, no. 3, (2007): 562–563, https://doi:org.ezproxy.uws.edu.au/10.1080/15213260701283186.

673 Ibid., 564.

674 Liu, "Reading Behavior in the Digital Environment," 700.

675 Ibid., 709.

The characteristics of the technology we use modify the way we interact with information and our capacity for sustaining attention, memory and knowledge. Distractions such as prompts and notifications are a feature of the internet and encourage divided attention across multiple information streams. This in turn decreases our capacity for sustaining concentration,[676] encourages shallow interaction with online content[677] and, when people perform tasks that load working memory, places heavy demands on mental capacity.[678] This has implications for image viewing.

Hayles elaborates on the idea of shallow reading, describing it as "hyper reading," a response to a visually cluttered environment designed to "conserve attention." This allows texts to be partially read by skimming, scanning and fragmenting to quickly identify the most important information.[679] Though these may be the primary methods used to process information online, Moran argues the way information is read online depends on the following four factors:

Motivation: The importance of the information to the person.

Type of task/intent: Is the goal to browse, look for a specific fact or research a topic?

Focus: The level of attention given to the task at hand.

Personal characteristics: Does the individual show a proclivity for scanning or do they take a detail-oriented approach to online reading. [680]

Overloaded Sensibilities

Our visual sensibilities are becoming overloaded with the pervasiveness of the images we see, make and distribute. This affects higher functions of the human nervous system, of

676 Firth et al., "The Online Brain," 120.

677 Ibid., 121.

678 Nilli Lavie, "Distracted and Confused?: Selective Attention Under Load," *Trends in Cognitive Sciences* 9, no. 2 (2005): 80, https://doi.org/10.1016/j.tics.2004.12.004.

679 Hayles, *How We Think*, 12.

680 Kate Moran, "How People Read Online: New and Old Findings," Nielsen Norman Group, 5 April 2020, https://www.nngroup.com/articles/how-people-read-online/.

conception (understanding), sensibility and imagination. Stiegler describes these effects as cognitive and affective forms of saturation typical of "hyper industrial" society.[681] In an overly apocalyptic tone, Stiegler suggests this affective saturation results from the technological mediation of our attention, affecting spontaneity of engagement with objects, moving us toward a state of detached consumption – a technologically enabled overload of consciousness and affect.[682] Baskinger argues the use of exaggerated visual prompts to attract users toward products as "aggressive in appearance and incoherent and chaotic to environments." These include graphic, interactive and video elements used in YouTube video thumbnails and banner and interstitial ads. The proliferation of these types of competing messages delivered through images, text and video are inundating the viewer's senses and affecting perceptual abilities. Using "over-stimulating" message forms creates a conditioned response of visual desensitising.[683] This phenomenon is more prevalent but not unique to the digital environment.

The Adaptivity of the Brain

The previous section highlighted technological effects on our neurological and sensory processes when accessing information online, including dispersed attention across multiple media sources,[684] increased cognitive load in a hypertext environment[685] and shallow interactions with online texts.[686] Despite these effects our brain can adapt to information-saturated technological environments. Neural adaptability and restructuring are "inherent biological traits; human beings are born with their nervous systems ready to be reconfigured in response to the

681 Stiegler, "The Disaffected Individual," Paper presented at the Ars Industrialis Seminar, Suffering and Consumption, February 2006, Translated by Patrick Crogan and Daniel Ross, (August 2006): 26. https://arsindustrialis.org/disaffected-individual-process-psychic-and-collective-disindividuation.

682 Ibid., 26.

683 Mark John Baskinger, "Visual Noise in Product Design: Problems and Solutions," in *Proceedings of IDSA National Education Conference*, ed. Jim Kaufman (Dulles, Virginia: Industrial Designers Society of America, 2001): 33–42.

684 Firth et al., "The Online Brain," 119.

685 Diana DeStefano and Jo-Anne LeFevre, "Cognitive Load in Hypertext Reading: A Review," *Computers in Human Behavior* 23, no. 3 (2007): 1636, https://doi.org/10.1016/j.chb.2005.08.012.

686 Firth et al., "The Online Brain," 121.

environment, referred to by Hayles as "plasticity." The brain's synaptic connections are coevolving with an environment in which media consumption is a dominant factor. Hayles claims the brains of children growing up in media-rich environments are "wired differently from those who are not exposed to such environments."[687] This indicates that we can adapt to conditions presented to us by technologically enabled media environments – seeing, thinking and doing things differently.

The visual cognition system is an example of the formation and growth of neuronal connections that over time is influenced by environmental factors. Information received from the environment activates the synapses and encourages their development, connecting fibres from the retina to neurons in the visual cortex – "making evident a certain plasticity in the execution of the genetic program."[688] An example of this plasticity in action is the changing cognitive behaviour toward a state of hyper attention ("switching focus rapidly among different tasks").[689] This is occurring predominantly in millennials but is also observed in adults. Hayles draws a correlation between the need for hyper attention, the preference for multiple streams of engagement and stimulation to changes in brain structure.[690] This emphasises the changes in cognitive styles of engagement with media. These new practices of engagement are altering the way and the extent to which we understand images.

The Brain Has a History

There is a relationship between the brain and our concept of the world, with Malibou suggesting "the brain has a history." [691] Malibou posits a structural bond between our brain and our "history" of influences and learned behaviour over time. The brain's synapses can grow and

687 Hayles, "Hyper and Deep Attention," 192.
688 Malabou, *What Should We Do with Our Brain?* 20.
689 Hayles, "Hyper and Deep Attention," 187.
690 Ibid., 186.
691 Malabou, *What Should We Do with Our Brain?* 1.

change according to environmental stimuli and "as a result of past" and anticipated experience when the sensory system stores input related to stimuli received in the immediate present. This input can be ordered and stored over time or for "one's entire history."[692] This process gradually takes over from the pre-established synaptic circuits transmitting nervous information, indicating a relationship between representation on a neuronal level and the mental level of conscious thought influenced by our "history."[693]

Neuroimaging studies support this idea, demonstrating that imagery is a conscious re-representation of a previous perceptual brain state where memories of visual objects can be re-activated both by signals from "lower-level visual cortex and by signals from higher-level cortices involved in cognitive control processes."[694] O'Craven and Kanwisher posit the act of viewing and perception share common processing mechanisms demonstrating that "specific brain regions activated during mental imagery depend on the content of the visual image." [695]

Malibou suggests the continuity between the neuronal and the mental is not only a scientific claim but highlights the interaction of the biological with the cultural from the natural base of the mind. This provides neuronal, historical and social dimensions to our perceptions and understanding of the world.[696] When the body and mind anticipate the translation of stimuli [the image] through the act of perception, a phenomenological relationship occurs between pre-reflective human experience in visual perception with other brain faculties. This offers new possibilities for understanding how we engage with images and the world around us, including

692 Silvan S. Tomkins, *Affect Imagery Consciousness, Vol. 1: The Positive Affects* (New York: Springer Publishing Co., 1962), 15, https://doi.org/10.1037/14351-000.

693 Malabou, *What Should We Do with Our Brain?* 24.

694 Giorgio Ganis, William L. Thompson and Stephen M. Kosslyn, "Brain Areas Underlying Visual Mental Imagery and Visual Perception: An FMRI Study," *Cognitive Brain Research* 20, no. 2 (2004): 237, https://doi.org/10.1016/j.cogbrainres.2004.02.012.

695 K. M. O'Craven and N. Kanwisher, "Mental Imagery of Faces and Places Activates Corresponding Stimulus-Specific Brain Regions," *Journal of Cognitive Neuroscience* 12, no. 6 (2000): 1013, https://doi.org/10.1162/08989290051137549.

696 Malabou, *What Should We Do with Our Brain?* 56.

integrating the mental, biological and phenomenological acts of visual processing and the influence they may have on the perception of images (see Chapter 6).

Affect and Arousal

Another critical aspect of visual perception is our emotional affective response toward images. How are we affected by what we see? This is important because our thoughts and behaviours are strongly influenced by affective experiences delivered through the primary motivational system allowing us to express emotion toward stimuli [images]. Our thoughts and behaviours are influenced by affective experiences with Tomkins arguing the affect system is the primary motivational system.[697] Biological drives such as arousal or the desire for emotional experiences like pleasure or excitement form part of this system.[698] Affect can be considered as the conscious subjective aspect of an emotion[699] and has implications for the way we experience images. This challenges the mindset that affect is "a distinct psychological phenomenon that can be separated from cognition and perception." [700]

The influence of affect on a person's experience of the world is referred to by Siegel et al. as "affective realism". It is a consequence of how the brain processes sensory information from the external world in the context of sensations from the body.[701] This means emotions or subjectively experienced feelings toward images are the expression of one or more affects such

697 Adam J. Frank and Elizabeth A. Wilson, *A Silvan Tomkins Handbook: Foundations for Affect Theory* (Minneapolis: University of Minnesota Press, 2020), 14, muse.jhu.edu/book/78624.

698 Karen Niven and Eleanor Miles, "Affect Arousal," in *Encyclopedia of Behavioral Medicine*, eds. Mark D. Gellman and J. Rick Turner (New York, NY: Springer, 2013), https://doi.org/10.1007/978-1-4419-1005-9_1089.

699 John T. Cacioppo and Garry G. Berntson, "The Affect System: Architecture and Operating Characteristics," *Current Directions in Psychological Science* 8, no. 5 (October, 1999): 134, https://www.jstor.org/stable/20182585.

700 Erika H. Siegel, Jolie B. Wormwood, Karen S. Quigley and Lisa Feldman Barrett, "Seeing What You Feel: Affect Drives Visual Perception of Structurally Neutral Faces," *Psychological Science* 29, no. 4 (2018): 496, https://doi-org.ezproxy.uws.edu.au/10.1177/0956797617741718.

701 Ibid., 496.

as enjoyment or interest operating in combination with cognitive or drive states. These feelings act to colour and modulate the affects.[702]

Affect theory seeks to organise affects into a set of responses (sensory feedback) to stimuli "triggered at subcortical centres."[703] Affects take the form of emotions, or subjectively experienced feelings. Tomkins organises these into the following categories which are by no means definitive but an attempt to standardise the terminology of affect and offer the possibility for further investigation into how feelings and emotions affect human behaviour. [704]

Table 4.4. Tomkins Discrete Affects Categories	
Positive	Negative
Interest	Distress
Enjoyment	Fear
Surprise	Shame
	Contempt
	Anger/Rage

These categories were typified by their physiological, social, interpersonal, and internalised manifestations and are adapted for this study to gain an understanding of participants' affect responses to images (see Table 4.5). The visual system continuously receives constantly changing information which is then transmitted to muscles and glands via the brain where only the more distinct messages are immediately recorded by the brain offering two kinds of human response – a variety of pleasure and pain signals from the drive system and a variety of positive and negative signals from the affect system. Both types of responses, in turn, generate sensory feedback which is experienced as "immediately acceptable" or "unacceptable." This occurs without prior learning.[705]

We are affected by images. Our relationship to images (as to other objects) is often an

702 Frank and Wilson, *A Silvan Tomkins Handbook*, 4.

703 Silvan S. Tomkins, *Affect Imagery Consciousness: The Complete Edition: Two Volumes* (New York: Springer Publishing Co., 2008), 135, ProQuest Ebook Central.

704 Ibid., 135.

705 Tomkins, *Affect Imagery Consciousness, Vol. 1: The Positive Affects*, 20.

emotional, affective one. Tomkins suggests affects are not simply neurological or socially "constructed" but are a combination of biological, psychological/emotional and social factors in which the body and the mind are linked in ways that are dependent upon on experience.[706]

When we look at an image, we are provided with options to experience, interpret or understand. Through understanding how we are affected we can see responses (Table 4.4) are both learned (responses based on experience) and unlearned (automatic responses to stimuli).[707]

Table 4.5. Participant Affect Responses: Learned and Unlearned

Affect, Feeling, Emotion	Affect Manifestations	Participant Comments	Medium/ Technology	Learned	Unlearned
Frustration (Negative)	Physiological	"If there are too many things going on, the message starts getting completely messed up because you might be reading news and two or three things pop up at the same time. I just close the whole thing because I become frustrated." (11p)	Website		✓
Connection (Positive)	Social	"The first encounter is really important. On a dating site, maybe you need to do a headstand just to get the reaction." (15p)	Social Media		✓
	Interpersonal	"My Dad's side of the family all have social media, so they communicate a lot more. They create a lot more get-togethers." (2s)	Social Media	✓	
Pleasure (Positive)	Internalised	"I remember the image of the old couple swimming. It reminded me of my family, the happiness of them. I like that picture." (8s)	Magazine	✓	

Affect is important in perceptual and sensory experience. Bergson posits "there is no perception without affection", meaning that every act of perceiving an object (or image) offers the potential for one's body to act on that object and is accompanied by a sensory self-affection of the body.[708]

706 Frank and Wilson, *A Silvan Tomkins Handbook*, 35.

707 Tomkins, *Affect Imagery Consciousness: The Complete Edition*, 13.

708 Henri Bergson, "On The Selection of Images For Conscious Presentation: What Our Body Means and Does," in *Matter and Memory*, eds. Nancy Margaret Paul and Scott W. Palmer (London: George Allen & Co., 1911), 60.

There are aspects of ourselves and our environment that we may easily transform while others we may transform only with difficulty and some we may never transform,[709] such as the conditions of visual masking phenomena. They are actions that occur on an unconscious and spontaneous level, an automated physical response triggered by the way visual stimuli are delivered to, and processed by, the brain. These responses to visual stimuli [images] sometimes occur without awareness of the cause, control of the response, or the possibility of corrective action.

Tomkins sees affect as having the following three characterises: Neurological, Physiological, and Aesthetic[710] (see Table 4.5). This taxonomy indicates affect is part of a system of motivation, a combination of the following: "thoughts, perceptions, motor actions, drive states, and other affects."[711] Our emotional reactions are a combination of these and can be felt through experiencing images.

Table 4.6. Tomkins' Affect Characteristics	
Affects Categories	Description
Neurological	Affects are defined by a certain profile of neural firing.
Physiological	Affects are delineated by sets of muscular, glandular, and skin responses.
Aesthetic	Affects are experienced consciously as different feelings.

Affect describes a type of knowing in an immediate and sensory way. Through the varying interrelationships between cognitive structures and processes, we achieve a sense of "knowing that something is the case." This can occur in distinct ways offering different kinds of knowledge that come from the diversity of the senses.[712] It takes place through the varying interrelationships of dependence, independence, and interdependence between cognitive structures, processes, and

709 Ibid., 61.

710 Frank and Wilson, *A Silvan Tomkins Handbook*, 4.

711 Ibid., 4.

712 Tomkins, *Affect Imagery Consciousness: The Complete Edition*, 889.

product – differences in knowing arising from differences in cognitive structures.[713.]

Storbeck and Clore posit affect moderates many of the phenomena in cognitive psychology with the arousal dimension of affect often promoting and intensifying engagement with stimuli thereby enhancing long-term memory of events. This is a biological and phenomenological process occurring through adrenergic hormones and subjective experience. Androgenic hormones are released in "emotionally arousing situations", whereby "Subjective experience presumably directs attention to the arousing event and adrenergic hormones activate memory consolidation processes." [714] Adrenaline is produced when engaging with stimuli so that arousal may operate mainly on information that was already slightly arousing during initial exposure.[715]

How can we understand affect? Do we need to adapt communication to create affect and does this impact on the type of image we choose to send out in ubiquitous and cluttered visual environments? The influences of affect are significant to how we engage and apprehend images. Understanding the implications of this phenomenon can help us understand more comprehensively how people relate and react to images.

Light, Senses and Perception

Let us consider the following abridged process of vision: the stimulus input of light from our environment is converted to energy passing through the retina, then received by the optic nerve and converted to an electrical signal which is transmitted to specific nuclei in the brain, where it is processed as the image we see before our eyes.[716] On consideration of this statement, we can see the importance of the brain and the critical role of light to the physiological process of vision.

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713 Ibid., 990.

714 Justin Storbeck and Gerald L. Clore, "Affective Arousal as Information: How Affective Arousal Influences Judgments, Learning, and Memory," *Social and Personality Psychology Compass* 2, no. 5 (2008): 1834, https://doi.org/10.1111/j.1751-9004.2008.00138.x.

715 Ibid., 1837.

716 Arturo Sánchez López de Nava, Anisha N. Somani and Baby Salini, "Physiology, Vision," in *StatPearls* (Treasure Island, FL: StatPearls Publishing, updated 9 May 2021), https://www.ncbi.nlm.nih.gov/books/NBK538493.

This has broader implications for image apprehension. Do our physiological reactions to the nuances of light affect our perception of images? Laeng and Sulutvedt argue visualising a mental image or a "re-representation of a perception" must include the properties of luminance or brightness in the visualisation, with mental images preserving the sensory qualities of previously experienced images. This activates a brain state similar to that which arises during visual perception where physiological adjustments of the pupils occur due to imagined scenarios and their corresponding perceptions.[717] This indicates a neurological connection to the biological activity of seeing. Mathôt and Van der Stigchel describe this phenomenon as follows:

> A picture of a sun is generally perceived as brighter, and elicits a stronger pupillary constriction, than a picture of an indoor scene – even when both pictures are equally bright. This phenomenon can also occur when thinking about a bright image in the mind's eye, the pupil constricts in anticipation even without any visual stimulation.[718]

Other studies conducted by Binda, Pereverzeva and Murray, using pictures of the sun and the moon with control images of matched luminance, confirm this phenomenon. This implies that high-level visual processes, such as being conscious of object characteristics, modulate one's physiological responses, such as "the change in pupil size in response to light increments or decrements." [719]

The measurement of pupil diameter, "pupillometry," plays a significant role in psychology and can successfully provide an estimate of the intensity of mental activity, changes in mental states and changes in the allocation of attention and the consolidation of perception.[720]

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717 Bruno Laeng and Unni Sulutvedt, "The Eye Pupil Adjusts to Imaginary Light," *Psychological Science* 25, no. 1 (January, 2014): 188, https://www.jstor.org/stable/24539482.

718 Sebastion Mathôt and Stefan Van der Stigchel, "New Light on the Mind's Eye: The Pupillary Light Response as Active Vision," *Current Directions in Psychological Science* 24, no. 5 (October, 2015): 374, https://doi.org/10.1177/0963721415593725.

719 Paola Binda, Maria Pereverzeva, and Scott O. Murray, "Pupil Constrictions to Photographs of the Sun," *Journal of Vision* 13, no. 6 (May, 2013): 7, https://doi.org/10.1167/13.6.8.

720 Bruno Laeng, Sylvain Sirois and Gustaf Gredebäck, "Pupillometry: A Window to the Preconscious?" *Perspectives on Psychological Science* 7, no. 1 (2012): 18, https://ezproxy.cqu.edu.au/login?url=https://www.jstor.org/stable/41613538.

This indicates the response to light is not driven solely by the amount of light that enters the eye but is related to high-level vision and mental imagery,[721] and pupillary response to light is a reflex with a cognitive component related to an awareness of the stimulus. This can occur whether one is paying attention to the stimuli or when thinking about it.[722]

Peripheral devices such as the keyboard, mouse and the computer's screen can impact visual perception. When elements in the environment differ in brightness, such as a dark keyboard and a bright monitor, pupils need to adjust when moving gaze between the two. The brain can perceive the impending change in brightness with adjustment in pupil size. A pupil size that was tuned to the brightness of the monitor prior to moving the line of sight to the keyboard begins to adjust to accommodate the brightness of the keyboard resulting in suboptimal perception.[723] The combination of these technologies, the way light is anticipated and processed and also human actions and reactions can alter the way an image is perceived.

Summary

The literature in this section has drawn attention to various technological, neurological and biological conditions that operate to affect our cognitive processes when we interact with information, with particular consideration toward the photographic image.

It is important to understand human visual processing holistically by considering the process of perception or the neurological mapping of the images we see into the brain and its relationship to subsequent higher order processes of semantic decoding of our perceptions to arrive at a phenomenological understanding of what we see or experience, either semantically or through affect and arousal.

721 Mathôt and Van der Stigchel, "New Light on the Mind's Eye," 375.
722 Mathôt and Van der Stigchel, "New Light on the Mind's Eye," 374.
723 Ibid., 377.

It is not the purpose of this study to provide an in-depth analysis of all aspects of neuroscientific processes and effects on image apprehension but to draw attention to areas that do have an impact on the way we experience images. The areas mentioned in this section have important implications in understanding how we see, react to, and apprehend images through the neuroscientific lens. For example, affect and arousal as human responses toward images are a result of the processing of emotional visual information (if present) that engages cognitive functions to induce arousal. This suggests that higher areas of the visual stream are fine-tuned to process emotionally relevant objects,[724] making for memorable images. Other neuroscientific areas and their implications for image apprehension are discussed in Chapter 6.

4.8 The Recall and Retrieval of Memory

Acknowledging The Effects of Memory Recall in Participant Photo-elicitation Responses

This section explores the concept of recall and retrieval of memory and its impact on the ability of participants to impartially compare the same set of photographic images viewed in the *Australian Geographic* magazine and the *Australian Geographic* magazine's website.

The section is presented as both a limitation to the study and a review of the literature on this topic. The cognitive process of memory and recall is an important aspect of image apprehension with visual communication relying on the effectiveness of images to connect with people in a memorable way. Following is an outline of the structural approach to the photo-elicitation tasks given to participants intended to provide context as to how this phenomenon affects participant responses.

724 Michael Kuniecki, Kinga Wołoszyn, Aleksandra Domagalik and Joanna Pilarczyk, "Disentangling Brain Activity Related to The Processing of Emotional Visual Information and Emotional Arousal," *Brain Structure Function* 223, no. 4 (2018): 1589, https://doi-org.ezproxy.cqu.edu.au/10.1007/s00429-017-1576-y.

Opinions were sought from Graphic Design students about whether their apprehension of photographic images is affected by the medium of communication, specifically comparing print and online formats.

How does the process of recall or retrieval of memory affect the participants' ability to discuss the differences between their viewing experience across the magazine and the website?

Participants undertook the following photo-elicitation tasks designed to understand their experiences when viewing the same set of images in the *Australian Geographic* printed magazine and the *Australian Geographic* magazine website.

Photo-elicitation Tasks

Part A (Stage 2 and 4 Photo-elicitation): Participants were given two minutes to view images on pages 61 to 71, 78 to 85 and 89 to 93 of the *Australian Geographic* printed magazine. They were then asked to briefly describe the five most memorable images in order of memorability. Responses were collected using a five-unit numerical Likert scale, with number one indicating the most memorable image and number five the least memorable. To further understand their choices, participants were asked to describe what made the number one choice the most memorable image and the number five choice the least memorable. After 30 minutes participants performed the same task viewing the same set of images on the *Australian Geographic* Magazine's website.

Part B (Stage 2 and 4 Photo-elicitation): Participants were asked to view the same set of four images in the *Australian Geographic* magazine and its associated website to ascertain whether meaning, symbolism and interpretation of narrative would change across both mediums. After 30 minutes, participants performed the same task viewing the same set of images on the *Australian Geographic* Magazine's website. The viewing sequence was changed between the two mediums. The following table indicates the images in each of the four locations and their associated questions.

Table 4.7. Part B: Photo-elicitation Outline		
Australian Geographic Magazine Website		
Location Sequence		Question
1	Page 44–45	Describe what you see in the image.
2	Page 57	Look at the image. What does this image mean to you?
3	Page 34	What does this image symbolise to you?
4	Pages 120–121	Without looking at the text describe the narrative in the series of images.
Australian Geographic Printed Magazine		
Location Sequence		Question
1	Pages 120–121	Without looking at the text describe the narrative in the series of images.
2	Page 44–45	Describe what you see in the image.
3	Page 34	What does this image symbolise to you?
4	Page 57	Look at the image. What does this image mean to you?

Part C (Stage 6 Photo-elicitation): Participants were presented with five images and asked whether they remembered them. They were asked to numerically rate the images in order of memorability with number one being the most memorable and number five being the least memorable. They were then asked whether they remembered the images from either the *Australian Geographic* Printed Magazine, the associated website, or both (see Appendix 1: Research Instruments – Students: Stage 6).

Is memorability affected by the cognitive processes of recall or retrieval of memory (remembering)? This refers to the subsequent re-accessing of events or information from the past, which has been previously encoded (to convert information) and stored in the brain.[725]

Responses indicated the effects of memory recall and retrieval influenced some participants in this study when discussing the memorability of the images viewed.

725 "Memory Recall and Retrieval System," The Human Memory, last updated 25 November 2020, http://www.human-memory.net/processes_recall.html.

Some participants displayed primacy and recency effects where a person recalls items presented at the beginning of a list (primacy effect)[726] or the end of a list (recency effect)[727] earlier and more often than items presented in the middle of the list.

Primacy effect theory was derived from order effects theory, which suggests that when subjects are repeatedly presented with information during recurring experiments, the order in which the information is presented influences "message" recall. In a study conducted by Haugvedt and Wegener, when participants were prompted with salient content, primacy effects occurred. When participants were presented with less conspicuous content, recency effects occurred.[728]

Recency effect theory corresponds with the primacy effect. It suggests that recent information has a stronger influence on memory than information accessed earlier.[729]

Cognitive psychologists found that early items in a list have a memory advantage due to the first items having less competition from other items for limited memory capacity. The last few items presented in the list also receive a memory advantage because these items may still be available in short-term memory.[730]

There are other factors affecting recall. Haugtvedt and Wegener argue that an object with high levels of message relevance for the viewer leads to greater primacy effects, while low levels of message relevance led to greater recency effects.[731] Not all participants expressed primacy and

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726 Thorsten Posselt and Eitan Gerstner, "Pre-sale vs. Post-sale e-Satisfaction: Impact on Repurchase Intention and Overall Satisfaction," *Journal of Interactive Marketing* 19, no. 4 (2005): 37, https://doi.org/10.1002/dir.20048.

727 Joseph P. Forgas, "Can Negative Affect Eliminate the Power of First Impressions? Affective Influences on Primacy and Recency Effects in Impression Formation," *Journal of Experimental Social Psychology* 47, no. 2 (2011): 428, https://doi.org/10.1016/j.jesp.2010.11.005

728 Curtis P. Haugtvedt and Duane T. Wegener, "Message Order Effects in Persuasion: An Attitude Strength Perspective," *The Journal of Consumer Research* 21, no. 1 (June 1994): 205, https://www.jstor.org/stable/2489751.

729 Ying-Jung Yvonne Yeh and Min-Hung Chen, "Examining the Primacy and Recency Effect on Learning Effectiveness with the Application of Interactive Response Systems (Irs)," *Technology, Knowledge and Learning* (5 May 2021): 4, https://doi-org.ezproxy.uws.edu.au/10.1007/s10758-021-09521-6.

730 Bennet B. Murdock, "The Serial Position Effect of Free Recall," *Journal of Experimental Psychology* 64, no. 5 (1962): 488, https://doi-org.ezproxy.uws.edu.au/10.1037/h0045106.

731 Haugtvedt and Wegener, "Message Order Effects in Persuasion," 205.

recency effects, instead identifying other cues as playing a more prominent role in aiding memorability. These included effects of the viewing medium such as vibrancy when viewed on a computer screen, qualities within the image, size, photographic effects, composition and emotional reaction.

Accessing Memory

The two main methods of accessing memory are recognition and recall. Recognition involves the comparison of information with memory – for example, recognising a known image by comparing it with previously stored information about that image – in other words, the act of viewing an image and associating it with one previously experienced or encountered.[732] This is a largely unconscious process where information is processed directly through the limbic areas of the brain, such as the hippocampus, where episodic memories (ones related to experiences) are formed and stored in long-term storage across other parts of the cerebral cortex.[733]

During the photo-elicitation method used in this study, participants would have encountered the identical image in the *Australian Geographic* magazine thirty minutes prior to viewing the image on the *Australian Geographic* magazine website. This encounter has the potential to make the image viewed recognisable as a known image.

Short Term and Long Term Memory

The Search of Associative Memory (SAM) is a general theory of memory retrieval providing an understanding of recall effects.[734] Associative memory describes features of human

732 John J. Medina, "The Biology of Recognition Memory," *The Psychiatric Times* 25, no. 7 (2008): 13, http://ezproxy.uws.edu.au/login?url=https://www.proquest.com/trade-journals/biology-recognition-memory/docview/204638078/se-2?accountid=36155.

733 "The Limbic System," Queensland Brain Institute, The University of Queensland, updated 24 January 2019, https://qbi.uq.edu.au/brain/brain-anatomy/limbic-system

734 D. E. Huber, T. D. Tomlinson, Y. Jang and W. J. Hopper, "The Search of Associative Memory with Recovery Interference (SAM-RI) Memory Model and Its Application to Retrieval Practice Paradigms," in *Cognitive Modeling in Perception and Memory: A Festschrift for Richard M. Shiffrin*, eds. J. G. W. Raaijmakers, A. H. Criss, R. L. Goldstone, R. M. Nosofsky and M. Steyvers (Hove, East Sussex: Psychology Press, 2015), 81, https://psycnet.apa.org/record/2015-11667-005.

memory incorporating principles of association between two or more items,[735] where two items thought about simultaneously may become linked in memory.[736] The model describes cue-dependent items retrieved from an associative network operating in the brain.[737]

According to Gillund and Shiffrin, SAM utilises a two-phase memory system: short-term store (STS) or the temporary store into which information about presented items is placed and where processes such as coding and rehearsal are carried out; these in turn "activate an associated set of information" in long-term store (LTS) or the permanent store, containing all prior information.[738] This is where connections are made and the item is output to the recognise stage through the contextual associations made between the interaction of the STS and LTS stages.[739]

A combination of STS and LTS factors was evident in participant responses where images were identified as memorable because they were remembered as being viewed either first or last in the rehearsed sequence of images presented (STS) which could be considered a cue for memory retrieval. Some images also triggered LTS resulting in images chosen as being memorable because they activated participants' past memory stores of previously experienced events drawing out strong emotional meaning to participants. These memories tend to be stored within the amygdala, a structure within the brain located near the hippocampus playing an

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735 Nancy A. Dennis, Indira C. Turney, Christina E. Webb and Amy A. Overman, "The Effects of Item Familiarity on the Neural Correlates of Successful Associative Memory Encoding," *Cognitive, Affective, & Behavioral Neuroscience* 15, no. 4 (2015): 889, http://ezproxy.uws.edu.au/login?url=https://www.proquest.com/scholarly-journals/effects-item-familiarity-on-neural-correlates/docview/1737492332/se-2.

736 Donald E. Carlston, "Associative Networks," in *Encyclopedia of Social Psychology*, eds. Roy F. Baumeister and Kathleen D. Vohs (Thousand Oaks, CA: SAGE Publications, 2007), https://doi.org/10.4135/9781412956253.

737 Jeroen G. W. Raaijmakers and Richard M. Shiffrin, "Search of Associative Memory," *Psychological Review* 88, no. 2 (March 1981):1, https://doi.org/10.1037/0033-295X.88.2.93.

738 Gary Gillund and Richard Shiffrin, "A Retrieval Model of Both Recognition and Recall," *Psychological Review* 91, no. 1 (January 1984): 7.

739 Ibid., 2.

important role in determining our emotional responses to experiences.[740] These areas of the brain work to generate a sense of familiarity before linking up with the cortical path where data about the object is processed.[741]

Recall and Recognition

Hall, Grossman and Elwood conducted experiments on preliminary recall and recognition, demonstrating that both were superior when the subjects expected and had practised for recall.[742] Evidence of recall and recognition processes were observed in this study. Participants viewing the set of images in the *Australian Geographic* magazine were expecting to view the same set of images in the *Australian Geographic* magazine website.

There is a difference between recognition and recall. Kintsch describes recognition as a single process of making a familiarity decision, whereas a full recall of an item from memory requires a two-stage process. During the first stage, referred to as the generate stage, long-term memory storage is searched and possible matches are retrieved and generated to a recognise stage. In the recognise stage, an item's familiarity[743] or contextual associations[744] is evaluated to determine if the generated item has been previously presented.[745]

In the context of this study, recall involves remembering an image that is not currently physically present by retrieving a representation, mental image, or concept. This requires the direct uncovering of information from memory which, aided by recall cues (previously viewed images), allows us to recall them more easily afterwards.[746]

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740 "The Limbic System", Queensland Brain Institute.

741 "Memory Recall and Retrieval System," The Human Memory.

742 James W. Hall, Lisa R. Grossman, and Kent D. Elwood, "Differences in Encoding for Free Recall vs. Recognition," *Memory & Cognition* 4, no. 5 (1976): 1, https://doi.org/10.3758/BF03213211.

743 Walter Kintsch, "Recognition and Free Recall of Organized Lists," *Journal of Experimental Psychology* 78, no. 3 (1968): 485, https://doi.org/10.1037/h0026462.

744 John R. Anderson and Gordon H. Bower, "Recognition and Retrieval Processes in Free Recall," *Psychological Review* 79, no. 2 (1972): 102, https://doi.org/10.1037/h0033773.

745 Gillund and Shiffrin, "A Retrieval Model of Both Recognition and Recall," 2.

746 Christian Lexcellent, *Human Memory and Material Memory* (Cham, Switzerland: Springer, 2019), 18.

The process of recall, and the resulting encoding specificity, also consider context cues such as questions and images previously presented and the environment in which they are presented. Bower, Carlin and Dueck suggest recall is better when the environments are similar in both the encoding and recall phases, suggesting that these and other context cues are important for memorability. Memory is aided whenever contextual cues trigger appropriate schemata into which the material presented can be fitted.[747]

Remembering can occur when items of information are linked directly to a question or cue.[748] During the image-elicitation survey, participants performed photo-elicitation part B (stages two and four) where they accessed a list of identical images that were viewed in a different sequence for both the website and the printed magazine. It is acknowledged that during the part B elicitation task the question and image list presented were the same for both the website and the printed magazine. According to the literature, we can assume both the questions and the image list act as a cue for remembering information because the two sets of images from the magazine and the website are linked to the same question.

During recall, the structure for the sequence of images is reinstated according to the temporal order that was coded during the first viewing. As a result, retrieval proceeds sequentially down the list and, if the ability to remember a particular image in the sequence occurs, retrieval may proceed to the next image in temporal sequence.[749] The data collected was not sufficient to evidence any instances of this retrieval method.

During recall, the brain replays a pattern of neural activity that was originally generated in response to a particular event, echoing the brain's perception of the real event.[750] The brain is

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747 Gordon H. Bower, Martin B. Karlin and Alvin Dueck, "Comprehension and Memory for Pictures," *Memory and Cognition* 3, no. 2 (1975): 216, https://doi.org/10.3758/BF03212900.

748 Gillund and Shiffrin, "A Retrieval Model of Both Recognition and Recall," 1.

749 Mary Howes and Geoffrey O'Shea, *Human Memory: A Constructivist View* (Amsterdam: Elsevier Academic Press, 2014), 45, https://doi.org/10.1016/C2012-0-06764-6.

750 "Memory Recall and Retrieval System," The Human Memory.

actively reconstructing information requiring the activation of all the neurons involved to activate memory, whereas recognition only requires a comparative decision as to whether one thing among others has been encountered before.

The processes of recall and recognition were evident in participant responses during the photo-elicitation tasks:

> "It was the first image I saw and gave most attention to it." (7s)
> "I found the golden frog the most memorable as it was closer to the end of the pages that we looked at." (6s)

This section has highlighted the cognitive effects of the processes of recall and retrieval of memory on participant responses to the photo-elicitation tasks. Many aspects of memory retrieval were observed and should be noted as influencing participant responses. Rather than detract from the study the process provided some interesting insights supporting existing literature in the way people store visual data in memory and how certain visual data can be remembered because it relates to previous experiences that have an emotional connection to a person (autobiographical memory). It is also important to note that short-term memory or working memory may have had more significant effects on responses than other types of memory. Working memory is a cognitive system allowing the temporary storage, maintaining and processing of information for short periods.[751] Participants viewed the lists of images within thirty minutes of each other.

Autobiographical Memory

Autobiographical memory is a mental system that allows people to recollect information, events, and experiences from their past.[752] Memory recall of the images viewed and the act of mental processing can be determined by connections with pre-existing memory, time spent

751 "Introduction to Working Memory," supplied by The Great Courses, *Kanopy*, 2018, video, https://www.kanopy.com/product/introduction-working-memory.

752 Helen L. Williams, Martin A. Conway and Gillian Cohen, "Autobiographical Memory," in *Memory in The Real World,* 3rd ed., eds. G. Cohen and M. A. Conway (Hove, East Sussex: Psychology Press, 2008), 22.

processing the images, cognitive effort and sensory input mode. The efficiency of this process can be increased by our use of schema or an organised mental framework of preconceived ideas about our world and how we view it. This phenomenon can influence the recall of certain images over others, ones that we feel are important to us.

The following participant remembered a certain image that had significance over others due to the image triggering an autobiographical memory of the experience. This indicates a neurological connection between memory and images, which is discussed further in section 4.7, Neuroscience and the Image, and sections 6.1.2 and 6.2.2.

> "I remember the one of the little baby snake because it has a connection to me. I remember when my Uncle had snakes … it brought back memories. I remember it was scary at the same time." (2s)

The participant comment above is an example of an autobiographical memory response to the image viewed. This type of memory enables people to remember personally experienced events. These memories tend to come with a sense of reliving or feeling that one is re-experiencing the original event.[753] The recall of this type of memory is independent of the viewing environment and plays an important part in the apprehension of particular images that are made more salient through their prompting of, and association with, previous experiences.

Episodic Memory

Tulving suggests episodic and semantic memory systems make possible the utilisation of acquired and retained knowledge through "temporally dated episodes and events" and our organised knowledge of symbols, their referents, meaning and relations among them. These systems can be accessed to activate memory.[754]

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753 Daniel L. Greenberg and Barbara J. Knowlton, "The Role of Visual Imagery in Autobiographical Memory," *Memory and Cognition* 42, no. 6 (2014): 922, http://ezproxy.uws.edu.au/login?url=https://www.proquest.com/scholarly-journals/role-visual-imagery-autobiographical-memory/docview/1550519122/se-2?accountid=36155.

754 Endel Tulving, "Précis of Elements of Episodic Memory," *Behavioral and Brain Sciences* 7, no. 2 (1984): 223, https://doi.org/10.1017/S0140525X0004440X.

Episodic memory is a type of long-term memory that involves the recollection of previously experienced events in the context of time and place together with associated emotions[755] – we re-experience the event as it occurred.[756] A combination of these factors are evident in this study, with participants remembering images in rich episodic detail, a sensory-perceptual re-experiencing of events from one's past.[757]

> "One of the images I remember ... because of the happiness of my family before we had problems. I remember happiness, enjoying my childhood." (8s)

Variations occurred in participant responses with some being less vivid and descriptive. This was dependent on whether the participant experienced the cognitive processes of knowing (noetic awareness) or remembering (autonoetic awareness). The "knowing" of images according to Tulving relies on common or "fact-like" experiences:

> One could know they saw a picture previously in much the same way that one knows one's mailing address. Tulving's idea was that remembering carries rich episodic detail, whereas knowing relies on less personal, fact-like experiences.[758]

Tulving suggests the phenomenal experience accompanying the recovery of information may be one of autonoetic awareness or noetic awareness or a mixture of the two. Participant responses revealed evidence of both autonoetic awareness and noetic awareness of images viewed. Some participants remembered a current image as known, having previously viewed (noetic awareness) the image, while others remembered an image by placing themselves in a particular moment in time, a moment triggered by the image (autonoetic awareness). These aspects of awareness are evidenced in the following participant comments.

Noetic Awareness: "There's an image in black and white and there are

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755 Endel Tulving, "What Is Episodic Memory?" *Current Directions in Psychological Science* 2, no. 3 (June 1993): 67, https://doi.org/10.1111/1467-8721.ep10770899.

756 Johannes B. Mahr and Gergely Csibra, "Why Do We Remember? The Communicative Function of Episodic Memory," *Behavioral and Brain Sciences* 41 (2018): 2, https://doi.org/10.1017/S0140525X17000012.

757 Sally C. Prebble, Donna Rose Addis and Lynette J. Tippett, "Autobiographical Memory and Sense of Self," *Psychological Bulletin* 139, no. 4 (2013): 818, https://doi.org/10.1037/a0030146.

758 Kathleen B. McDermott and Adrian W. Gilmore, "Chapter Two – The Role of Context in Understanding Similarities and Differences in Remembering and Episodic Future Thinking," *Psychology of Learning and Motivation* 63 (2015): 47, https://doi.org/10.1016/bs.plm.2015.03.004.

> children with patches and he's opening a kid's eye and I saw that image this morning and I went 'oh I've seen that so many times somewhere'." (2s)
> **Autonoetic awareness:** "Seeing images of the 9/11 memorial that I took made me remember when my whole family was together. That's good because we rarely get together." (1s)

Semantic Memory

Semantic memory can be described as an organised knowledge of facts and conceptual information a person has about the world. This includes knowledge about images, symbols, relationships between them, meaning and referents and about rules for the manipulation of these symbols, concepts, and relations.[759]

According to Pashler, semantic knowledge can be divided into two types: a person's concepts or mental representation of something and propositions (a linking of concepts expressing a person's judgement or opinion). This is knowledge that is already known and not tied to any particular time or place.

The following participant description of an image is used to describe the semantic memory model. This is where a person identifies a concept. They would then proceed to find the proposition that is connected to that concept: [760]

> "An Australian Bush Turkey [concept] so comfortable with human interaction it is able to eat from the food bowl of the owner's pet [proposition]." (2s)

Free Recall

This is the process in which a person is given a list of items (images) to remember and then asked to recall them in any order. [761] In this case participants were asked to recall the most memorable and least memorable image. The photo-elicitation activities performed by

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759 Endel Tulving, *Organization of Memory*, eds. Endel Tulving and Wayne Donaldson (New York: Academic Press, 1972), 386.

760 Harold E. Pashler, *Encyclopedia of the Mind*, 2 vols. (Thousand Oaks, CA: SAGE Publications, 2012), 679–680, ProQuest Ebook Central.

761 *American Psychological Association Dictionary of Psychology*, s.v. "Free recall", https://dictionary.apa.org/free-recall.

participants could be classified as a process of free recall. Free recall may often display evidence of either of the following effects:

1) **Primacy effect** – when the person recalls items presented at the beginning of the list over those viewed toward the end of the list. [762]

   Evidence of the primacy effect was noted in the following participants' responses to Photo-elicitation Task part C: Stage 6. "This is the first image I saw and the one I paid most attention to." (7s)

   "It was the first image I looked at twice because I finished before the 2 minutes. I used it as a reference to understand the next set of images." (8s)

2) **Recency effect** – when the person recalls the most recently presented items or at the end of the list over those presented earlier.[763]

   Evidence of the recency effect was noted in the following participant response when asked to describe the most memorable image viewed and the reasons why.

   "It was the last image I looked at." (3s)

3) **Contiguity effect** – the marked tendency for items from neighbouring positions in the list to be recalled successively. This principle is associated with the idea of association. Forming connections between ideas, events (e.g. stimuli and responses), or other items depends on their proximity in space or time.[764] This occurred when some participants viewed images sequentially from consecutive pages during Photo-elicitation Tasks as indicated in the following examples.

762 *American Psychological Association Dictionary of Psychology*, s.v. "Primacy effect", https://dictionary.apa.org/primacy-effect.

763 Ibid., https://dictionary.apa.org/recency-effect.

764 Ibid., https://dictionary.apa.org/law-of-contiguity.

- Participant (7s) recalled images that were presented sequentially and appearing on the same page. Image 6B on page 66 of the magazine and image 6E on page 67 of the magazine and the website.
- Participant (6s) recalled two images 6B and 6E presented sequentially on pages 66–67 and two images 6A and 6D both appearing on page 63. These were recalled from the printed magazine and the website.
- Participant (9s) also recalled images 6A and 6D that were presented sequentially on the same page.

Memorability

According to Borkin et al., studies in visual cognition and memory have demonstrated that people remember abundant detail from visual objects and scenes that have defined meanings and use cases. Familiar and unique or distinct visual stimuli are easier to remember.[765]

These aspects of memorability were noted in the following participant responses.

> "I was interested in what native fruit they were. The aboriginal girls in the background made me think of the culture behind it and how long the fruit was a known food." (2s)
> "The burning man, that was just such a shocking image. It was so shocking and such a one-off." (9s)
> "…let's say you have a sea, landscape and maybe a ship and then they manipulate so it looks like the world is turning upwards. That's very memorable because it's completely distorting reality in a very interesting way." (10s)

A stronger coded representation of an object in a particular memory becomes more probable when a certain stimulus fits into the viewer's inventory of background knowledge. This increases the chance of its representation in the person's long-term memory store.

765 Michelle A. Borkin et al., "Beyond Memorability: Visualization, Recognition and Recall," *IEEE Transactions On Visualization And Computer Graphics* 22, no. 1 (January 2016): 520, https://doi.org/10.1109/TVCG.2015.2467732.

Images are remembered more often when they have individual meaning for a person that places them in context and, without this, the capacity to remember them is weakened. The objects need to be rehearsed to remember them later.[766]

> An impression can never by itself be associated with another impression. Nor has it the power to arouse others. It does so only provided that it is already understood in the light of past experience in which it co-existed with those which we are concerned to arouse.[767]

Conscious representation operates in a phenomenological sense where association does not occur as a self-determining force. It is never the image on its own that activates the response of remembering. This occurs by the meaning it has acquired in the context of a person's former experience and the phenomena of recalling that experience that activates recognition for the viewer.[768]

Comprehension

The act of comprehension is a higher cognitive process of the brain that examines relationships between a given object or attribute and other objects and their connection in long-term memory. "This establishes a representational model for the object or attribute by connecting it to appropriate clusters of memory."[769]

When viewing images, perception or interpretations occur in part using the person's previous knowledge to gather and interpret stimuli registered by the senses. Matlin describes the process as a combination of the following three factors: information registered by the eyes, previous knowledge about that information, and previous knowledge of what to expect when the visual system has already processed the image combining the outside world with the viewer's

766 Howes and O'Shea, *Human Memory: A Constructivist View*, 113.

767 Maurice Merleau-Ponty, *Phenomenology of Perception*, trans. Colin Smith (London: Routledge, 1989), 17.

768 Ibid., 17.

769 Yingxu Wang and D. Gafurov, "The Cognitive Process of Comprehension," in *Proceedings: The Second IEEE International Conference on Cognitive Informatics*, eds. Dilip Patel, Shushma Patel and Yingxu Wang (London: IEEE, 2003), 93, https://doi.org/10.1109/COGINF.2003.1225963.

inner world.[770] Porion et al. conducted a study[771] of reading comprehension comparing computer and paper-based texts to evaluate comprehension. The study uses Kintsch et al.'s three levels of representation.[772] The surface level, text-based or semantic level and the situation-model or inferential level. Kintsch's model below has been adapted here to include the photographic image in place of textual elements.

1. The surface level corresponds to the memorisation of the elements within the image, but not their meaning (Information registered by the eyes).
2. At the semantic level, the representation encompasses memorisation of the meaning of the image (Previous knowledge).
3. At the situation-model (or inferential) level, representation involves linking the information provided by the image with the information already in memory using inferences (Linkage to memory stores).

The study found that surface level is only activated during immediate recall while the strength of the memory traces for the semantic level decreases over time. The memory traces for the situation-model level are maintained over time and at a high level of activation, thus allowing the information to be retrieved whenever it is required.[773]

The first and third levels of Kintch's model were evident in the photo-elicitation tasks in this study. We could assume the first, or surface level (memorising elements within the image without meaning) was operative. Short-term memory function and subsequent recall were

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770 Margaret W. Matlin and Thomas A. Farmer, *Cognition*, 9th ed. (Hoboken, NJ: Wiley, 2015): 41, ProQuest Ebook Central.

771 Alexandre Porion, Xavier Aparicio, Olga Megalakaki, Alisson Robert and Thierry Baccino, "The Impact of Paper-Based Versus Computerized Presentation On Text Comprehension and Memorization," *Computers in Human Behavior* 54 (2016): 569–576, https://doi.org/10.1016/j.chb.2015.08.002. (https://www.sciencedirect.com/science/article/pii/S0747563215300807)

772 Walter Kintsch, David Welsch, Franz Schmalhofer and Susan Zimny, "Sentence Memory: A Theoretical Analysis," *Journal of Memory and Language* 29, no. 2 (1990): 135, https://doi.org/10.1016/0749-596X(90)90069-C.

773 Porion et al., "The Impact of Paper-Based," 569–576.

activated when the same set of images was viewed within a 30-minute time frame. Participant evidence demonstrated a simple act of recognition and recall:

> "I remember the guy holding the bug in the jar. It was in one of the end pages. I just remember that one the most because I was like 'hey that's a bug'." (6s)

The third level or situation model (linking information already in memory) was evident and operated firstly, as a direct link to information about the image to its previously seen duplicate (see participant 8s comment below) and secondly, as associated information about the image with information stored in long-term memory (see participant 5s comment below).

> "It was the first image I looked at twice because I finished before the two minutes. I used it as a reference to understand the next set of images." (8s)
> "It looks like somewhere I may have been or would like to go." (5s)

Technology and Effects on Memorability

The way memory processes operate can be influenced by the technologies within which the image is viewed. For example, there are differences in the quality of viewing afforded by the technologies of print compared to screen-based technologies. These differences impact the viewer's experience of an image in different ways and can override the cognitive processes of recall and retrieval of memory.

The following examples highlight the feature effects of print and web technologies on participant memory processes. The first example demonstrates the effect of luminous intensity provided by light transmitted from computer screens to aid memorability. This effect activated the memory recall of certain images amongst participants due to the physiological experience of vibrant and bright colour representation in the image, a feature of screen technology. The second example indicates the tactile nature of paper assists memorability.

> **Image viewed on the website.** "I remember that image the most (p. 64–65). It was a great image with a vibrant feel and great colours." (1s)

Image viewed in the printed magazine. “The images stuck in my head a little better because of the physical feel of paper while analysing.” (2s)

The effects of technologies on the viewing experience are discussed further in section 4.7 and Chapters 5.3 and 6.3.

When discussing memorability and recall it seems the effects of different technologies on their own are less than the processes of human cognition in combination with the phenomenological processing of information. This is an area that warrants further research to ascertain which conditions favour the agency of either technological or cognitive processes to affect memory.

Participants’ responses to memorability questions relating to images being viewed align with the literature presented and confirm that effects on memory recall and comprehension operate within existing human cognitive operations. Participants showed in varying degrees the cognitive application of free recall, episodic, semantic and autobiographical memory during photo-elicitation exercises. There was also evidence of surface-level memory retrieval based on memory cues and the situational model of comprehension linking image retrieval to pre-existing information stored in long-term memory.

It is acknowledged that the processes of recall or retrieval of memory affected the participants’ bias to recall certain images over others. Semantic interpretation of the same images viewed on the website and in the printed magazine would have already been formed after the initial viewing and in most cases remained the same for both mediums (see Chapter 5.1).

CHAPTER 5 –DISCUSSION OF THE RESEARCH DATA

This chapter analyses the data collected and considers the literature review and the conceptual and methodological frameworks established in Chapters 3 and 4. The following discussion also attempts to gain insights into participants' feelings and beliefs of how image usage practices and ways of seeing and understanding images have changed from their appearance in the earlier technologies of print to their more recent digital online presence.

It is essential to note the data was collected within a controlled classroom environment with no noticeable external distractions. When viewing images on the desktop computer, the screen's resolution allowed for them to be presented in comparable physical dimensions to the printed magazine. Participants viewed the sequence of images on both the website and magazine. There was a 30-minute interval between the two viewings. Despite altering the order of the image sequence across the two viewing sessions, the researcher acknowledges that interpretation of the images would be formed and stored in short-term memory after the first viewing. This is discussed in Chapters 4.5 and 7.4 and may explain the similarity of the way images were understood across the magazine and the website.

The data in this study reveals new ways of understanding how images are used in the current technological environment. Digitisation through the various converging technological and social forces discussed in this study has significantly altered photographic image usage practices which are influenced by computation and automated processing. This discussion is hermeneutically cognisant of neuroscience, quantum physics and computational intelligence,[774] acknowledging the mediation of artificial neural networks and physics[775] on photographic apprehension.

774 Daniel Rubinstein, *Fragmentation of the Photographic Image in the Digital Age* (New York, NY: Routledge, 2020), 5.

775 Wolfgang Ernst, "Experimenting with Media Temporality: Pythagoras, Hertz, Turing," in *Digital Memory and the Archive*, ed. Jussi Parikka (Minneapolis: University of Minnesota Press, 2013),185, https://www.jstor.org/stable/10.5749/j.ctt32bcwb.

The data supports some of the literature presented in the thesis, suggesting the necessity to revisit past conceptualisations of photographic image discourse to establish its current ontological and epistemological state.

The discussion is framed through a phenomenological lens, and upon examining the interview transcripts and survey results, eight key considerations emerge from the data analysis. These considerations pertain to participants' responses to the research questions, summarised in Table 5.1 below.

Table 5.1. Data Analysis Considerations			
Key Considerations			
1	Semiotic Possibilities?	5	Digital Fauxtography
2	Visual Noise and Disrupted Sensibilities	6	Size Still Matters
3	Altered Encounters of The Fourth Kind	7	Sensory Perception
4	The Spaciotemporal Image	8	What is an Image Worth?

This chapter will review these key considerations as sections, drawing on student and practitioner data to address specific points. In addition, relevant sub-categories will provide specificity and elaboration. The chapter represents a creative and iterative interaction between the researcher and the data that reveals and articulates participants' insights into their image usage practices.

5.1. Semiotic Possibilities?

The following question was asked of student and practitioner sample groups. It was intended to establish whether the medium on which an image is viewed has any influence on the interpretation of the meaning: *"Images can be created to convey meaning through the composition of various elements depending on the message that the author would like to convey. In the following scenario, a person could view the same image on a website or in a magazine. Do*

you think the interpretation of the meaning in the image by the viewer would be different if viewed on a website or in a magazine? If so, explain your reasons."

Participant responses indicated the meaning of an image remains the same when observed across both website and printed magazine. However, the data also revealed that the viewing process, including context, place, time, type of device used and task-related intent, influence how a viewer approaches interpretation. These variables alter the type of viewing experience and, as a result, affect the way meaning is understood. For example, the following comment indicates that, often, photographs uploaded to social media are not a literal representation of "something" but a projection of an "ideal self."

> "Everyone's taking photos and uploading them to social media…it's often not about the literal photographic image but the image people want to project." (11p)

This is discussed further in Chapter 6.2.3: The Social Media Image. Other aspects of the data indicate the viewing experience and interpretation of images are shaped by the technologies within which they are viewed. This observation is illustrated in the following participant comment and will be explored further in this chapter:

> "If it [an image] were on a desktop computer or a laptop I think the user would interpret the image better, would look into it in detail compared to tablets and smartphones. These are devices that people mostly use when commuting or during work or university or during a time when they're doing something else." (7s)

The following comment highlights the importance of intent and personal agency attached to an image search. This activity places a higher level of importance on the image viewed on a website compared to a magazine, which in this case is consumed in a more leisurely paced viewing environment:

> "The website holds more importance to me. When I'm searching the web, I'm searching for something. In a magazine it's a leisurely thing and I'm always just thinking ad, ad, ad, flip, flip." (Participant 5s)

The participant also acknowledges targeted advertising presenting personalised images according to a person's online digital habits hold a high level of importance. This is a situation where a level of familiarity is created through advertising algorithms creating a sense of connection where images viewed become more salient:

> "If an image happened to pop up on the web, even if it was an ad, it would be relevant to me since I'm on the web and they've assigned the right ad for me so it would take on more importance. The meaning would be the same." (5s)

Magazines with niche content targeting a reader's interests have the connotation of a casual viewing experience. Images placed within this medium would be taken less seriously than images viewed on a website, even if the image was "political" in nature:

> "If the image conveys a political message and it's viewed in a magazine, it's less likely to be taken seriously because most of the time when people are going through a magazine, they're focussing on niche content. I would interpret the image more seriously in a website compared to a magazine." (7s)

The nature of the medium may therefore create an interpretation bias in the viewer's mind. The following participant presented their perception of images appearing online as "propaganda".

> "For me, the importance would be for a magazine because I would have a mindset of being open to everything I read instead of seeing something as propaganda." (1s)

Participant responses suggested the two mediums encouraged different types of interaction; the magazine was associated with more viewing time compared to less time for the website. A higher level of importance is assigned to an image when viewed in certain viewing environments, such as informational websites and newspapers. This sets off a cognitive process where shortly after the visual sensory input, the viewer engages mentally with the "important" image ensuring its likelihood to be coded into long-term memory. Although all inputs or images may be stored in memory, the proportion of cognitive effort allocated to information processing and retrieval from memory may be less for an image of less importance or one that is "not taken seriously":

> "I would take it [image] more seriously in a newspaper. They are images that are important or relevant to some cause or issue." (Participant 7s)

Norman states sensory visual input must receive extensive automatic and unconscious processing before input enters consciousness. The more significant the input to the viewer the more likely it is to enter consciousness. [776]

Seeing, Symbolising, Meaning and Narrative

The following section discusses data gathered from four photo-elicitation questions asking participants to identify differences in interpretation of meaning in four images viewed in the *Australian Geographic* magazine and the *Australian Geographic* magazine website. Participants were asked questions relating to seeing, meaning, symbolism and understanding of narrative. These keywords can be considered part of the interpretive lexicon used for semiotic interpretation. They are part of the broader semiotic framework including connotation and denotation (see Chapter 4.2).

The goal was to observe the difference in the application of semiotic meaning between the mediums to observe evidence of concepts, such as identifying relationships between elements in a photograph [signifiers], and how the concept or meaning derived from those elements [signified] changed: Was there evidence in the change of personal meanings and interpretations of [connotation] or literal or "common-sense" [denotation] [777] meaning of the images?

These frameworks for understanding meaning-making are used to determine to what extent, if any, their application can aid in understanding how images are read as part of current online and offline viewing practices and whether this differs from one medium to another.

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776 Donald A. Norman, "Toward a Theory of Memory and Attention," *Psychological Review* 75, no. 6, (1968): 528, http://dx.doi.org.ezproxy.uws.edu.au/10.1037/h0026699.

777 Chandler, "Semiotics for Beginners."

Seeing

The following are participant responses to the viewing of Figure 5.2. They are representative of data collected during Phase 2 and 4 (see Chapter 3: Research Design) of the investigation, demonstrating denotative interpretations were commonly given for all images presented across both mediums. Some participants combined aspects of connotation and denotation, introducing personal ideas and feelings to describe the photo in addition to applying literal interpretation to the photograph's subject matter. The literal responses were guided by the structure of the question, "describe what you see . . .," and participants responded accordingly:

> "The girl and the dog watch on patiently." (5s, Magazine)
> "The turkey has become accustomed to the idea of houses and urban areas." (1s, Magazine)
> "A lady with her uninterested dog looking on." (3s, Magazine)
> "I see the country life in Australia." (8s, Magazine)
> "A really cute bush turkey who thinks he is a dog." (5s, Magazine)

Figure 5.1. Seeing. "Describe what you see in the following image."
Australian Geographic Magazine. May–June 2016.

It is important to note that there was a structural change in the image depicted in Figure 5.1. from one medium to the other. The image appeared as a double-page spread in the printed magazine but was separated as two single pages on the website. This resulted in 50% of participants experiencing adverse effects during viewing on the website, describing it as "harder

to understand," "harder to visually connect the two parts of the image," "not cohesive" and "losing meaning."

When the arrangement of elements in an image is disrupted by the removal of one or more items intended to function together with others and present a certain type of meaning or aesthetic, the semantic meaning of the image is broken. The *Australian Geographic* magazine was presented on the website as a digital replication of its printed counterpart.

This was an early form of transitioning texts from print to digital, without consideration given to the presentation limitations or requirements of translating and viewing previously printed material on screen.[778] Viewing on computer screens is performed by scanning and skimming texts rather than sustained reading. This was not an affordance provided by the online version of the *Australian Geographic* magazine. Information was presented in portrait form on the website and participants were required to use scrollbars supporting both continuous and discrete scrolling operations to access images. Thumb and index finger page-turning was replaced with the previous and next buttons and double-page spreads were separated.

During the photo-elicitation tasks, some participants expressed a level of difficulty in understanding the double-page spread image when displayed as separate pages on the magazine's website. This presentation removed important image elements crucial to participants perceiving the composition of the scene and understanding its meaning. An important aspect of visual communication is the idea that elements in composition work together supporting each other to convey meaning:

> "It's harder to connect the bird. Looks like a separate image of a bird on a porch." (9s, website)
> "You may not remember the turkey from the page before. The image loses much of its meaning." (5s, website)

778 The online presentation of print-based material has undergone a transformation since the 2017 data collection for this study. Increasingly, online content is designed acknowledging screen viewing patterns such as the "F", "Spotted" and "Layer-cake" patterns which are prevalent in online environments.

Descriptions of the image did not change dramatically across the two mediums. Participants viewed the same set of images presented non-sequentially, firstly in the magazine and then the website (see Chapter 3: Research Design). A 30-minute interlude was allowed between the two viewing activities. It is acknowledged that interpretations would already be formed from the first viewing encounter. This influenced results to some degree with the transfer of previous answers provided when viewing the magazine to the website photo-elicitation. This is expressed as a limitation (see Chapter 7.4)

Symbolising

The purpose of presenting the following image to participants was to detect differences in the symbolic reading (conception) or the connotative meaning and interpretation of the image comparing viewing in the printed magazine and the website.

Figure 5.2. Symbolising. “What does this image symbolise to you?” *Australian Geographic* Magazine. May–June 2016. Courtesy Australian War Memorial.

The responses showed a tendency to begin describing the image’s literal aspects. This occurred previously when participants viewed a different image (Figure 5.2) and may have influenced their approach to this question, as the process would more likely be stored in short-

term memory stores; they had rehearsed the procedure. Rehearsal is an important factor in maintaining and remembering information.[779]

When symbolic aspects were expressed, participants offered personal interpretations that were quite different from one another. However, these interpretations were consistent with the interpretivist perspective acknowledging the influence of learned cultural behaviours when associating image elements to concepts. An individual's concepts derived from an image are influenced by cultural norms, prior semantic knowledge and experience. Images are understood in these contexts which become "instruments" in interpreting one's relationship and experience with the image.[780]

Seven examples of these "known" concepts were expressed by participants when viewing Figure 5.2. They are presented in Table 5.2 below.

Table 5.2. Concept Matching to Signifier – Symbolic Interpretation	
Signifier	Concept/Signified
Teacher	Authority
Group of Children	Unity, Groupwork, Subtle Rebellion
Monochromatic Image	The Past, History, Vintage
Ship	Movement, Migration

There was no significant difference in interpretation of symbolism between the two mediums, with responses indicating the image was understood as representing a historical event:

> "A vintage image of a group of mostly young people, possibly part of a study tour." (7s, magazine)
> "This image symbolises the past … a representation of history." (6s, magazine)
> "Black and white suggest it is an old image, a memory of days past." (3s, website)

779 Roy Lachman, *Cognitive Psychology and Information Processing*, eds. Earl Butterfield and Janet L. Lachman (Hove, East Sussex: Psychology Press, 2015), 244, https://doi-org.ezproxy.uws.edu.au/10.4324/9781315798844.

780 Uwe Flick, *An Introduction to Qualitative Research*, 4th ed. (London: SAGE Publications, 2010), 84.

Any differences in viewing experience expressed between the two mediums were the result of the inherent characteristics of the medium. These differences were either of a technical or physiological nature. If technical, the image was separated on the website:

> "Important symbols from the image are now on a separate page. You can't see the teacher so now they look like war orphans." (5s, website)

If of a physiological nature, the effect of the transmission of light through the computer screen illuminating the image to a degree of brightness was described by one participant as endowing the image with a "happier naiver feel."

> "The image is a lot brighter. The brightness gives a happier naiver feel." (2s, website)

Meaning

The image below (Figure 5.3) was shown to participants to confirm whether meaning would change across both magazine and website viewing.

Figure 5.3. Meaning. "Look at the image. What does this image mean to you?" *Australian Geographic* Magazine. May–June 2016.

Responses revealed a combination of literal and connotative descriptions with no marked differences in meaning expressed across the two mediums. Two participants noted the change in the physical representation of the image when viewed on a computer screen. Colour saturation on screen can operate to increase engagement by triggering physiological responses to visual stimuli (see Chapter 4.7: Neuroscience and the Phenomenology of Body, Mind and Image). This was not expressed by participants when viewing images in print and indicates that brightness and saturation can be used as devices to create impact and memorability by setting in motion the brain/body affective responses to visual stimuli:

> "The image still looks great, bright, vibrant. Red cardigan stands out on the white computer background." (5s, website)
> "… the colours are more vibrant, so I focus on the image more." (2s, website)

Narrative

Figure 5.4. Narrative. "Without looking at the text describe the narrative in the series of images." *Australian Geographic* Magazine. May–June 2016.

When viewing the images in Figure 5.4, all participants identified mangoes and mango farming as the focal point of the narrative. Interpretations did not change across the two mediums with the narrative expressed in denotative terms, indicated by participant responses below.

In this interaction, the pragmatically arranged image sequence conveyed the literal and unambiguous meaning using the carefully arranged image sequence. This indicates one of many possible photographic manifestations and engagements we have with images produces meaning on a representational level in online and printed mediums:

> "A story about people/workers who grow and collect the mangoes." (4s, magazine)
> "I believe it is talking about the farming industry more precisely the mango farms and how it is run, and how each person is important to every aspect of the process." (1s, magazine)
> "It shows the technology to process and also shows the different types of mangoes that they have." (8s, website)

Across all images the semiotic process of meaning can be observed within an editorial process; the images viewed were a replication of those in the printed magazine transposed onto the website. Accordingly, it seemed traditional semiotic devices such as connotation and denotation were evident as well as cultural influences applied to meaning. Learned concepts were also expressed, such as black and white representing "old" and teacher as representing "authority" (Figure 5.2). This idea emanates from the exposure to this sample group of traditional analogue photographic techniques, including the association of monochromatic images with pre-colour photographic technology.

There was no marked difference detected in the way images are understood in the photo-elicitation task, despite being presented in different mediums. Images were inherently understood the same way despite the technology on which they are viewed.

In this study, when looking at the same image in print or on a website in this setting images are broadly understood in the same terms. For example, an elderly woman playing the piano in a nursing home viewed in the printed magazine will still be perceived the same way on the website. The data collection setting allowed for a focussed singular engagement with the images and the results indicated semiotic codes provided the same meaning across both mediums. This is by no means definitive and other settings that use different viewing technologies, semiotic

codes and associated responses from participants can change. This will be discussed further later in this chapter.

Meaning, Interpretation and Understanding

There was no consensus to clearly establish the meaning, understanding or interpretation of the message of an image would be different when viewed in online or printed mediums. However, some participants agreed that viewing search engine results can impact the way meaning is derived from an image:

> "The meaning will change because it's not standalone . . . it's going to be drowned out if it's competing with other images . . . and one might not be as clear, so the meaning might be lost there." (3s)

Data gathered during photo-elicitation Phases 2 and 4 support existing semiotic theories that meaning is based on the coding and decoding of an image's meaning and influenced by the arrangements of its visual elements and the observer's knowledge and world view. This is the genesis for higher-order processing that leads to understanding. To some degree it remains fixed, being neurologically and environmentally configured and constructed over a person's lifetime. Yet this ontology of western cultural knowing has the potential to be disrupted by the influences of chaotic, multi-stimuli environments presented through pervasive screen technologies, the human behaviours they facilitate, the contexts of interactions and *a priori* neural processing that forms an integral part of cognition.

Data from interviews with both participant groups' questions provided distinct nuances of interpretation between the two extremes of "An image is an image. It doesn't matter where it comes from" (15p) to "The meaning will change because it's not standalone in a Google search . . ." (3s). In between these two extremes, concepts of scepticism, neutrality, insignificance, and imprecision were noted. These themes require further investigation to clarify the influence search engine results have on image apprehension.

The concept of scepticism will be discussed further in Chapter 5.5: Digital Fauxtography. Suffice to say that the image's veracity can be questioned due to the presentation of images from many unvetted sources.

Scepticism

> "I would be very sceptical of what I'm looking at on Google search because it pulls up whatever they can from many different sources. They don't verify the images." (7s)

Neutrality

This was a term applied to the perceived detachment of a Google image search.

> "It's quite a neutral context, isn't it? It's just a search." (9s)

Insignificance

The ubiquitous results of a Google image search may signify the dollar bin of the internet: "they take this brilliant photo and it just ends up in part of a mass Google search" (13p). An inability to observe the image in isolation, therefore, creates a perceived loss of value of the image because of the similarity and universality of the alternatives. In this sense, we could argue that meaning is lost.

Imprecision

The nature of an image search, together with the presentation of results as smaller hyperlinked versions of the image's larger self, eventualises in a broad visual array of image types. This sets in motion a twofold interpretive and selection process:

a) assessing the suitability of the smaller image amongst its myriad counterparts and

b) selecting the smaller image to further assess its suitability for the intended purpose via its larger counterpart.

This can be a time-consuming process executed in a cluttered environment where we need to consider the effects of external stimuli, including other images, on attention, and those of visual masking, where the visibility of an image is reduced by the appearance of another (see Chapter

4.6). It is not the purpose of this study to offer a detailed discussion on the effects viewing images from search engine results has on apprehension but to acknowledge them in this context as one of many where images are encountered. Further consideration of this environment is the utilitarian task of the image search; a reciprocal perfunctory activity executed synchronously by human and machine, a task less about interpreting the meaning and more about the practical considerations of suitability for a specific task, such as enhancing a PowerPoint presentation or supporting textual information:

> "If I see an image in Google search, I will not interpret anything from it. I might look at the source of the image and then decide." (8s)

Meaning and Social Media Images

Images in social media environments are conveying meaning in different ways that are not necessarily fixed to indexicality. The following participant quote provides an insight into how images are used to convey meaning in such settings. Emergent themes are the performative role of images, used to enhance a sense of self through affirmation consolidated through likes, the quantitative accumulation of positive comments and views and images as a means to an end for narcissistic performance and attention-getting "stunts". The following participant quote provides an insight into how images are used to convey meanings in such settings:

> "Instagram and all those different platforms have changed things. Now it's the idea of images pulling people into your site and getting you rankings and likes. Kids are being taught very early about how to set up images just to get likes. Images have become important to get yourself out there. It's basically advertising, isn't it? How to get my face out there. How to get more likes. What do you do? You go to steal a car and you video it." (15p)

It must be noted that these viewing environments and image practices did not exist in Peirce, Saussure and Barthes's day. This brings us to a rudimentary but important observation: the need to extend the photographic treatise into areas of digitality and to critically ask whether these traditional semiotic theories are relevant in these circumstances. This is discussed further in Chapter 6: Interpretation.

Meaning and Semiotics

Questions were structured priming participants to consider their responses through semiotic and social semiotic principles operating within Western social and cultural conventions. The semiotic concept of the sign was introduced into the questions to tacitly relate participant responses directly to these theories (see Appendices 1). All practitioners and student participants agreed images are understood through the individual's culturally and socially constructed meaning.

Despite this, the data reveals that meaning elicited from images can change from one medium to another when assessing differences in image apprehension using conventional semiotic practices. Meaning-making occurs through mediated inflection cast upon images through the inherent physical characteristics of the forms of technological representation and the types of social and mental interaction they encourage. Images are polysemous objects open to a variety of interpretations. This polysemy intensifies through today's varied and constantly evolving technologies and social practices.

Barthes referred to the image as a floating chain of signifieds.[781] To illustrate this concept, let us consider a printed magazine using a different visual communication language to that of an online blog. In this scenario, we can assume the signifieds in one language do not correlate to those in another. This is critical because that image occurring within the different contexts associated with the environments within which it appears will elicit different evaluations.

781 Roland Barthes, *Image, Music, Text,* trans. Stephen Heath (London: Fontana Paperbacks, 1984), 39.

The following participant comment indicates the importance of contextual understanding and of anchoring meaning with textual support:

> "When we see the amazing picture, maybe in a magazine article with the headline and the body copy, we can see it in a context very quickly. Whereas if we see the image on its own, we just don't know what's going on and how it got to be there. A lot of the story part gets lost." (12s)

There is still the possibility of applying certain semiotic conventions to the meaning of an image in a fluid digital environment. For example, suppose one possesses visual communication skills; in that case, it may be possible to impose a definitive meaning onto the image by associating it with a linguistic message, thus overriding the contextual or ambiguous impositions of the technologies delivering us the image. This proposition, however, does not consider the intuitive and spontaneous reactions that we experience toward images, nor the neurological-based processes activated in certain viewing situations. Visceral reactions toward images are discussed further in Chapter 6: Interpretation.

Themes of Change

How does meaning change from one viewing environment to another? The following table illustrates five themes of change that emerged from the data. These are contextualised within key discourses and supported by participant insights.

Table 5.3. Themes of Change Affecting Meaning

Themes of Change	Key Discourse	Participant Insight
Distraction	It is difficult to maintain singular focussed attention online when a person is confronted by competing visual stimuli. This can prevent meaning-making.	"People just switch off. They don't pay as much attention as they would if there were fewer images." (13p)
Believability	Varying modalities of truth are associated with different mediums.	"If you see the same picture on a newspaper, you would be more likely to believe it compared to seeing the same picture online. You'd be sceptical, this isn't real." (7s)
Multitasking	Multitasking allows more content to enter the visual field causing a shallower level of interpretation.	"On their phone, they've got different things happening at the same time. They're not actually concentrating on one specific thing. It affects the way

Table 5.3. Themes of Change Affecting Meaning		
		you interpret images because you can focus less on them." (11p)
Stronger meaning through linguistic message	Textual description acts as a substitute for personal interpretation fixing the author's desired meaning to the image.	"The story behind the image adds meaning to it. In a magazine article, we see the amazing picture with the headline and body copy, we can see the image in context very quickly." (12p)
Shallow Interpretation	Different devices offer modalities of meaning.	"You would get a shallow meaning when you're flicking through the smartphone." (10s)

The themes of change include distraction, moving rapidly from one information source to another, the type of communication environment and the associated expectations of inflection for that medium. For example, an image seen as part of a news story is perceived differently to an image appearing in social media. The news story may have an air of authority, believability, information value, while the social media image lacking the first two of those values operates as an attention grabber or an information node, informing online listeners within a particular social group about selected moments of a person's day-to-day life.

Grammatical and Visual Conventions

There are certain grammatical and visual conventions when it comes to printed mediums such as magazines. The *Australian Geographic* magazine stories are conveyed through images and text, each reciprocating anchored meaning, one supporting the other. Online visual communication occurs in a more unstructured, non-linear way with many alternative and hyperlinked paths that can be taken to view information. Images in the online environment can appear in a variety of ways not always supported by industry-based, visual communication conventions, sometimes supported by text or caption, at other times appearing on their own. This is due to the internet's egalitarianism; everyone, amateur or professional, has the potential to publish. While online presentation formats may have their conventions for information

presentation, it is not always predictable as to how amateur authors will present information within those structures.

These inconstancies in presentation offer the potential for many different contextualisations of information display. Meaning would be different across these contexts. Each presentation format can alter the nature of the image, our intent toward it and our visual and mental realisation and apprehension. We view images in printed magazines, on devices such as smartphones, desktop computers and as elements of communication on blogs or in social media environments; the image's meaning is not freestanding or independent from the medium within which they are viewed. The medium's physical characteristics play a part in altering meaning, as do external influences and elements within the image, including colour and composition. Each form of viewing, including those performed within printed mediums, play a part in the makeup and presentation of the image and can influence apprehension. The variations and possibilities of representation conditioning image apprehension are more voluminous when images appear via digital mediums. These aspects of representation are illustrated in Figure 6.5, P.E.M.I. Effects Compass (Chapter 6, page 256).

This section has described how semiotic conventions influence our understanding of images in print and digital media environments. The following section discusses how external stimuli impact our understanding.

5.2. Visual Noise and Disrupted Sensibilities

Distractions from external stimuli are affecting our ability to process information. The data collected in this study supports existing literature revealing the changing ways we process information and our brain's ability to process and adapt to the multiple streams of information that are available to us through digital devices. The neurological effects of these conditions are altering the physical structures of our DNA with neural circuits being repurposed by digital

reading.[782] The brain is adapting to these environments and information is processed differently with an increase in fragmented information processing[783] and "hyper attention," or the flexibility to rapidly move between different information streams."[784]

The ubiquity of information pushed to us from a plethora of devices and the speed and magnitude at which this occurs have induced two neurological states within us when we come to view digital information. These states were referenced by participants. One was somnambulant wakefulness:

> "It's just like an irrational movement going through the phone. Though we're watching the screen we're not actually reading or paying much attention. It's just a habit. (13p)

The other state is of transcendental *a priori* processing of information:

> "You swipe through things really quickly and something goes 'ah' stop and then that's the one [image] you spend more time on. It's like a filtering process." (9s)

We are also accessing images differently online compared to print, alluded to by this participant:

> "The way that people consume images online would have to be like short bursts." (3s)

Participants noted that these aspects of accessing and processing information have consequences on the way we apprehend information affecting the following cognitive dimensions:

> Attention: "…the attention span of people using digital devices is very short." (13p)
> Comprehension: "…when I'm using a smartphone, I'm not able to comprehend the image as well…at the end of the day everything is cluttered in your head. You haven't absorbed real information at all." (7s)
> Motivation to engage with content: "there's stuff overlapping, sooner or later you switch off." (10s)

782 Hayles, *How We Think*, 66.

783 Liu and Gu, "Media Multitasking, Attention, and Comprehension," 67.

784 Hayles, *How We Think*, 69.

Much of the literature refers to studies focussing on the processing of texts, reading comprehension[785,786] and using shape primitives to detect effects of multitasking on cognition.[787] However, there is an increasing body of research that centres on the way we process visual image and media content in different media environments.[788,] This discussion augments that research on the way we cognise images.

The extreme amount of information that we are confronted with inundates our perceptual abilities preventing us from commencing the process of meaning-making:

> "There's an oversaturation of images so they're switching off sometimes. They just see images they don't want to, especially through social media." (13p)
> "It's [internet] like a noticeboard that's got so much on it, there are pins falling off and there's stuff overlapping, sooner or later you just switch off." (9s)

Despite these demands on cognition, the brain may be adapting through its inherent quality of plasticity where cerebral neurons can "change their structure and function in response to experience".[789] For example:

> ". . . but there's also the potential that [multiple channels of communication] are also training us to absorb information more quickly." (9s)

Participants noted there are beneficial aspects of the omnipresent image where visual literacy, knowledge and awareness of the world are enhanced:

> "Everyone's got instant access to a camera on their phone. Everyone's got lovely filters that you can make it [image] look good. So yes, people are much

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785 Xuefei Gao, Elizabeth A. L. Stine-Morrow, Soo Rim Noh and Rhea T. Eskew, "Visual Noise Disrupts Conceptual Integration in Reading," *Psychonomic Bulletin & Review* 18, no.1 (February 2011): 83–88, http://ezproxy.uws.edu.au/login?url=https://www.proquest.com/scholarly-journals/visual-noise-disrupts-conceptual-integration/docview/920259625/se-2.

786 Anne Mangen, Bente A. Walgermo and Kolbjørn Brønnick, "Reading Linear Texts on Paper versus Computer Screen: Effects on Reading Comprehension," *International Journal of Educational Research* 58 (2013): 61–68, https://doi.org/10.1016/j.ijer.2012.12.002.

787 Ophir, Nass and Wagner, "Cognitive Control in Media Multitaskers," 15583–15587.

788 Chrissy M. Chubala, Tyler M. Ensor, Ian Neath and Aimée M. Surprenant, "Dynamic Visual Noise Affects Ill-defined, Not Well-defined, Images," *Memory* 28, no. 1 (2020): 112–127, https://doi.org/10.1080/09658211.2019.1691236.

789 Alessandro Sale, Nicoletta Berardi and Lamberto Maffei, "Environment and Brain Plasticity: Towards an Endogenous Pharmacotherapy," *Physiol Review* 94, no. 1 (January 2014): 189, https://doi.org/10.1152/physrev.00036.2012. PMID: 24382886.

> savvier when it comes to photography, they're far more visually literate." (11p)
> "Images are more widely available now in terms of media and the Internet. People are more aware of different types of images and have become more educated more literate because of computer technology…. more aware of the world because they've got more access to information through the Internet." (13p)

It is important to note that each technology encourages modalities of cognition. These correlate to the levels of visual noise expressed by participants (the higher the level of visual noise the lower the modality of cognition). The following table illustrates these modalities induced by the device type and level of visual noise. This has implications in the choices we make on the way we create and use images. Participant responses indicated that when creating images for smartphone screens that are associated with a high level of visual noise and low cognitive modality (reduced attention and engagement – see Table 5.4), image choices require "shock value" or the "wow factor," using manipulation of colour and content choice[790] to mitigate the effects of modality level and visual noise.

Table 5.4. Modalities of Cognition per Technology						
Technology	Modality			Level of Visual Noise		
	High	Medium	Low	High	Medium	Low
Printed Magazine						
Newspaper						
Desktop Computer						
Laptop						
Tablet						
Smartphone						

There are occasions where selective processing of information can occur very quickly, undeterred by the interference of external stimuli. When our sensibilities are inundated, our perceptual abilities allow us to select the salient objects in our surroundings to efficiently process

790 Participant 15p.

stimuli. During visual processing, the mechanisms of selective attention allow us to select a particular part of a scene or image upon which to focus.[791]

> "I can just flick through it and then my peripheral vision, my automatic senses will pick it out. The effect is where we're absorbing information quite quickly." (9s)

The Effects of Visual Noise

Visual noise can be considered as anything that might transform, distort, block, or add to what we see. Table 5.5 illustrates the types of visual noise participants identified and the subsequent effects experienced. It outlines how visual noise can affect the degree of attention, the efficiency of cognitive processing, ability to remember images and the quality and type of engagement we have with images.

Table 5.5. Visual Noise: Descriptor and Effect

Descriptor	Effect
Too much competition between too many sources happening at the same time	Less ability to focus Distraction
Bombarded with images Many different channels	Can't absorb information Loss of attention Faster comprehension, less retention
Different things going on	Your interpretation may change No time to think Don't see an image Forget an image
Multitasking	Not paying much attention just skimming Able to absorb information on a shallow level

Other factors can play out to circumvent these effects and it is not certain how and when these factors occur. Certain neurological and physiological processes, such as the way information is stored, processed and retrieved by the brain and experienced by the body, can influence and facilitate cognition allowing certain images to captivate and hold our attention.

791 Richard A. Abrams and Mark B. Law, "Random Visual Noise Impairs Object-based Attention," *Experimental Brain Research* 142, no. 3 (February 2002): 349, https://doi.org/10.1007/s00221-001-0899-2.

How and under what conditions these processes do this warrants further investigation through a combined neuroscientific and social sciences study.

For example, the cognitive processes of episodic or semantic memory (see Chapter 4.5: Recall and Retrieval of Memory) can be triggered by certain images creating more affective experiences and a stronger connection with the image. Episodic memory evokes a sense of familiarity, a re-experiencing of something that occurred in a different place and time.[792]

The following comment illustrates how an image activates episodic memory through the image viewing experiences of participant 5s:

> "That image stuck with me. It had a connection with me. I was always trying to do that and it looks like somewhere I've been or want to go." (5s)

Semantic memory can be described as organised knowledge a person has about an image, its meanings and referents and the relationships among them. This knowledge has been encoded over time.[793] Semantic memory can also support cognition.[794]

The following participant comment offers an example of semantic memory using previously-stored knowledge to assess the salience of an image:

> "They had composition to them and a depth of field. That care of the composition made them more memorable." (9s)

The effects of visual noise can be detrimental to the way we apprehend images; this assumes that we can see images at all under these conditions. Apprehension requires the allocation of sufficient attention toward a visual task. Diffusing attention across multiple channels is not

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792 Michael W. Eysenck and Mark T. Keane, *Cognitive Psychology: A Student's Handbook*, 7th ed. (London: Psychology Press, 2015), 266.

793 Endel Tulving and Hans J. Markowitsch, "Episodic and Declarative Memory: Role of the Hippocampus," *Hippocampus* 8, no. 3 (1998): 202, https://doi-org.ezproxy.uws.edu.au/10.1002/(SICI)1098-1063(1998)8:3<198::AID-HIPO2>3.0.CO;2-G.

794 Melissa C. Duff, Natalie V. Covington, Caitlin Hilverman and Neal J. Cohen, "Semantic Memory and the Hippocampus: Revisiting, Reaffirming, and Extending the Reach of Their Critical Relationship," *Frontiers in Human Neuroscience* 13, no. 1–2 (2019): 1, https://doi.org/10.3389/fnhum.2019.00471.

conducive to deep engagement, encouraging a shallow interaction affecting the ability to fully apprehend. Despite this, we see that certain technologies offer more cognitive control of information processing. In this study, it was evident that interference from visual noise is less likely when viewing images in printed magazines due to usage characteristics of the medium. For example, a lifestyle magazine encourages a leisurely interaction offering the potential for a focussed engagement with content. To a lesser degree, a desktop also offers possibilities for focussed engagement. This is facilitated by larger screen size and its common association with work or study:

> "Size has a lot to do with the viewer's ability to comprehend and absorb information from images. My desktop computer is 21". It's quite big. That's definitely going to have more impact." (14p)

5.3. Altered Encounters of The Fourth Kind

To appreciate the significance of the findings of image perception, particularly concerning the social media image where changes in image usage practices are significant, it is worth considering these practices within a historical context. Therefore, this section discusses four altered encounters that we have experienced with images and articulates the significance of attitudinal change expressed by participants compared to previous social practices.

Scholars such as Lee et al.[795] and Gomez[796] have presented a topology of technological movements, moments, revolutions and epochs where seismic changes have occurred in the way people conduct their lives. One could include our encounters with the digital photographic image as part of this topology. Technological developments tend to transform the way society operates, creating new conditions that encourage new types of social behaviours not present prior to the

795 MinHwa Lee, JinHyo Joseph Yun, Andreas Pyka, DongKyu Won, Fumio Kodama, Giovanni Schiuma, HangSik Park, Jeonghwan Jeon, KyungBae Park, KwangHo Jung, Min-Ren Yan, SamYoul Lee and Xiaofei Zhao, "How to Respond to the Fourth Industrial Revolution, or the Second Information Technology Revolution? Dynamic New Combinations between Technology, Market, and Society through Open Innovation," special issue, *Journal of Open Innovation* 4, no. 3 (2018): 21, https://doi.org/10.3390/joitmc4030021.

796 Cruz and Meyer, "Creation and Control in the Photographic Process," 203–221.

technology. These moments encourage a distinct form of encounter with the photographic image.

Encounter 1: Reality and Representation

The first stage is "reality and representation"; the photograph viewed as a direct representation of reality associated with nineteenth-century positivist scientific thought. Again, using the natural sciences as a model for understanding the world,[797] the technical and physical aspects for creating photographs such as effects of light, exposure time, and preparation of chemical emulsions were dominant considerations.

Encounter 2: Democratisation

The second notable encounter with the photograph was photography's democratisation via the snapshot image beginning in the twentieth century. Photography was able to be performed by people other than professionals. This introduced a form of sociality to the image in an environment where increasing pictorial communication of people's lives was shared through snapshots displayed in family albums. [798]

Encounter 3: Digitality and The Internet

Our third encounter with images began in the late twentieth century –the transformation of conventional to digital photography. The digital, megapixel sensor capturing camera combined with the connectivity of computers and the internet allowed images to be stored and displayed on computers and shared over the internet. This encouraged the further democratisation of photography, allowing consumers to take many photos at little cost. [799]

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797 Grix, *The Foundations of Research*, 81.

798 Richard Chalfen, *Snapshot Versions of Life* (Madison: University of Wisconsin Press, 1987), 9, http://ebookcentral.proquest.com/lib/cqu/detail.action?docID=3444963.

799 Henry C. Lucas and Jie Mein Goh, "Disruptive Technology: How Kodak Missed the Digital Photography Revolution," *The Journal of Strategic Information Systems* 18, no. 1 (March 2009): 49–50. https://doi.org/10.1016/j.jsis.2009.01.002.

Encounter 4: The Social Media Image

The altered encounter of the fourth kind encompasses our interactions with the social media image created primarily through the ubiquitous camera phone. These encounters are significantly different from those experienced in previous epochs. The sharing of social media images heralds the unprecedented use of the image in visual online conversations. These images are often used to construct self-identity and as representations of our everyday lives blurring the boundaries of our online and offline worlds. This represents a change from representation and signification toward unparalleled democratisation and online self-representation and the presentation of the everyday. Images are in communication; they are increasingly used in oral form in changing online social communication practices (see Chapter 4.1: The Image in Digital Culture).

We could further argue we are amid a fifth kind of altered encounter, that of experiencing images inhabiting the immersive artificial environments of virtual, augmented and mixed realities and through deepfake technologies. These are AI technologies designed to read and replicate visual objects, merging, combining, replacing, and superimposing visual elements to create fake visual content that appears authentic[800] (see Chapter 5.5: Digital Fauxtography). It is beyond the scope of this discussion to offer an in-depth analysis of these developments. They are mentioned as an acknowledgement of the rapidly evolving condition of the image. Understanding the changing nature of encounters can account for participants' perspectives and comments on the changing use of photography that emerged in the data.

Changing Uses

Smartphone photography has altered how we interact with, understand and communicate with images. We are engaging with images in new ways, a communality of sharing visual

800 Maras and Alexandrou, "Determining Authenticity of Video Evidence," 255.

conversations through networked social environments. These are new types of encounters where our lives are performed through images on social media.

These images are not designed for semantic deconstruction or to be engaged with in any in-depth way. They represent personal narratives, itemised accounts of day-to-day life, observations, feelings and attitudes, more of a confirmation of presence in the social media space where space itself is a consumer-desired commodity that offers value and belonging to desired social groups. At times the presentation of oneself through social media can appear as the narcissistic performance of a constructed realities of the self:

> "I'm really important look at what's going on in my life." (9s)

Online social media images are transient, designed for instant consumption and experienced as conversation. Once the utterance and the desired effect has occurred, they are disposable. They have done their job:

> "…rather than throw away images like social media where you just look at images of people taking it of their food, of craft they're making or whatever." (12s)

We breathe the social media image through the smartphone, the habitual expedient of our everyday lives. These images are an augmentation of ourselves. They have become more than extensions of our "human senses" as McLuhan argued,[801] they have become us; our lives are data and devices; we see, speak, listen and live through images.

These omnipresent images constructed from data will outlive us in a cryogenic state of existence on virtual cloud databases offering the possibility for the future resurrection of our prosaic lives. These are very different encounters to those we experienced with analogue images of the past.

801 McLuhan, *Understanding Media*, 21.

Our encounters with digital images have been altered in other ways. We access and comprehend images differently. We scroll, tap, swipe and pinch images into existence on our screens. Skimming through content, we view them in short bursts, seeing only parts of images, sometimes not seeing at all:

> "Maybe I will pass and not look at the image. It's very difficult because there are a lot of images." (8s)

The way we look at and read digital information is also different from print. This information is presented in what Hayles refers to as "distributed cognitive environments" that initiate and demand Cyborg reading practices.[802] These are environments where apprehension occurs through the interaction between "writer, reader, designer," humans and computers,[803] dynamically and coactively creating meaning.

Therefore, the knowledge and cognition required to apprehend images does not exist solely within oneself. It also occurs through interactions between individuals, the representational media used, and the environment in which the activity occurs. This is a process encompassing human and machine actions, combining the internal process of thought, physical action and sensorial experience and finally the creation and exchange of external representations.[804] Our behaviour in this environment is altered by our interaction with digitality and all its accruements that need to be manipulated and processed by the individual for the realisation of the image and the process of apprehension to take place.

> "You're never really there when you have all these other things happening. You just have to turn off all your digital devices to really absorb all the information." (2s)

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802 Hayles, "Print Is Flat, Code Is Deep," 23.

803 Ibid., 23.

804 Edwin Hutchins, "The Social Organization of Distributed Cognition," in *Perspectives on Socially Shared Cognition,* eds. Lauren Resnick, John Levine and Stephanie D. Teasley (Washington, DC: American Psychological Association, 1991), 306, http://dx.doi.org/10.1037/10096-012.

From Linear to Divergent Narrative Paths

Viewing information and images on digital devices can involve an assortment of hyperlinked paths travelling from one media element to another facilitated by the tactility of touch screen interactions. We can travel into the image expanding and contracting its structure with screen-based gestures or mouse actions. We can bring into view particular elements that may interest us while excluding others, breaking the semantic code that would be fixed in two-dimensional images appearing in print. This ability to manipulate the image can enhance the viewing experience as expressed by the following participant:

> "You really experience the panoramic or the 360-degree view. You can zoom in and out. If it's a big landscape, you can zoom in over there. It's not just a flat thing anymore. It's got so much more depth, its nearly like a movie." (2s)

A more linear progression through information is taken in a magazine, a left-to-right scanning of information, a turn of the page forward or backwards brings images into view. As the visual path continues, the image remains fixed in size without the possibility of changing its view options.

However, despite the image remaining fixed in size the viewer has agency in other ways when interacting with images appearing in print. One can choose to view preferred images without other images coming into view unexpectedly from superstitial or pop-up advertising as with online reading. In addition, a person can spend more time with the printed image due to the singular attentive engagement the printed medium encourages. This is significant because the length of time is essential for cognition. The brain requires more than 500ms[805] for all its visual regions to complete processing of their specific areas of speciality, such as colour, shape, position, patterns and object orientation (See Chapter 6: Interpretation).

In the digital environment, a certain amount of decision making is removed from the viewer. Images are pushed at us from various sources as mentioned previously but can also include

805 Zeki, "A Theory of Micro-consciousness," 584.

social media posts and video recommendations through visual thumbnails. These images appear uninvited and may elicit affective responses on the emotional spectrum before further processing occurs. One could feel frustration and annoyance or surprise and delight. These precursor responses can set in motion the type of reaction the viewer will experience and whether the interaction with the image will continue. These initial touchpoints with the image are based on hedonic valence, which can be multifaceted and correspond to different types of evaluations or feelings ("micro-valences"). These are assessed and incorporated toward a realisation of either positive or negative experiences ("macro-valences") when engaging with an object [image]. [806]

The presentation of interface navigational elements and contextual links can be structured in such a way as to dictate the way the user will progress through content, offering distinct narrative pathways that are non-sequential and determined by the screen design and computer algorithms. Although the viewer has a certain degree of agency in instructing the computer, the underlying programs and code, the marshalling of bits and bytes to present information, also impact the mind's actions.

> "If people want to read print material they will get it, open it and read it. Through the Internet and social media, the image is there. You don't necessarily want to see it, but you open your Facebook feed and then something pops up without you wanting to see it." (13p)

The viewer is presented with many more possible methods of interaction with the digital image than one appearing in print. Choices are afforded by interactive navigational elements, such as hyperlinks and navigational buttons, accessed through keyboard commands, mouse movements or touch screen gestures allowing the selection, manipulation and viewing of chosen content:

806 Vera Shuman, David Sander and Klaus R. Scherer, "Levels of Valence," *Frontiers in Psychology* 4, (May 2013): 261, https://doi.org/10.3389/fpsyg.2013.00261.

> "If you're viewing an image online, you can zoom in on it. You can click on that image and it might take you to more information about it. You can dig deeper into the source of that image." (11p)

These methods of digital interaction can provide positive and negative experiences. They could add to the amount of visual noise we experience when accessing online images; however, we can choose engagement and manipulate viewing conditions to personalise the viewing experience. This is not possible with the static printed image where viewing different image aspect ratios is dependent on our field of vision focal length. Student participants were experienced in viewing and engaging with printed content. They could articulate their feelings, experiences and observations and compare them to digital viewing experiences through personal anecdotes and responses to this study's photo-elicitation data-gathering process. Some participants found the limited options to personalise the viewing experience in print affected apprehension of the image.

> "I couldn't really process the images as well in the magazine compared to the website. In the print magazine you can't really zoom in or download or view it in more detail or try different brightness and contrast options to better understand the image." (7s)

These altered encounters with images may become the status quo in future. The next generation may never access information in print, viewing images through a fully digitally networked experience of virtual and mixed realities.

> "A 15-month-old is so into the phones and the iPad and all that stuff and they're not even two yet. At that age they're already used to images – high colour, high interaction at high speed. Wow! where are they going to be in ten years' time? (15p)

5.4. The Spaciotemporal Image

Images are consumed in space and time. The production and consumption of images are happening in movement. Images are components of configurations of place and time.[807] On the

807 Pink, "Sensory Digital Photography," 4.

perceptible [external] level we access them daily in different spaces, on various devices at places of work or study or in spaces of online or offline social activity. These interactions can happen at any time of the day synchronously or asynchronously. Each of these diverse spatiotemporal moments exerts an influence on how we apprehend images.

The spatiotemporal experience of images can also occur on a mental level [internal]. The activation of the mental image can be considered a temporal moment, a process of seeing and experiencing occurring in the mind. Viewing an existential image can bring about this phenomenological moment. Such images can activate the mental sensation of teleporting a person back in time to a moment once visited or allowing the imagining of oneself in a new moment. This is a form of virtual reality of the mind, actualising the past in the present as a mental image:

> "I remember the one of the little baby snake because it has a connection to me. I remember this time when my uncle had snakes. I remember one like the one in the magazine, the smallness of it wrapping around my arms. It brought back memories." (2s)

This is not only a phenomenological moment but also a neurological one where cognitive processes of short- and long-term memory, semantic, episodic and autobiographical can be activated through images. These processes occur in space and time.

Temporality

Temporality can also be expressed through synchronous and asynchronous communication via images. Both print and online communication allow a copresence of interaction through time and space, one physical the other virtual, with different temporalities affecting the quality of communication. In print communication, the viewer is present with the image or text in the moment while online there is the potentiality for copresence between the viewer, the image and

the sender. This offers a sense of immediacy online, where the image is considered a more effective tool of communication expressed by participant 7s below. Asynchronous communication is also a characteristic of both mediums where a time delay occurs between the moment communication is sent and when the recipient views the information and responds.

When asked whether communication through images is more effective in print or online, the following participant expressed the idea of online "instant conversation" with the image being more effective when viewed in this situation.

> "It's different because people don't communicate much in print anymore. Everything's online. I don't know a lot of people who use snail mail to communicate on an individual level. Online communication is very fast compared to snail mail. You're communicating with someone instantly. The effectiveness of images in terms of communication when viewed online is more effective because online you're having an instant conversation with someone." (7s)

The temporal and locative nature of the viewing environment is particular to each technology which have their own spatiotemporal affordances; a desktop computer may be accessed in a work or study environment, a smartphone may be accessed in social situations, in movement or as a moment of distraction between tasks. A printed magazine or a newspaper may be accessed during a moment of leisure. Participants noted that the printed medium offers more time to contemplate the image. The medium encourages deeper and more focussed attention compared to digital mediums:

> "When you're looking at print you don't have as many distractions and therefore, you're concentrating more on the image and what It conveys." (14p)
> "I've got more time to look at a magazine and read it. My brain would say gee I've got some time now so I can sit down and read it." (15p)

This section of the discussion has highlighted the effects of different mediums and information streams which, through participants' unique spatiotemporal dimensions, encourage their own system of encoding meaning, providing multiple states of perception. Table 5.6 on the following page illustrates how visualisation and apprehension can be linked to a spatiotemporal

component unique to the viewing medium and how spatial and temporal variables impact apprehension.

Table 5.6. Relationship of Spatiotemporal Attributes to Image Apprehension			
Technology	Spatial Component	Temporal Component	Image Apprehension
Magazine	Page space, Home, Work, Leisure	"In a magazine you might take more time to try and work out the meaning of it [image]." (10s)	High
Newspaper	Home	"I used to spend all day reading The Sydney Morning Herald on a Saturday. Nobody's got time for that shit anymore." (11p)	High
Desktop Computer	Screen space, Home, Work, Study	"Meaning would be easier to comprehend on a desktop computer because in my case I'm usually at home when I use it". (7s)	Medium
		Scenario One. "If you see an image on a billboard you've got less time. If you see an image on your smartphone, you're reading it close. You might pick it [meaning] up quicker. You've got more time and more control. It's a huge difference in seeing an image in two seconds rather than one minute." (13p)	Medium
Smartphone	Screen space, Multiple locations	Scenario Two. "People on a Smartphone might be waiting, sitting in a cafe for a person to arrive. They've got a minute so they'll quickly fill in a bit of time and flick through not really paying much attention." (11p)	Low

5.5. Digital Fauxtography

This part of the discussion expands upon notions of photographic truth, covered in Chapter Four: whether that which is recorded by the camera is considered an accurate and authentic representation from the observer's orientation. Many of these discourses emanate from traditional semiotic propositions of indexicality, positivist epistemologies and visual accuracy, and rely on the binding relationship between the photographed object and the resultant image.

From a phenomenological perspective, an individual's belief in truth manifests in ways that associate with, and make sense within, their belief system. This, coupled with the many

modalities of truth possibilities presented through analogue and digital images and the tacit implication of the distinct technologies of viewing, indicate an epistemological fluidity of ontologies of truth and reality. We may even argue whether these ontologies are valid in an evolving world of AI, virtual, augmented and mixed reality and deep fakes.

The data indicates the shifting modalities of truth perceived by participants. These modalities are recognised as analogous to the characteristics of the medium within which the images were presented. The following table (Table 5.7) illustrates the overall participant responses to their concepts of reality as observed through different viewing media.

Table 5.7. Truth Modalities by Medium

Viewing Media	Truth Modality (high, medium, low)	Participant Perception
Magazine	Medium to high	"I trust the magazine image, it's there for a purpose." (15p) "Certainly, in something like *Australian Geographic* magazine, it has much more status to it." (9s)
Newspaper	High	"If you were to see the same picture in a newspaper you would be more likely to believe it compared the same picture online. You would be sceptical like 'oh maybe this isn't real'." (7s)
Blog	Low	"…on a random blog you could just upload any text or any image you feel like." (2s)
Website	High	"I would trust a website as a reputable source." (6s) "I would trust this image in a website because normally it's for company or enterprise." (8s)
Social Media	Low	"…the least amount of trust I would have is from social media sites." (7s) "I wouldn't assume they are because with social media and everything everyone's always posting images and they've gone through a lot of editing and stuff I guess that's the same as magazines." (3s)

Participants considered printed media as having an authoritative inflection on the image as a presenter of truth and reality even though they were aware of, and have been exposed to, photographic manipulation processes. This indicates the overriding effect of previously acquired knowledge and mental models of images created and presented through pre-digital photographic technologies, such as analogue film cameras and offset printing processes, making image

manipulation more difficult and therefore less likely. Participants considered printed images would less likely be manipulated compared to their digital counterparts:

> "Printed photos have for generations been done in newspapers, people are used to seeing pictures in newspapers and whatever they see in newspapers they generally believe. They have a cognitive bias that printed pictures are meant to be real. But it's changing now but people still hold on to the cognitive bias." (7s)

Images appearing in print are also associated with an editorial review process ensuring their veracity and relevance in supporting textual information. This was understood by participants as giving the image a higher level of credence than would be given if the image appeared online. The permanency of print would seem to indicate the likelihood and importance of ensuring credibility considering the difficulty in editing post-publication:

> "I would assume print represents reality because there's a process the image needs to go through before it gets published because print is like a permanent thing." (3s)

Physical and Haptic Experiences

When asked about their viewing experience in the Australian printed magazine, the following participant comment associated the sensations of "feel" with reality ("looked real").

> "It was easy as you could almost feel the images as they looked real." (5s)

Haptic experiences afforded by screen technology attempt to simulate physical bodily actions. However, the rich kinesthesia experienced through touching a malleable surface such as paper, the synergism of pressure exerted onto the skin and blood vessels and the subsequent neuronal message to the brain concreates a more intense neurological percept of reality with experiential apprehension. This was evidenced in the following participant comments:

> "The screen is not tactile like if you've got something in print. The texture of the paper feels really nice." (11p)
> "The images stuck in my head a little better maybe because of the physical feel of paper while analysing." (2s)
> "I prefer the printed book because it has the physicality and has a presence to it that electronic stuff doesn't have." (9s)

These sensory phenomenological experiences were not expressed by participants toward their digital viewing experiences. Haptic affordances of screen-based devices were expressed in terms of zooming in and out to change the magnification of the image but not through any form of expressive sensorial experience:

> "A tablet makes the image's meaning easier to comprehend because the screens are quite high quality and the tactile nature of them. You're not interacting with the image, but you can blow it up, not like a magazine. In print that's it, that's the size." (10s)

Photo-editing applications easily allow the manipulation of images, signifiers can be repositioned, altered and reused creating a new set of signifieds within the original image. This practice was perceived by participants as a common behaviour for images assigned to social media platforms. This reinforced participants' perceptions that social media images were:

***altered*:**

> "I know on social media you can find a white wall in your house and find a nice tree and a table next to you and then say hashtag staying at the Hilton this weekend." (5s)

falsified:

> "In social media sites it's about the image you want to project, it's not necessarily about truth. You might project you're this happy person having a great time and you could be miserable but you don't want to project that. It's a false image. (11p)

falsity in disguise:

> "On my Facebook, it is hard to believe some photos that you see. With all the photoshopping that happens you can't be sure online of what is true and what's not." (6s)

fake reality:

> "… like images in Instagram, they're not connected at all. The subject itself is trying to trump up a fake reality or there are filters on them or they're done in such a way that it's not reality." (10s)

The combination of the disparate terms "fake" and "reality" used when describing Instagram images by participant 10s indicate semantic disjunction.

Knowing that images have been altered does not prevent us from experiencing them in some form or another whether it be with disbelief, belief, ridicule, humour, indifference, or as visual greetings.

> "Generally, print photography is trying to represent reality whereas there's definitely more acceptance of completely ridiculous images online." (10s)

In social media narratives, the image is disconnected from the truth rhetoric becoming an icon for personal branding.

> "Kids are being taught very early how to set up images just to get likes and how to get yourself out there. Basically, it's advertising, isn't it? How to get my face out there." (15p)

Altered images are an expectation online in all contexts but they do have varying modalities of truth. As per Table 5.7, the contextual placement of the image is an indicator of its truth modality with social media having the lowest modality.

> "It depends on what the photo is but online everything these days is usually digitally enhanced no matter what it is." (4s)

Expanded Interpretive Possibilities

The DNA of the photographic image has its genesis in the conceptual intent of the photographer and will always be reconfigured through the various stages of mediation from concept through to its many forms of presentation. The result is a series of "simulacrum"[808] of the original, each altered throughout the various touchpoints of human intent, lens aberration, digitisation, manipulation, dissemination and interpretation; each one a bias of the truth intended or otherwise.

Digital photography has removed the "burden of representation"[809] from the image transfiguring indexicality to create a visual enigma of expanded interpretive possibilities. Each

808 Jean Baudrillard, *Simularca and Simulation*, trans. Shelia Faria (Ann Arbor, The University of Michigan Press, 1994), 121.

809 Tagg, *The Burden of Representation*.

image is a visual statement and we can choose how we respond to what aspects are meaningful for us of the vastly varying situations of reality. Therefore, the dichotomy of truth and falsity in the photographic image may become redundant in future as prospective generations may have less exposure to printed images. Viewers' perceptions of what reality is are shifting, acquiescing more towards affect responses:

> "It was a very visually appealing image. It gives you positive vibes." (7s)

5.6. Size Still Matters

When viewing images, the size of the viewing area is an essential factor affecting the interpretation of the meaning and the intensity of the immersive experience we have with them. Participants in this study associated a richer, more rewarding viewing experience with large size viewing than viewing at smaller sizes. This offered many benefits spanning mental, sensory and utilitarian qualities resulting in more effective information osmosis when viewing images at larger sizes. This is illustrated in Figure 5.5 below. This figure was designed from the data and based on views and experiences expressed by participants.

On occasion, some factors neutralise the "bigger is better" assertion. For example, smartphone personalised viewing habits can offer a more intimate connection with images if we engage with them in a singularly focussed, uninterrupted setting. Figure 5.5 on the following page illustrates the types of benefits afforded by viewing images of larger sizes. The benefits presented were indicative of participant data.

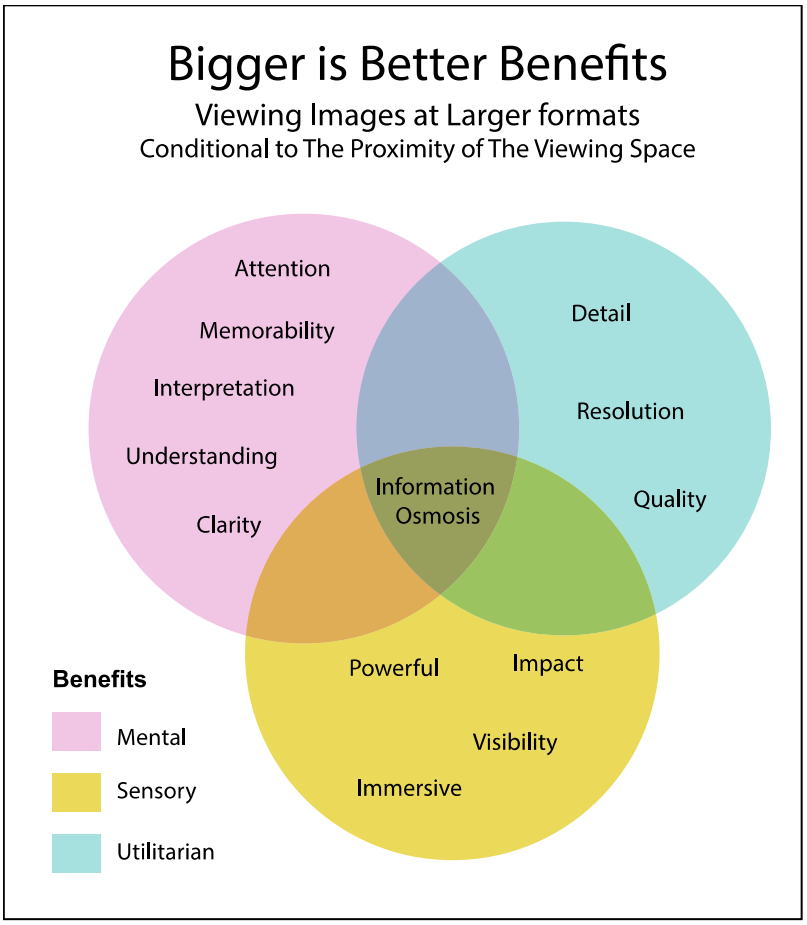

Figure 5.5. Bigger is Better: Viewing Size Benefits

Viewing images on a larger screen offered the sensorial affordance of being there in the moment, the ability to see images in more detail and understand them more easily than smaller screens. However, this is dependent on the proximity of the observer to the viewing area as noted by one participant:

> "… a lot of screens tend to be a little bit too big." (12p)

Being too close to a large screen may occlude parts of the image extending beyond peripheral vision. The amount of screen real-estate afforded by larger screen sizes also provided the utilitarian benefits of higher resolution, more detail and better quality. These viewing benefits were associated with easier image search and identification and better understanding:

> "It's a bigger screen so there's more detail on the pictures. The information will be absorbed quicker when you see it on a desktop or a laptop. You will be able to understand more of what the image is trying to show." (6s)
> "I would always do the same search again on a laptop so I can see images at a

> larger size. I don't want to look at images on the smartphone. Unless it's for something very simple because they're just too small." (9s)

The small viewing size of the smartphone screen may not be conducive to a deeper comprehension of the complexities presented in some images, with important detail being difficult to notice:

> "A tablet is quite small so for me to absorb something, it'll be a lot shallower but less shallow than the smartphone." (14p)

This may result in the misinterpretation of the image being viewed.

The Quality of Engagement is Contextual

The data indicates the quality of engagement with any form of content is context-dependent. Different devices favour certain types of interaction over others; however, participants still related the quality of interaction to the size of the device independent of the type of activity being performed. For example, larger screen sizes were associated with more engagement and the potential for concentrated attention. Conversely, smartphones were considered less engaging, encouraging shallow interaction where the content was skimmed through very quickly.

These types of interactions may be a consequence of screen size but are also indicative of device usage practices. Smartphones are devices used for quick access of information, social media communication and telephony activities while desktop computers are generally used for work or study. One encourages brief surface-level interaction and the other a deeper more extended engagement.

The practical limitations of smaller screen sizes can cause the misreading of images with signifiers interpreted differently to what may have been intended. This is despite the affordance of zooming to view the detail as indicated by the following participant:

> "A smartphone screen is so small you couldn't pay attention to it. I saw an image on a smartphone in the tutorial this year. It was a very high impact image of a child that washed up on the beach that had died. It was a famous image from some atrocity. I'd never seen it before. I didn't know what it was about. I thought it was just a kid who'd fallen in the water, so I laughed and

> everyone else freaked out because I hadn't seen it in any context at all and they'd already seen it in some other context. It's harder to comprehend an image and the complexity of a potential image on a smartphone because of the small screen even though you can zoom in." (10s)

Size is not the only determinate for encouraging engagement, immersion or facilitating the interpretation of an image. Other factors such as image content, screen luminosity, viewer intent, visual clutter and distraction can neutralise the benefits of larger viewing size. For example, personalised interaction and minimised interface controls on tablet devices and smartphones which increase screen real estate and reduce visual clutter, allow the viewer a positive interaction within the image:

> "It depends on the environment. If they are looking at it as a group or alone. I'd probably say tablet just because people focus in very quickly. Tablets don't have a keyboard. It's very one on one, it's very personal. A lot of screens tend to be a little bit too big." (10s)

The meaning of an image doesn't change due to size but the obstruction or the prevention of the meaning-making process can occur when viewing images on smaller screens. Occlusion may affect the interaction processes with smaller screens. This may impact the ability to see the detail through interference with the fingers when swiping or tapping on touch-enabled devices:

> "I don't think the meaning would change but when viewing the image on a smartphone it might be harder to interpret the meaning because it's a smaller screen and you won't be able to see it clearly." (3s)

5.7. Sensory Perception

Images can be apprehended more meaningfully and powerfully when experienced through various senses. For example, participants commented that the sense of touch provided a physical and mental connection when viewing mages in the *Australian Geographic*, as expressed by the participant comments below.

> "The images in the magazine felt real, they were easier to relate to." (1s)
> "The image was right there in your hands. It was more memorable, more detail to look into." (3s)

The senses of touch and vision and the resultant hedonic experiences play an essential part in acquiring knowledge and meaning.[810, 811, 812, 813] Furthermore, vision is not purely visual, but a multisensory embodied experience, closely linked to touch and haptic perception.[814] We see and touch images, images touch us.

Viewing images in the printed medium can be described as an active act of sensory perception. For example, when thumbing through a magazine we hold and squeeze the page corners turning them to advance to the next page. We engage the act of touch, as well as our visual senses.

This type of interaction can provide for a more intense experience when looking at visual stimuli, one that is embodied in autonomic reactions that are directly manifested in the skin, which together with our eyes, combine as a dual interface for visual engagement. These are autonomic reactions occurring primarily on an unconscious level before any semantic decoding of the image and can provide a favourable disposition in the viewer's mind toward the level and intensity of engagement they chose to apply toward the image.

Physicality and Reality

The physicality of print can also create synergy between the image and the representation of reality. For example, touch can be seen as having an affective value in validating a sense of the

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810 Matthew Fulkerson, *The Stanford Encyclopedia of Philosophy*, ed. Edward N. Zalta, rev. ed. (Summer 2020), s.v. "Touch," https://plato.stanford.edu/archives/sum2020/entries/touch/.

811 Alnoor Dhanani, *The Physical Theory of Kalam: Atoms, Space and Void in Basrian Mu'tazili Cosmology* (Leiden: E.J. Brill, 1994), 63.

812 Maurice Bloch, "Truth and Sight: Generalizing without Universalizing," *The Journal of the Royal Anthropological Institute* 14 (2008): S22–32, http://www.jstor.org/stable/20203795.

813 Mark Paterson, *Seeing with the Hands: Blindness, Vision and Touch After Descartes* (Edinburgh: Edinburgh University Press, 2016). https://search.ebscohost.com/login.aspx?direct=true&AuthType=sso&db=e000xww&AN=1821845&scope=site.

814 Laura U. Marks, "Thinking Multisensory Culture," *Paragraph* 31, no. 2 (2008): 128, http://www.jstor.org/stable/43151879.

real as expressed by the following participant when asked whether they thought images in print were representations of reality:

> "The images in the magazine felt real so they were easy to relate to." (1s)
> "Yes, because you see a stunning photo and it just seems like they've just caught it, a nice image at the right time. And because it's a physical thing. You can hold it and touch it and you feel like it's a photo and it's printed." (10s)

Viewing images on screen does not always provide this level of physical sensorial connection toward the image. Participants demonstrated the tactile nature of the printed medium was not evident during the online viewing experience. It must be noted images were viewed on desktop computers and immersive technologies such as virtual, mixed and augmented reality were not discussed.

Luminosity, Vibrancy and Saturation

Luminance, a quantifiable quality describing the intensity of emitted light,[815] can influence how we perceive the vibrancy of an image, in turn operating on subjective experience to heighten sensation and attention, particularly toward the online image as expressed by the following participants:

> ". . . The physics of it and the glowing of the images. Having that backlight will make an image look a whole lot better...they stand out a lot more having the luminous background." (12p)
> "With the white background, the colours are more vibrant, so I focus on the image more." (2s)

Various studies in colour have considered its effects on feelings of relaxation or arousal with saturated and bright colours causing "significantly stronger skin conductance responses."[816] These affective responses have the potential to transmit the stimuli to a more permanent state in

815 Kevin Aamodt, "Understanding Illuminance, Luminace and Brightness," X-Rite, August 7 2020, https://www.xrite.com/blog/luminance-and-brightness-what-is-the-difference.

816 Lisa Wilms and Daniel Oberfeld, "Color and Emotion: Effects of Hue, Saturation, and Brightness," *Psychological Research* 82, no. 5 (June 2017): 89, https://doi-org.ezproxy.cqu.edu.au/10.1007/s00426-017-0880-8

the memory[817] by increasing attentional level and arousal and improving cognitive abilities.[818] Colour and content were associated with "depth of feel" by the following participant and necessary for the sensorial "wow factor" in an image.

> "Colour and content come to the forefront and that depth of feel. You want content that really has that wow factor." (15p)

It is not fully clear from participant comments whether the impact of colour directly influenced hedonic sensations of arousal. However, colour saturation was regarded as important for attention (participant 3s) and colour vibrancy may alter the interpretation of meaning in an image (participant 4s).

> "Newspaper… it's possibly the same but because sometimes newspapers are limited in colour or a little bit desaturated, they might also ignore the image." (3s)
> "The interpretation of meaning would be different because colour is more vibrant on the website." (4s)

Embodied and Disembodied Experience

We could argue viewing images in print is an embodied experience achieved through touch, smell and visuality, while screen-based viewing offers disembodied moments of interaction. There can be a disconnect between viewing and apprehension in the desktop computer which may be the result of the ensemble of technological apparatus and interface elements, including keyboard and mouse marshalled to gain access to screen-based content. This comes with an amount of cognitive effort before the process of viewing and apprehension of the image occurs.

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817 Shubham Gupta Lalbabuprasad and Anita Rahul Gune, "Effect of Colours on Perception and Cognition of Students Belonging to Two Different Age Groups: A Cross-sectional Study," *Journal of Clinical and Diagnostic Research* 15, no. 8 (2021): 8, https://doi.org/10.7860/JCDR/2021/47280.15246

818 Mariam Dzulkifli and Muhammad Faiz Mustafar, "The Influence of Colour on Memory Performance: A Review," *The Malaysian Journal of Medical Sciences* 20, no. 2 (April 2013): 6, http://ezproxy.uws.edu.au/login?url=https://www.proquest.com/scholarly-journals/influence-colour-on-memory-performance-review/docview/1506900827/se-2?accountid=36155

Other screen-based devices, such as tablets and smartphones, offer a less cluttered viewing environment and allow focussed interaction:

> "If it's on a computer there are a lot of other things happening. There might be a menu bar, there might be pop up ads or this and that happening, so there's a lot of things fighting for attention. If it's on a Smartphone, there might not be as many things happening around it so we can focus more on the image." (11p)
> "The tablet is like a single unit. It's like putting an image in a frame. A laptop has a keyboard and other stuff with it. Smartphones are smaller so it's the closest there is to a picture in a frame and it can be decluttered." (9s)

Gibson posits "visual control of the hands is inseparably connected with the visual perception of objects" and that manipulation of a surface "subserves many other forms of behaviour."[819] The following participant comments relating to the printed magazine indicate affective behaviours through interacting with tactile surfaces. The affordances of positive physical encounters with the image, coupled with its visual perception, create the potential for a favourable response toward its apprehension:

> "I like the experience of holding something physical in your hands." (3s)
> "It's a physical thing. You can hold it and touch it and you feel it's a photo and its printed." (9s)
> "Hands-on, interactive, more authentic." (5s)
> "It felt real, so it was easy to relate to." (1s)

Gibson associates sense with intrinsic sensations fusing with perception creating "acts of learning." He describes sense as a "bank of receptors or receptive units connected with a so-called projection centre in the brain" – local stimuli at the sensory level causing "local firing of neurons in the centre."[820]

Sensory Modalities of Perception and Meaning

Perception and information are initially derived from the senses before higher-order neural activities such as the image's analysis, evaluation and apprehension occur. The information

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819 James J. Gibson, *The Ecological Approach to Visual Perception: Classic Edition* (New York: Psychology Press, 2014), 224, ProQuest Ebook Central.

820 Ibid., 234.

gained from the different sensory modalities of touch, sight, smell and sound impact the degree of perception, creating a relationship between the tactually felt and the visually represented image. The component sensation of touch with texture provides added tenacity for connection and meaning:

> "It was a tangible book meaning I could feel the true meaning of the image." (1s)

The attribution of meaning toward images involves a combination of processes, including sensorial interaction that operates with other modalities and conditions such as social communication, influences of technology and the environment in which they are viewed. Therefore, apprehension is not dependent on any particular state but can be enhanced when the sensory modalities are activated.

It is vital to acknowledge neuroscientific research demonstrating multimodal cognitive integration in our brain as human action combines with the motor system enabling multimodal sensory integration. Seeing becomes a tactile experience through the interplay of "vision, touch and action." The resulting tactile experience of seeing while touching leads to the activation of our motor and somatosensory systems. [821]

Participants felt viewing the printed image offered its own unique experience of physicality that has not quite arrived yet digitally:

> "I prefer the printed book because it has the physicality and it also has a presence to it that electronic stuff doesn't have." (9s)
> "If you're viewing an image online, it's not tactile like something in print. Sometimes the texture of the paper feels nice, or the smell of the ink." (11s)

The sensation of touch coupled with vision offers a corporeal experience of embodied materiality enhancing human experience's quality and intensity.

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821 Vittorio Gallese and Sjoerd Ebisch, "Embodied Simulation and Touch: The Sense of Touch in Social Cognition," *Phenomenology and Mind* 4 (November 2016): 270, https://doi.org/10.13128/Phe_Mi-19602.

Although touch screen technologies mentioned in this study, such as smartphones and tablets, offer some tactility there is a difference in the quality and richness of the tactile engagement. The printed experience correlated to sensorial attributes of touch such as pressure and texture felt more intensely through the skin's blood vessels. Digital screens predominantly engage the visual senses with luminance and brightness emanating from screens offering engagement and immersion. This discussion does not compare which medium provides the strongest sensorial qualities but highlights the importance of sensorial experience in creating concrete and memorable interaction with images. These interactions are associated with a certain amount of neurological processing that can cement an experience as more potent than one where the senses are not involved with the exchange. Thus, interacting with an image becomes a corporeal experience of embodied materiality, enhancing the quality and intensity of the human experience. Table 5.8 indicates participants' sensory and visual viewing experiences comparing print and digital mediums.

Table 5.8. Sensory and Visual Modalities Comparing Print and Digital Mediums

Print	Digital
Hands-on, interactive, more authentic. (5s)	With the white background the colours are more vibrant, so I focus on the image. (2s)
The images stuck in my head a little better maybe because of the physical feel of paper while analysing. (2s)	The physics of it, the glowing of the images and having that backlight will make an image look a whole lot better. (11p)
I like the smell of new books. (5s)	The brightness gives a happier more naïve feel. (2s)
I like the experience of holding something physical in your hands. (3s)	The colour would be more vibrant on a website. (4s)
It's nice to flick through pages as well rather than try to scroll all the time. (6s)	You really experience the panoramic or the 360 view. If it's a big landscape of a mountain range, you can zoom in over there. It's not just a flat thing anymore. It's got so much more depth, its nearly like a movie now. (5s)
Brought a real feel of authenticity. (1s)	

Understanding is delivered through both digital and printed interfaces, each offering its own distinct set of heuristics. In digital environments, we summon the image through the digital interfaces of touch-enabled devices, tapping or swiping its malleable surface into view. Our touch completes an electric circuit at the point of contact, changing the electrical charge at this location to create a touch event. The screen's receptors flag this event to the operating system and the image is realised. We can alter the state of the image by pinching our fingers together or apart to zoom in and out. There is no passive receiving of information. This is a two-way dialogue between us and the image through haptic interaction. It has its unique affordances that are different from the printed medium.

Viewing the image in print is a more immediate tactile experience with the possibility of experiencing multiple sensations of touch, pressure, texture and smell when handling the paper. There is no mediation of screen, electrical circuits, or sensors. While viewing images in print is a more passive activity compared to online viewing, the process requires less cognitive effort and offers the benefit of a more immediate understanding and retention of information than would be possible with the digital image:

> "Viewing Images in the magazine was easy because it was more hands-on, interactive and authentic". (5s)
> "The images stuck in my head a little better maybe because of the physical feel of paper while analysing." (2s)
> "The quality of the photos and seeing them in print made you stop and look at them a bit more." (10s)

Salience Reveals All

There are variables in the visual communication ecology that may override any viewing or cognitive benefits offered by particular technologies. On occasion, the semantic content of an image is salient enough to arrest a viewer's attention and elicit the same emotion regardless of whether the image is viewed electronically or in print. However, the experience of the "3D"

sensation when viewing images on the screen can favourably affect the viewer making a less salient image more memorable or further intensifying reactions toward a significant image:

> "It's coming from a device, electronic or print and sometimes those images can almost be 3D so that would affect a person a lot more. It depends on the image. If it's a baby with a mother and it's an image in print and [on] your phone, the brain overrides the fact that it understands that one is a colourful device and the other one is print. The brain interprets that photograph, yes, it's a photograph of a mother and baby. But I still get the same emotion from it seeing it in print or online." (15p)

Affect and Embodiment

We have discussed the sensorial aspects of our interaction with images, identifying the viewing affordances of different technologies and how they facilitate engagement and understanding of images, but how are we affected by what we see? Massumi posits bodily sensation can influence one's emotional response to events, objects, or things like images.[822] Images can be all of these. This part of the discussion extends the discourse of image apprehension from the perspective of the biological response of the senses to include neurological aspects of affect.

The human body responds to certain affective qualities experienced when viewing images. These responses are manifested in the form of sensations, feelings or emotions such as happiness, sadness and excitement:

> "I remember the old couple swimming. I also remember my family and their happiness. I like that picture." (8s)

Affective experiences delivered through the primary motivational system allow us to express emotion toward stimuli.[823] This is where the visual system receives information and transmits it into the muscles and glands via the brain. The more distinct messages are immediately recorded by the brain, generating various positive or negative signals from perceptions. This causes sensory feedback experienced through psychophysiological constructs consisting of affective

822 Massumi, *Parables for The Virtual*, 25.

823 Frank and Wilson, *A Silvan Tomkins Handbook*, 4.

dimensions (Table 5.9) and is part of a processual relationship between body and mind before knowledge or semantic decoding. Table 5.9 is derived from the literature and helps us map participant experiences expressed through the data, considering the dimensions of valence, motivation and arousal as influencing apprehension.

Table 5.9. Affective Dimensions According to Gable et al.
a) Valence: Positive to a negative evaluation of the subjectively experienced state[824]
b) Motivational intensity: The strength of urge to move toward or away from a stimulus[825]
c) Arousal: Measured subjectively by activation of the sympathetic nervous system and is a proxy for motivational intensity[826]

Emotional connections to a photo are affective responses to perception, giving significance to a photo's salient features that may not be possible without emotion. These connections occur in various ways, such as through the cognitive processes of autobiographical or episodic memory.

> "I remember the old couple swimming. I also remember my family and the happiness of them. I like that picture." (8s)

The Importance of Intensity of Affect

Bodily sensations and expressions are inherent components of emotional experience and can influence the immediate evaluation of objects and situations. There is a connection between the semiotic structure of an image and the affect it has on the viewer with affect being a mediating influence on the resulting connotative interpretation.

The intensity of affect is embodied in autonomic reactions directly manifested in the skin which interfaces with surfaces such as paper or screens. These reactions occur primarily on an

824 Eddie Harmon-Jones, Cindy Harmon-Jones, David Amodio and Philip Gable, "Attitudes Toward Emotions," *Journal of Personality and Social Psychology* 101, no. 6 (2011): 1332.

825 Eddie Harmon-Jones, Cindy Harmon-Jones and Tom Price, "What is Approach Motivation?" *Emotion Review* 5, no. 3 (2013): 291–295.

826 Philip Gable and Eddie Harmon-Jones, "Does arousal per se account for the influence of appetitive stimuli on attentional scope and the late positive potential?" *Psychophysiology* 50, no. 4 (2013): 344–350.

unconscious level. Through somatosensory projection, we experience objects with our bodies that mediate our experience with the world:

> "I prefer a printed book. It's lighter and fun to have and hold. I prefer to hold this than a tablet." (2s)

Intensity can also be conducive to memorable experiences with images as expressed by the following participant.

> "The images stuck in my head a little better because of the physical feel of paper." (2s)

The impetus for image apprehension comes from many sources: semiotic content, emotional valence, arousal, personal intent, viewing device and context of use and the image source, such as an authoritative website or social media. We encounter these sources contemporaneously or sequentially – streams of stimuli that trigger either the appetitive or aversive motivational system.[827] In other words, an individual may engage with an image depending on positive or rewarding cues and stimuli (appetitive) or may avoid meaningful interaction with the image if experiencing an adverse response (aversive).

This affects how individual emotional cues are processed and can "facilitate attention allocation, information intake and sympathetic arousal."[828] These emotional cues then determine whether an image is salient enough to motivate the viewer toward deeper engagement making the image more memorable.

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[827] Harald T. Schupp, Ralf Schmälzle, Tobias Flaisch, Almut I. Weike and Alfons O. Hamm. "Affective Picture Processing as a Function of Preceding Picture Valence: An Erp Analysis," *Biological Psychology* 92, no. 3 (2012): 82, https://doi.org/10.1016/j.biopsycho.2013.02.002.

[828] Peter J. Lang and Margaret M. Bradley, "Appetitive and Defensive Motivation: Goal-Directed or Goal-Determined?" *Emotion Review* 5, no. 3 (2013): 230.

The following participant describes the effects of experiencing an image with high emotional valence:

> "The most memorable image for me was the burning monk. That was such a shocking image. It was hugely memorable because of the loss of life and the sacrifice and all those kinds of things. That's one that sticks in my head." (9s)

5.8. What's an Image Worth?

The data suggests that the ubiquity, speed and ease of access to, creation, manipulation and dissemination of images has produced a sense of diminished value accorded to the online image.

The proliferation of duplicates creates distance between copies and the original to an extent where the original, the author and the image's intent are completely forgotten. The only reason the creator may be considered is the practicality and consideration of copyright usage and the attribution of authors to their material:

> "I feel sorry for professional photographers. They take this brilliant photo and it ends up in a mass Google search. People don't absorb what it took to take a photo or what the photographer was thinking. There's no depth in looking for that meaning of what they were trying to take. A lot of that stuff gets thrown away, neglected, not realised or appreciated." (12p)

To some degree, we lament the loss of the image's position as a primary source of representation, affect and understanding of the world, a visual conduit offering possibilities through which our emotions are released in a heightened moment of sensory arousal and apprehension. Instead, the omnipresent image has become disposable.

> "It's the same philosophy as the Two Dollar shops. You buy something quickly, you use it for two months, you throw it out. There is less respect for the individuals. When you see images online, they lose their value the same way that Two Dollar shops lose their value because the quality is gone." (14p)

Diminished value

Diminished value is one of many paradigms we can apply to describe the image. This concept comes with its own taxonomy and depends on context and understanding through levels of modality (See Figure 6.7, page 260). An image in a printed newspaper may be considered of

higher modality than one appearing in social media. The former context is one of credible representation supporting a newsworthy article and the latter a glib mode of self-representation.

The moments where we can contemplate an image as a singular entity viewed in prolonged solitary gaze are few and far between. The online digital image does not stay still for long enough to allow this to occur. These images do not appear in art galleries, nor do they occupy a fixed position on a printed page. Instead, they are commodities for consumption in a mass market viewed through transient interactions occurring in spatiotemporal conditions – here one moment, gone the next:

> "A print image has a physicality to it that you can come back to. It's here tomorrow and I'm sitting here tomorrow and it's still there. Whereas if you see something online you might never see it again." (9s)

An image can take on value aspects if we have time to build a relationship with it, fulfilling all the affective and cognitive stages of visual apprehension (see Figure 6.6, page 258). If an image is important to us it takes precedence amongst competing external stimuli:

> "You've got less yet less interaction with it, less time on it. If it was really important then that would override it. It depends on the image. If you're fixated with that image you're not going to worry about your emails." (15p)

The multiplicity of devices and information streams impose an abundance of images upon us, creating a cultural over-familiarity with certain kinds of images, activating the following influential forces diminishing the value of the image: ubiquity, competition for attention, distraction and banality (see Figure 6.7, page 260). This phenomenon creates an environment of mundane visuality deterring critical engagement and reducing the worth of images. Banality in this sense is discussed relative to the online social media image where images proliferate in the expansive networks of social media reach appear as repetitive motifs and platitudes of ourselves and our ordinary lives.

Every day social media images act out the social desires and aspirations of their authors in various narratives that seek validation from others. Images fleetingly connect. They are conversation:

> "I'm really important, look at what's going on in my life and here's a photo of it." (9s)

Opposing Argument

We must acknowledge and validate the experiences of the participants interviewed. Then, elaborating on their sentiments toward the devaluing of images, we can propose the following counterpoint which is one of intellectual observation and analysis in concert with the literature review (see Chapter One: The Image in Digital Culture).

Counterpoint: The previous comment from participant 9s offers insight into the image's value as an important and powerful social agent for connection and dialogue amongst online communities. There is a power and a value to these images as they travel by the multitude in the flow of online conversations, appended and augmented with inflections by other viewers. Whilst fleeting, their lifespan and worth is extended with every value-added interaction, comment and emoticon that attaches to the image a particular concept. These characteristics indicate a valuable point of difference to one considered an original. It seems all images have value even the esteem of just being there:

> "An image can grab people from being entirely unexceptional as well. There's an 'anti' sort of thing. No one only reads text but as soon as you put a picture of the most boring thing ever…. It's still better than nothing." (10s)

In summing up, the data reveals the multifarious situations in which we encounter images and how apprehension is affected at every stage. Photographic image usage is discussed through eight key considerations emerging as dominant discourses in the data. These considerations operate together in various combinations and intensities in a complex ecosystem of mental, bodily, machinic, environmental and social factors that are shaped by the spatiotemporal nature

of different forms of visual communication. Modalities of image interpretation and understanding are activated via a gamut of sensory perception, higher-level cognitive neural processing and decoding and influencing aspects of sociality.

CHAPTER 6 – INTERPRETATION

The previous chapter examined participant experiences with images through eight key considerations emerging from the data and co-related with relevant literature. In this chapter, these cogitations are interpreted relative to the three research questions that are the nexus of this study. The chapter aims to reveal insights about the changing nature of image apprehension, the need to evolve interpretive theories to incorporate notions of the fluidity of images and how mind, brain and body respond to create meaning in what we see through those images.

This discourse adds two further deliberations related to pertinent aspects of image usage and apprehension – Neurophenomenology and The Social Media Image. These considerations relate to emerging literature and indicate a potential synergy between neuroscientific and phenomenological aspects of image processing and images' sociality. This is illustrated in Figure 6.1 on the following page, which outlines how the key considerations are mapped to the research questions and critical insights.

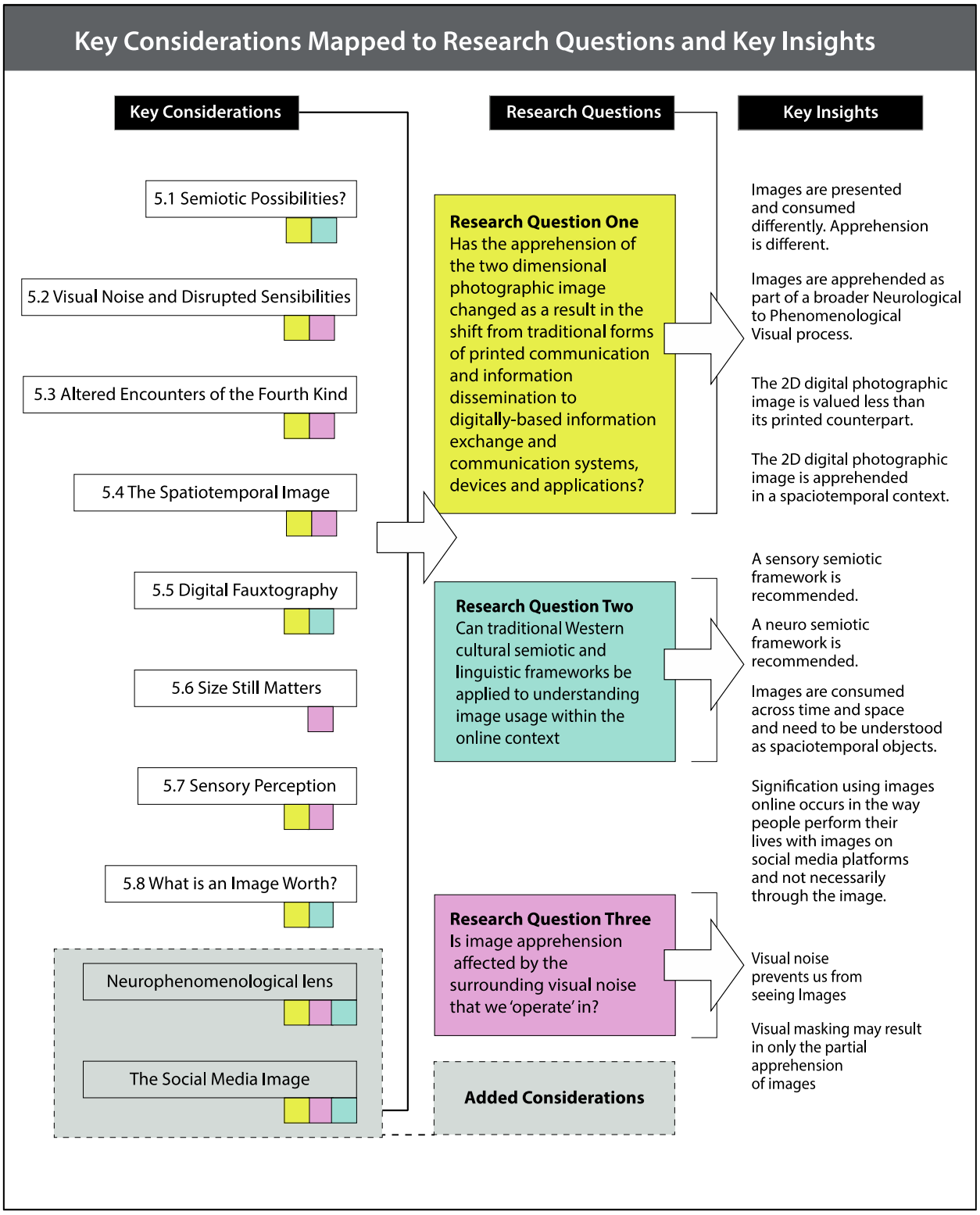

Figure 6.1. Key Considerations Mapped to Research Questions

6.1. Research Question One

Question: Has the apprehension of the two-dimensional photographic image changed as a result in the shift from traditional forms of printed communication and information dissemination to digitally based information exchange and communication systems, devices and applications?

6.1.1 Apprehension is Different

Apprehension relative to Research Question One refers to noticing and understanding something[829] in a way that creates meaning to us, "to make experience intelligible by applying concepts."[830]

The apprehension of images has changed. This has occurred through the many new and evolving ways we interact with images. The networked digital environment provides for expanded possibilities of engagement with images and more available spaces and opportunities for interaction to occur than are presented to us in printed forms of communication.

Each moment of interaction presents us with diverse possibilities for apprehension. A neurophenomenological approach helps us understand how we cognise images in different situations through the interplay between neuroscientific aspects of visual processing and resulting phenomenological interpretation. Exposure to digitally networked technologies is reconfiguring our brain, resulting in a change in the way we access and process information. Furthermore, cognitive aspects of visual processing influence final higher-order interpretation of

829 *Cambridge Dictionary*, s.v. "apprehension", https://dictionary.cambridge.org/dictionary/english/apprehension

830 *Merriam-Webster Dictionary*, s.v. "understanding", https://www.merriam-webster.com/dictionary/understanding

what we see. This is significant and is discussed in a growing body of literature[831, 832,833, 834, 835] calling for the integration of scientific study in combination with the social sciences; the world we see is not only objective or subjective but can be a combination of varying modalities, with each affecting the others.

Digital technologies provide great affordance for the way people use, view and exchange images. The number of locative and temporal spaces where images are seen has increased with images constantly moving through these spaces. One person may view an image on a desktop computer in the home environment, while another person may see the same image on a smartphone while in the presence of others. Scenarios such as these provide each viewer with distinct viewing experiences, generating variations in apprehension. Factors contributing may include screen size affecting the ability to view details and the quality of attention determined by potential distractions. These viewing experiences are more acute when viewing images in digitally based information exchange and communication environments than traditional printed forms of communication.

What follows is an analysis of factors impacting apprehension as indicated by participants. Figure 6.2 maps the relationship between influencing factors on image apprehension, noting the causal influences for change (Figure 6.3), the nature of change and the reasons (Figure 6.4).

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831 Khachouf, Poletti and Pagnoni, "The Embodied Transcendental," 611.

832 Evan Thompson, "Life and Mind: From Autopoiesis to Neurophenomenology: A Tribute to Francisco Varela," *Phenomenology and the Cognitive Sciences* 3, no. 4 (December 2004): 381–398, https://doi.org/10.1023/B:PHEN.0000048936.73339.dd

833 Francisco J. Varela, Evan Thompson and Eleanor Rosch, *The Embodied Mind: Cognitive Science and Human Experience*, rev. ed. (Cambridge, MA: MIT Press, 2016).

834 Frederic H. Peters, "Neurophenomenology," *Method and Theory in the Study of Religion* 12, no. 1/4 (2000): 379–415, http://www.jstor.org/stable/23551196.

835 Shaun Gallagher, "Rethinking Nature: Phenomenology and a Non-reductionist Cognitive Science," *Australasian Philosophical Review* 2, no. 2 (2018): 125–137, https://doi-org.ezproxy.uws.edu.au/10.1080/24740500.2018.1552074.

We encounter digital images in many more situations than previously possible through traditional forms of print communication such as magazines or newspapers. These encounters are mediated through:

- the type of technology delivering the image
- the context of communication, whether a blog or a corporate website
- our viewing intent toward the image: for social contact or study
- the impact of stimuli present in our surroundings

It is beyond the scope of this study to discuss the many types of images, contexts and technologies within which they appear. We should be cognisant of image apprehension occurring in many scenarios which influence the final act of apprehension.

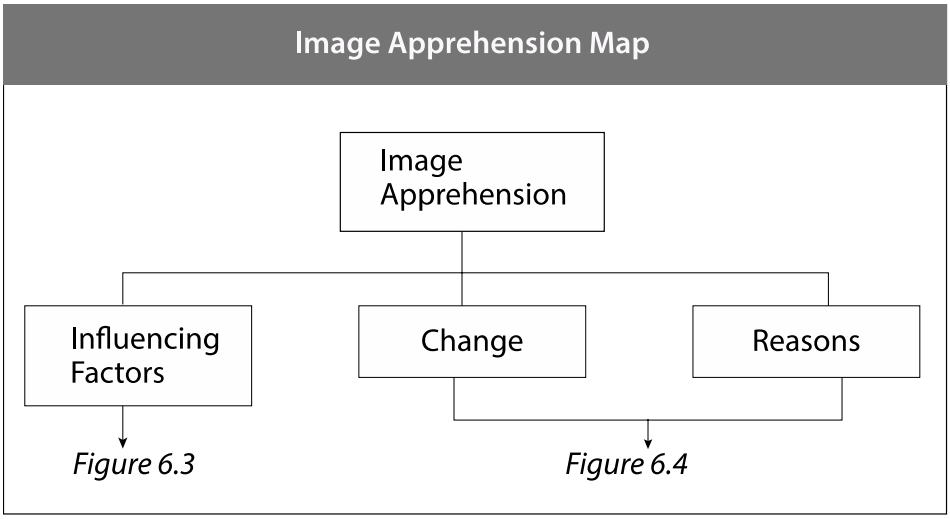

Figure 6.2. Image Apprehension Map

Figure 6.3 illustrates the influences and characteristics that affect apprehension across print and digital mediums. Both mediums share human and temporal characteristics such as the viewer's world view, the time allocated for visual processing, the viewing intent and the message's source.

Other influences on the apprehension of the printed image include size of the viewing area and image manipulation. These are not exclusive to online images. They have not been included

in the printed image sphere because, according to the participant data, they were not deemed essential factors influencing apprehension in print.

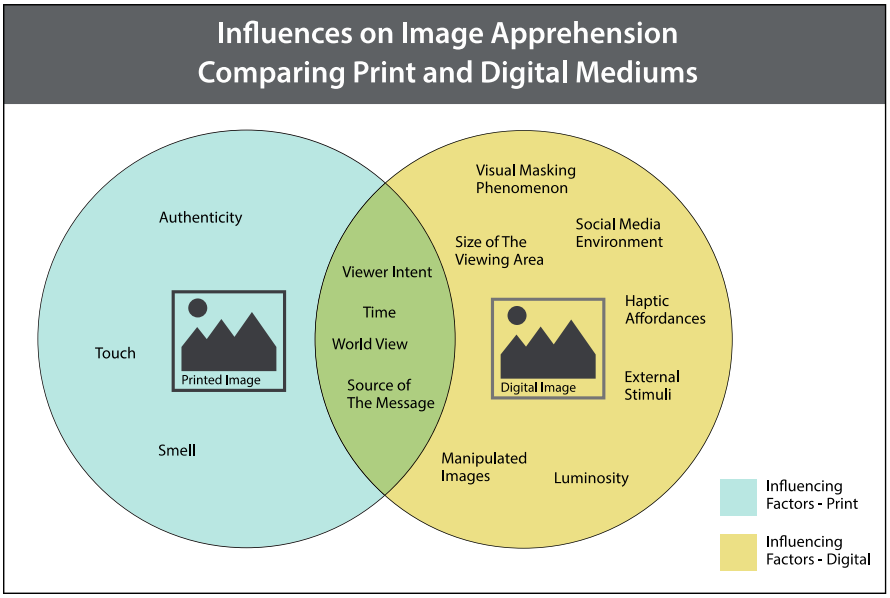

Figure 6.3. Influencing Factors on Image Apprehension

We can see from Figure 6.3 that there are many more influences operating on image apprehension in the digital sphere. These are influences brought about by the particulars of the viewing technologies and their effect on cognition, each influencing change in the way images are apprehended across print and online environments.

These changes are shown in the Figure 6.4 word cloud diagram on the following page. This diagram shows the reasons for the changes, which are closely related to the influencing factors shown in Figure 6.3. The words incorporated in the clouds were collated by analysing transcripts of participant interview comments using Nvivo software for usage incidents.

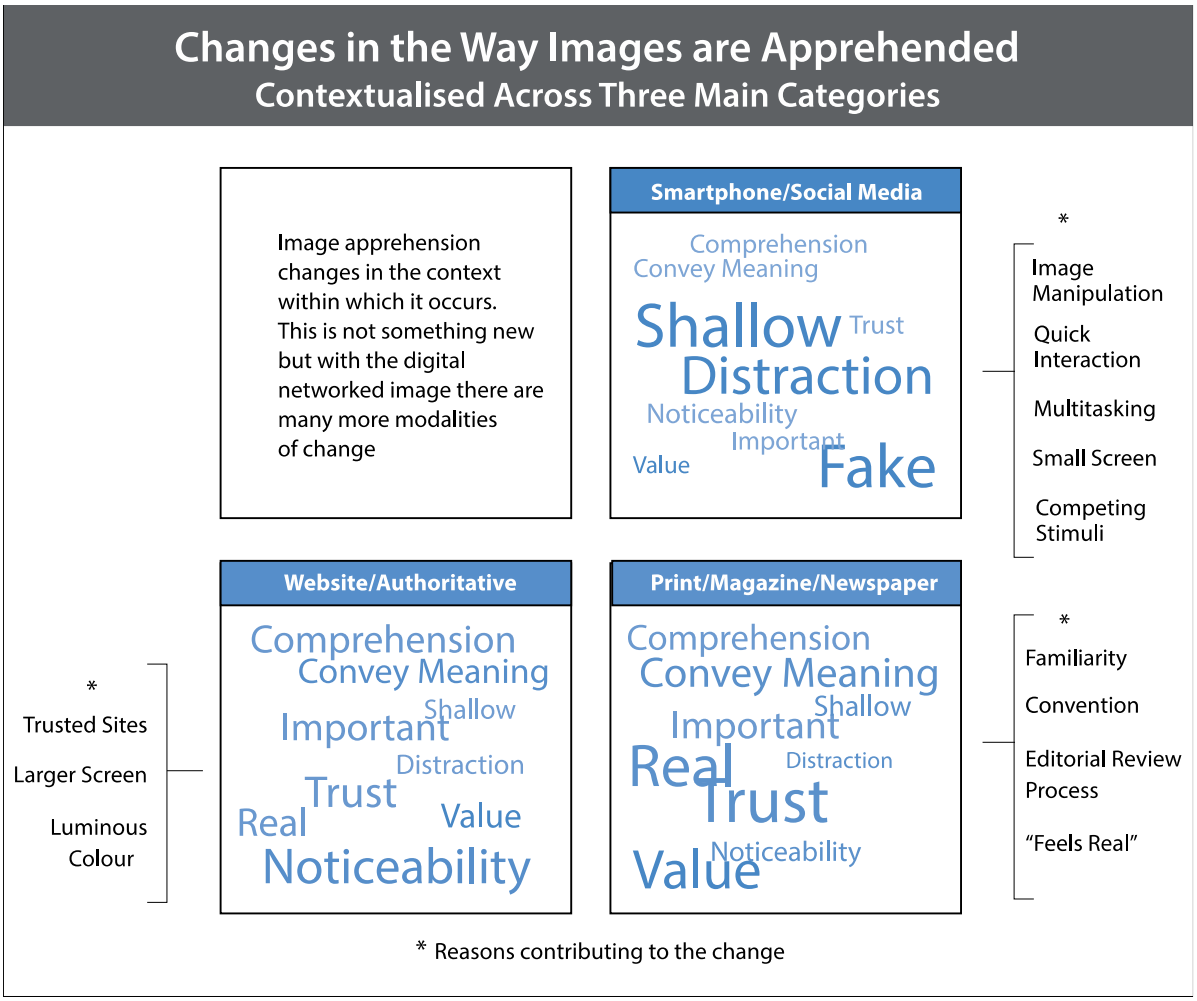

Figure 6.4. Image Apprehension Word Cloud: Changes in the way images are apprehended – Contextualised across three main categories.

Viewing an image from one environment to another will come with an associated effect that is particular to that environment. From the word cloud in Figure 6.4 we can see that an image viewed on a smartphone in a social media context involves a shallower interaction. It is perceived as less trustworthy and is less able to convey meaning than an image viewed in print or on a desktop computer (if viewed from a trusted source such as a credible company website or news authority). In some instances, we can see that viewing the image online via a website can provide similar affordances to viewing the image in print, such as a stronger ability to convey meaning, trust and facilitate comprehension. Participants perceived magazines and desktop

computers as offering similar-sized viewing environments, consumed in spaces with less external distractions and conducive to extended focussed attention.

A person's apprehension of the two-dimensional photographic image has changed in many ways from print to online environments but remains similar in some situations (See Figures 6.3 and 6.4).

The P.E.M.I. Effects Compass (Figure 6.5) provides a holistic overview of effects on image apprehension through four critical coordinates: viewing medium, the medium's physical characteristics, external influences and image properties.

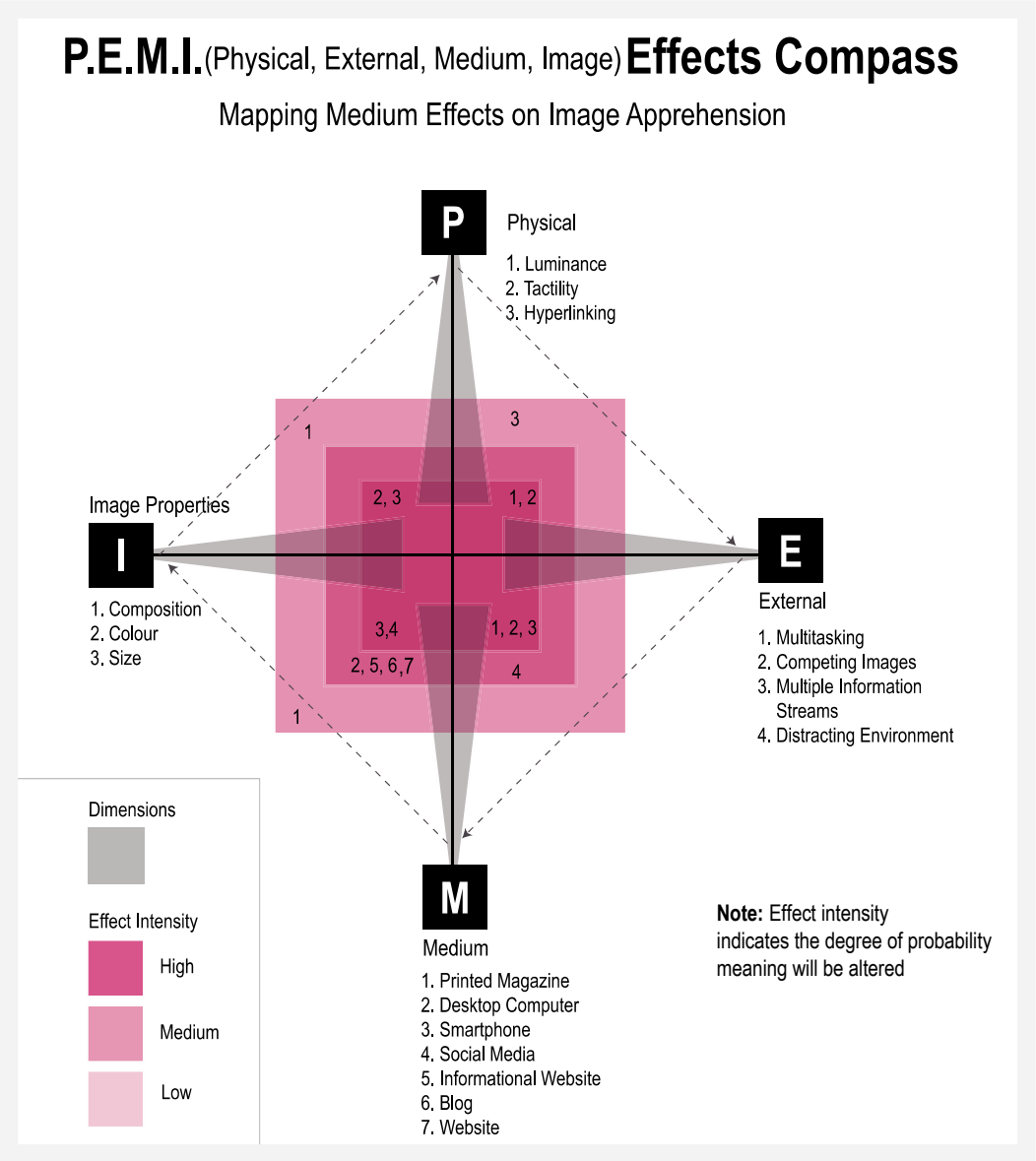

Figure 6.5. P.E.M.I. Effects Compass.

6.1.2 Neuroscientific to Phenomenological Framework

When discussing possible changes in apprehension, we need to include neuroscientific aspects of perception. There is a process connecting the activities of brain, body and mind, where the way we perceive images should be seen as a corporeal, neurological and phenomenological process – we can see, not see, feel, remember, forget, disregard (seen but ignored) and think images.

Each processual stage affects the final interpretive outcome. Image apprehension is not a process solely driven by bottom-up input. The apprehension process can begin autonomously, influenced by external stimuli or attributes of the image that are experienced sensorially (bottom-up processing) or by cognitive control in a (top-down processing).[836] In top-down processing perception is partly driven by prior learned experience projected onto "antecedent cortical areas with top level processing creating a 'predictive' coding of the image".[837] For example, when one is looking for a particular type of image, a semantic expectation of one that is already known occupies the "mind's eye". The relevant neurons carry this information with nonrelevant neurons being suppressed,[838] facilitating the recognition of the desired image choice which is then available for further semiotic analysis. This represents the phenomenological act of intentionality toward the image, an *a priori* of lived experience.

An image is seen in a particular context such as a blog, lifestyle magazine or news site. This in turn, influences the viewer's cognitive approach to the image.

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836 Jan Theeuwes, "Top–down and Bottom–up Control of Visual Selection," *Acta Psychologica* 135, no. 2 (October 2010): 77, https://doi.org/10.1016/j.actpsy.2010.02.006.

837 Charles D. Gilbert and Li Wu, "Top-down influences on visual processing," *Nature Reviews Neuroscience* 14, no. 5 (May 2013): 352, doi: http://dx.doi.org.ezproxy.cqu.edu.au/10.1038/nrn3476.

838 Byung Wan Kim, Youngbin Park and Il Hong Suh, "Integration of Top-down and Bottom-up Visual Processing Using a Recurrent Convolutional–Deconvolutional Neural Network for Semantic Segmentation," *Intelligent Service Robotics* 13, no. 1 (October 2019): 88, https://doi-org.ezproxy.uws.edu.au/10.1007/s11370-019-00296-5.

Figure 6.6 illustrates the process from the reception of the image through to phenomenological processes. After the visual input, a corporeal interaction can occur

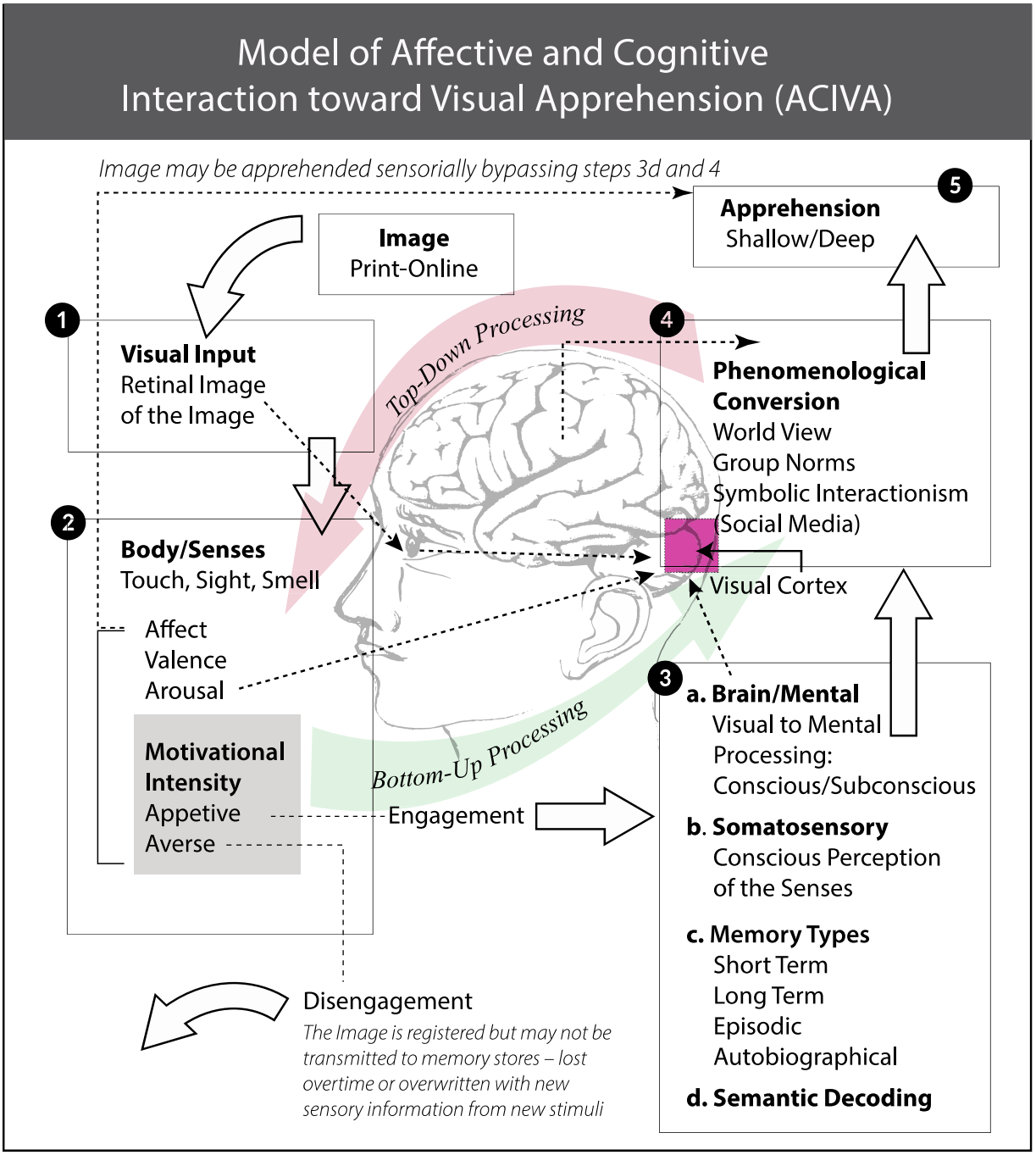


Figure 6.6. ACIVA Model of Image Apprehension.

which affects motivation and the type of interaction one will have with an image (bottom-up processing). Image processing occurs on a conscious or subconscious level, translating the affective experience into conscious perception (somatosensory process).

Images can also generate episodic and autobiographical memories which further enhance the perceptual process making interactions with images more vivid, increasing the likelihood of an image to be seen, experienced and remembered (top-level processing).

Our interaction with images occurs in many modalities, as illustrated in Figure 6.5. The combination of the various components of affective and cognitive pathways toward apprehension (ACIVA) will vary depending on the affordances of the viewing situation, quality of the image and intent of the viewer. This cooperation of "parts" is not solely a brain function alone but includes our body and worldview.

6.1.3 The Devaluation of The Digital Online Image

The photographic image has diminished in value, ineffectual at delivering meaning, a "Two Dollar Shop" item, a disposable commodity, utilitarian in its online functional aspects of self-representation and social communication. It is viewed amongst a multitude of others as part of search engine results delivered through machinic algorithms – part of a data stream; here one moment, gone the next.

The sense of the original has been lost amongst the replicas permeating our digital environments resulting in an emotional disconnect between the photographer, the original image and semantic meaning.

Image modality has "depreciated" due to many factors including its saturated presence on ubiquitous screen technologies and information streams (see Figure 6.7). Digital technologies enable the imposition of image abundance upon us, manifesting as a visual backdrop of onscreen banality deterring vital engagement. If one image doesn't grab attention immediately move on to the next.

The Ten Forces Model in Figure 6.7 illustrates the forces placing downward pressure on image value. In support of this model, value is defined as having the following affordances: importance, worth, usefulness, quality, significance, meaning.

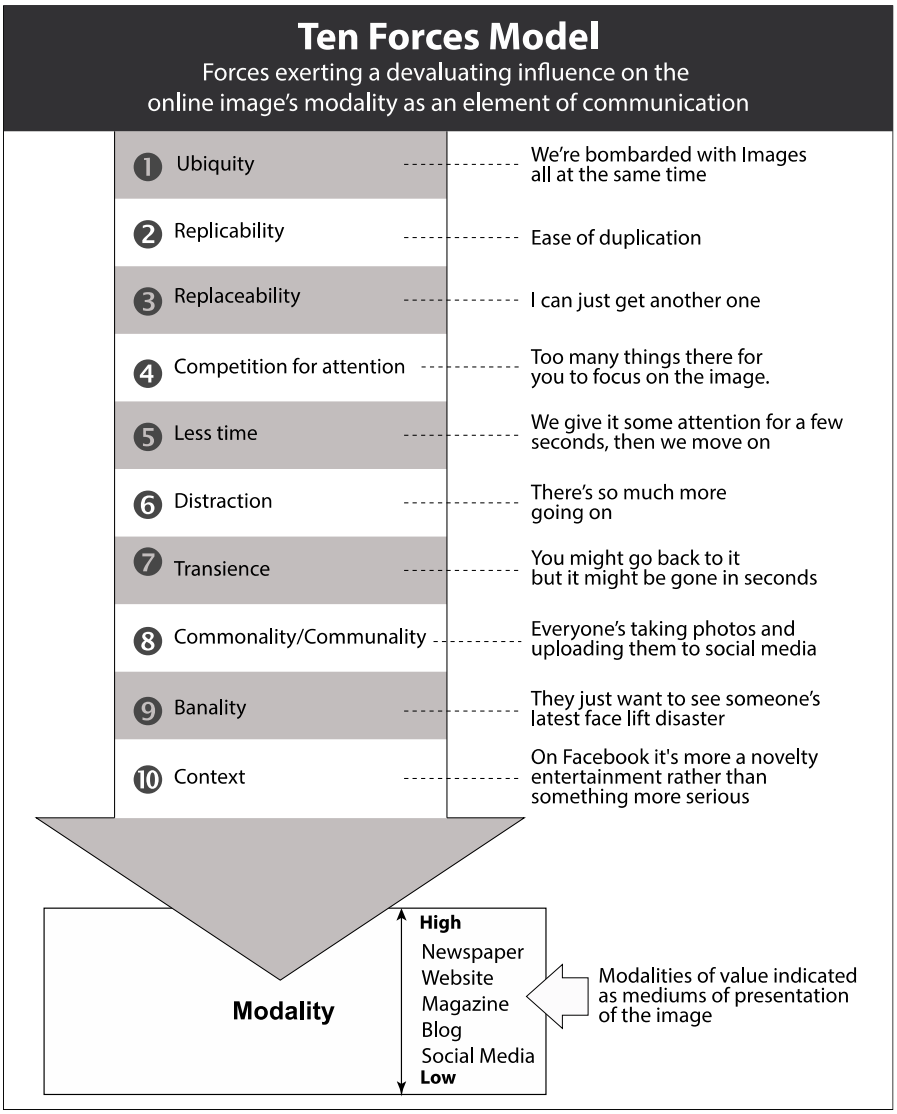


Figure 6.7. Ten forces influencing the perception of an image's value.

Figure 6.7 illustrates value characteristics as modalities and describes them as communication mediums within which the image appears – each medium offering a level of value from high to low. For example, an image in a printed newspaper may be considered to have a higher modality than one appearing on social media platforms. Modality level indicates the viewer's perception of the importance and significance of the image when appearing in a particular medium.

6.1.4 Spatiotemporal Aspects

The spatiotemporal model – analysis of data through spatial (geographic/locative) and temporal (related to time) attributes[839] – provides a useful framework with which we can better understand image apprehension. Images are consumed in temporal sequence and are "configurations of place."[840] We can apply this model to understand the relationships between spatial and temporal attributes of image consumption and the resultant influence these attributes have on image apprehension. This influence occurs at macro and micro levels of spatiotemporal image viewing experience, described in the following sections. Let us first examine the act of viewing images as a macro spatiotemporal event occurring at and within a specific time ambit and location.

Macro Spatiotemporal Level

Images consumed across time and space possess at least one spatial and temporal property. Apprehension is affected depending on the combination of time and space dimensions. An illustration of macro spatiotemporal aspects of image apprehension occurring through two viewing scenarios, print and smartphone, is presented in Figure 6.8 on the following page. The spatial form of image presentation changes as images move from one viewing environment and medium/device to another. Each environment's physical and technical viewing characteristics influence spatial form (the scale at which the image is viewed) and temporal duration and velocity at which images are delivered and accessed. At each stage, apprehension is affected.

839 Natalia Andrienko and Gennady Andrienko, "A Visual Analytics Framework for Spatio-temporal Analysis and Modelling," *Data Mining and Knowledge Discovery* 27 (2013): 55, https://doi.org/10.1007/s10618-012-0285-7.

840 Sarah Pink, "Sensory Digital Photography," 4.

Macro Spatiotemporal Dimensions and Affects Magazine vs Smartphone Scenario		
	Australian Geographic Magazine	Smartphone
Spatial Location, Geometry (Space the image occupies on the viewing medium)	Home environment 21cm x 28cm	Cafe, bus, waiting in a queue 6.1" Screen *
Temporal Time at which the image is accessed and engagement duration. Intervals between viewing one image before the next	"more time" "leisurely viewing"	"less time looking" "flicking very fast" "skimming through content"
Apprehension	Deep engagement offers potential for apprehension	"shallow engagement" "shallow interpretation" "not reading or paying much attention" Less potential for apprehension

*Example Screen Size based on iPhone 11. Source: https://www.apple.com/au/iphone-11/specs/

Figure 6.8 Macro Spatiotemporal Dimensions and Affects: Magazine vs Smartphone Scenario.

Photographic images operate at a transcendental level with images representative of a cyclical trilogy of past, present and future. This can be considered a macro spatiotemporal characteristic. The past in the sense we view an image representing what may have been before the camera at a previous moment in time. The present, manifesting as viewing in the moment, and the future where the image is propagated into the shared viewing spaces of social media to be interpreted by others and eventually to databases to be experienced at a time in the future. The viewer will again be viewing the image in the "moment" in the future.

The online image is in perpetual movement, updated and replaced from databases, archived onto hard drives, shared drives, the "cloud", often lost in a sea of duplicates and iterations. A prosaic imaged moment of a person's life in social media is replaced by another imaged moment, becoming part of a virtual procession of images accessed via the previous and next affordances

of online carousels or through touch screen gestures. Images are "spatiotemporal datasets" describing spatial and temporal phenomenon existing at a certain time and location, subject to change and manipulation.[841] The image, instantaneously swiped into the present or the past in data-described temporal moments, presents us with an opportunity to understand it in the various manifestations of the macro context.

Micro Spatiotemporal Level

Visual processing of an image occurs on a micro level through the mutual interaction of relevant regions of the brain's visual cortex, specialised to process different attributes of the "visual scene" at different micro-temporal moments.[842] This processing occurs in temporal sequence and is reliant on all relevant areas operating in unity for apprehension to occur. Zeki describes this as a "unified consciousness" resulting from the process of visual input, cognitive processing and apprehension. This happens once all the situationally relevant mental operations are completed and is brought about by the interplay of "many micro-consciousnesses" that are distributed in space and in time.[843] Zeki is referring to the asynchronous processing of visual input by the relevant areas within the brain's visual cortex[844] (see Figure 6.9) where we can observe the micro-interactions of these areas and their temporal correlates. These areas of the visual cortex process different components of the optical system, such as colour, motion, location and orientation in temporal sequence.

841 "Spatiotemporal Analysis," Columbia University Irving Medical Center, last updated 11 March 2022 https://www.publichealth.columbia.edu/research/population-health-methods/spatiotemporal-analysis

842 Cordell M. Baker, Joshua D. Burks, Robert G. Briggs, Jordan Stafford, Andrew K. Conner, Chad A. Glenn, Goksel Sali, Tressie M. McCoy, James D. Battiste, Daniel L. O'Donoghue and Michael E. Sughrue, "A Connectomic Atlas of The Human Cerebrum—Chapter 9: The Occipital Lobe," *Operative Neurosurgery (Hagerstown)* 15, no. S1 (2018): S372, doi:http://dx.doi.org.ezproxy.cqu.edu.au/10.1093/ons/opy263.

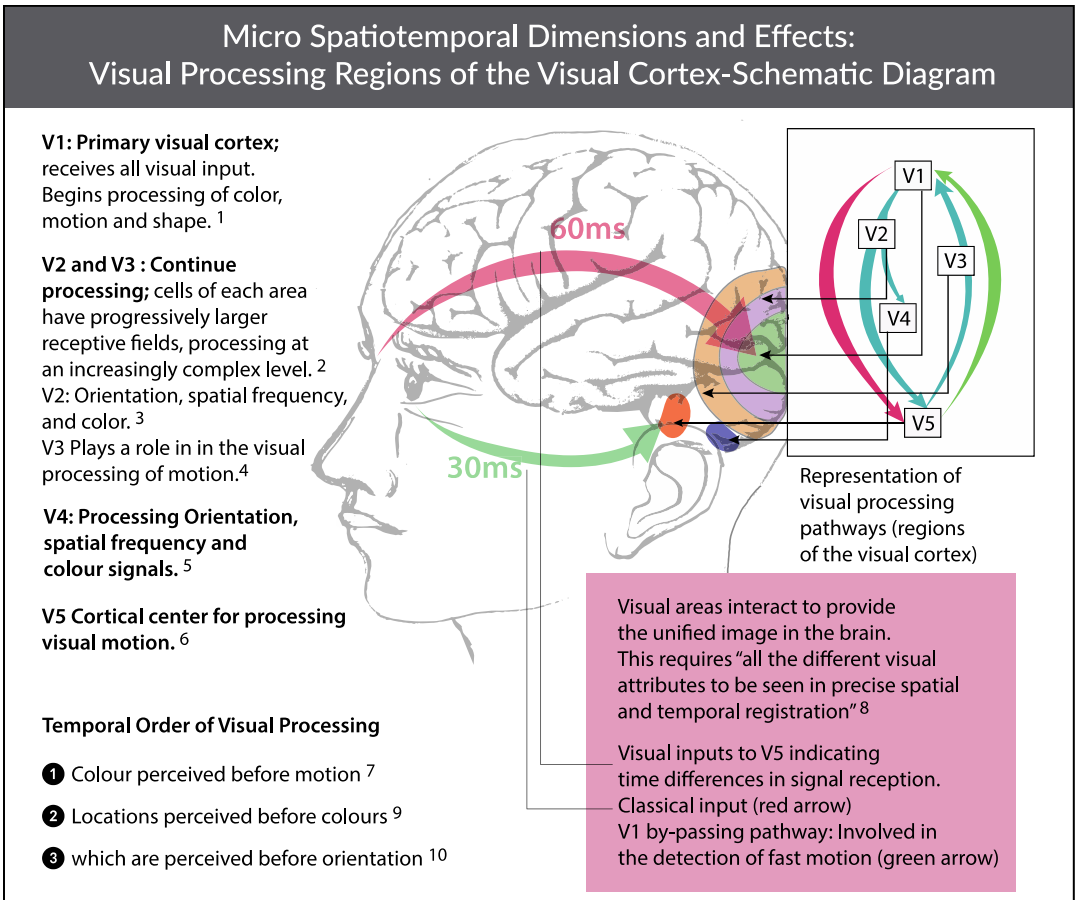
843 Zeki, "A Theory of Micro-consciousness," 580.

844 Ibid., 583.

If given the adequate amount of time to process visual input, each attribute of the viewed image is handled in "perfect temporal" and spatial registration."[845] This has implications for the way we cognise images on digital devices, which happens in "short bursts" of time or in situations of fragmented attention. In these situations, signals from one area of the visual cortex are not able to reach those of another in time and do not "bind"[846] resulting in only partial processing of the visual scene. Consequently, the resulting phenomenological experience of the image and the quality of semantic decoding are affected. Figure 6.9 on the following page illustrates the micro spatiotemporal processing functions of the visual cortex.

845 Zeki, "A Theory of Micro-consciousness," 584.

846 Ibid., 584.



1 Li Zhaoping and Robert J. Snowden, "A Theory of a Saliency Map in Primary Visual Cortex (V1) Tested by Psychophysics of Colour–orientation Interference in Texture Segmentation," *Visual Cognition,* 14 no.4-8, (2006): 911-912. doi:10.1080/13506280500196035.

2 Semir Zeki, "The Ferrier Lecture 1995: Behind the Seen: The Functional Specialization of the Brain in Space and Time," *Philosophical Transactions: Biological Sciences* 360, no. 1458 (2005):1147. http://www.jstor.org/stable/30041335.

3 Ibid., 1157

4 Michael J. Arcaro and Sabine Kastner, "Topographic Organization of Areas V3 and V4 and Its Relation to Supra-areal Organization of the Primate Visual System," *Visual Neuroscience* no. 32 E014(2015): 5. doi:10.1017/S0952523815000115

5 Anna W. Roe et al. "Toward a Unified Theory of Visual Area V4," *Neuron,* 74 no.1, (2012): 8. doi:10.1016/j.neuron.2012.03.011.

6 Semir Zeki, "A Theory of Micro-consciousness," *The Blackwell Companion to Consciousness,* eds. Max Velmans and Susan Schneider, (Malden, MA, USA: Blackwell Publishing, 2007): 580. https://doi-org.ezproxy.cqu.edu.au/10.1002/9780470751466.ch46

7, 8 Ibid., 583.

9 Laure Pisella, Mohammed Arzi and Yves Rossetti, "The Timing of Color and Location Processing in the Motor Context", *Experimental Brain Research* no. 121, (1998): 270. doi:https://doi-org.ezproxy.cqu.edu.au/10.1007/s002210050460

10 Konstantinos Moutoussis and Semir Zeki, "Functional Segregation and Temporal Hierarchy of the Visual Perceptive Systems," *Proceedings: Biological Sciences* 264, no. 1387 (1997): 1411. http://www.jstor.org/stable/5104.

Figure 6.9 Micro Spatiotemporal Dimensions and Affects: Visual Processing Pathways Diagram flow adapted from Zeki[847] and Perri et al.[848]

847 Semir Zeki, "Area V5–A Microcosm of The Visual Brain," *Frontiers in Integrative Neuroscience* (2015): 4, https://doi.org/10.3389/fnint.2015.00021

848 Carolyn Jeane Perry and Mazyar Fallah, "Feature Integration and Object Representations Along the Dorsal Stream Visual Herarchy," *Frontiers in Computational Neuroscience* (2014): 2, doi:http://dx.doi.org.ezproxy.cqu.edu.au/10.3389/fncom.2014.00084

It is recommended that further research be undertaken into the spatiotemporal analysis of image usage to detect levels of affect on apprehension across spatiotemporal dimensions under different viewing conditions. This will help to detect and understand the nature of relationships between quality of image apprehension and how this is influenced by device characteristics and the type of viewing environment through space and time.

The visual act encompasses all the above, which to varying degrees impact how the viewer acts and reacts toward their environment, ultimately influencing their apprehension of the image. This is orchestrated more by the spatiotemporal properties of the environment and brain activity than by any semantic properties inherent in the image.

6.2. Research Question Two

Question: Can traditional Western cultural semiotic and linguistic frameworks be applied to understanding image usage within the online context?

To deconstruct and decode images from their constituent parts to understand the meanings inferred by the combination of their signifiers becomes a complex process when considering the many aspects affecting the process of apprehension discussed in the previous sections. In a phenomenological context, the meanings understood from images are interpretive and are influenced by personal values, historicality and the cultural mores of the society in which one operates. For example, a mother with a baby will always represent concepts such as motherhood, nurturing or religious connotations depending on context. This concept is an archetypal one that is fundamental to communicating and understanding our world through our experience. When values are potentialised in association with an image, the viewer actualises meaning relevant to them.

There are moments where the phenomenological process of meaning-making is affected. Occasions of distraction or asynchronous micro-processing of visual input, as described in Section 6.1.4, interfere with the higher-level processes of semantic decoding and prevent a full apprehension of an image.

Traditional methodologies of image interpretation are challenging to apply to social media images. In the fluid movement of online social communication, the image takes on a significant conversational role, transient but essential, primarily in the communicative moment. In social media the image becomes an expressive juncture of life performance, an annunciation of "hey look at me . . . look at what I'm doing." This is a social behaviour condition where images facilitate expression and interaction between people, dynamic communication shaping relations with others. Images need to be understood from this viewpoint rather than as purely static representational objects.

Understanding the image through concepts such as icon, index and symbol has given way to the visual verbality of online participants where signification occurs through the vocalisation of images; images are not only in conversation but are conversation.

Decontextualised Meanings

Images are decontextualised more readily in the online space than their printed counterparts. They are more easily separated from their original intended meanings through manipulation and distribution across the diverse digital landscape of websites, search engine results pages, blogs, image-sharing sites and social media platforms. Each of these inflects their context onto the image.

The important point is the meaning or interpretation that the viewer realises may not be associated with any semantic context. There is a language of performance in social media communication where meaning is external to the representational aspect of the image.

In more traditional contexts, the image can be understood through semiotic frameworks of

indexicality and signification. This is particularly the case when viewing images on authoritative and trusted websites accessed at work or study from desktop computers which offer similar affordances to printed media such as magazines. Affordances include size and extended viewing time and provide the potential for "deep attention."[849]

Interpretation and analysis of photographic meaning-making is dependent on context. We can begin using existing cultural, semiotic and linguistic frameworks to understand images in some situations. In others, we can apply varying combinations of theory involving affect, hyperattention and neurophenomenological experience to the study of image apprehension.

The following sections present three proposed models of image apprehension: Sensoriotic, Neurosemiotic and the Social Media Model. We can use the first two alongside traditional semiotic interpretive frameworks to augment our understanding of how and why apprehension occurs, if at all. Sensorial and neuroscientific aspects related to touch, feelings, vision and memory influence semiotic interpretation. The Social Media Model provides a framework addressing the social image's uniqueness, arguably relying increasingly on conversational context and less on literal visual content toward understanding. Interrelationships of self-representation, orality and world view are considered over semantic content. This is discussed further in section 6.2.3: The Social Media Image.

6.2.1 Sensoriotic Model

Figure 6.10 presents the "Sensoriotic" model of understanding image apprehension. In this model we can see that if multiple senses are engaged during the viewing of an image, we may experience the image through affective responses such as, but not limited to, excitement, pleasure or displeasure. This, in turn, can motivate us to engage with images in specific ways. In a sense, this is a predictive form of interaction, a bottom-up process that continues through

[849] Hayles, "Hyper and Deep Attention," 187.

higher-order processes of semantic decoding or as pure sensorial experience depending on the situation. For example, an image may shock a viewer. This is a primary response that progresses to further semantic decoding if time allows or is experienced purely through the senses – in an immediate sensory way. It can be constitutive of emotional feeling where our experience of it occurs at an autonomic level.

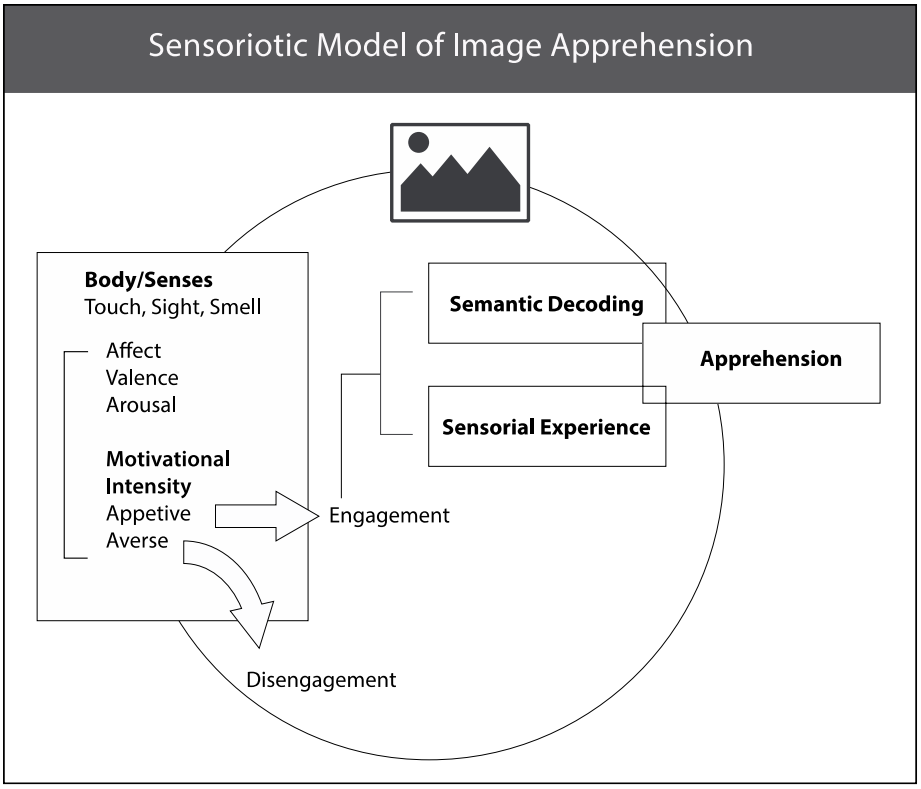


Figure 6.10. Sensoriotic Model of Image Apprehension.

6.2.2 Neurosemiotic Model

In the "Neurosemiotic" Model (Figure 6.11), the process of apprehension progresses as an intellectual type of top-down processing. This occurs either consciously, if the image appears in the dominant visual sphere of focus or experienced unconsciously when the brain automatically processes all or part of an image that may be invisible or masked.[850] Dehaene refers to this as

850 Stanislas Dehaene, *Reading in the Brain:The Science and Evolution of a Human Invention* (New York: Viking/Penguin Group, 2009), 90.

subliminal priming. If the image is perceived consciously, it is then decoded through phenomenologically interpreted traditional semiotic modes of analysis. These include world view, group norms and symbolic interactionist perspectives of understanding meaning through people's social interactions – a part of the social media image environment. This model presents the image as being experienced semantically and phenomenologically. This is more likely to occur when viewing in the printed environment and is possible in the digital domain when the viewer has the ability for singularly focussed interaction. The "sensoriotic" and "neurosemiotic" models can also influence each other through the feedback loop of top-down to bottom-up processing (see Figure 6.6: Aciva Model of Image Apprehension, page 258). This occurs when the makeup of an image has enough salience to attract the viewer's attention and for the image to be initially stored in short-term memory. This occurs in the following way: Sensory information from the somatosensory region of the brain is transferred (fed forward) to higher-order areas of the brain[851] ("sensorial" model) for higher-level processing ("neurosemiotic" model – see Figure 6.11 on the following page). The feedback connections from these areas then transfer information in the reverse direction,[852] modulating responses by activating cortical processes such as attention and figure-ground segregation or grouping which allows us to perceive the [image] more fully.[853] The image can then be further processed and semantically decoded using higher neural functions (refer to Figure 6.6: Aciva Model of Image Apprehension, page 258).

851 Jean Bullier, "Integrated Model of Visual Processing," *Brain Research Reviews* 36, no.2 (2001): 97, https://doi.org/10.1016/S0165-0173(01)00085-6.

852 Peyman Khorsand, Tirin Moore and Alireza Soltani, "Combined Contributions of Feedforward and Feedback Inputs to Bottom-up Attention," *Frontiers in Psychology* 6, no. 155 (March 2015): 1, https://doi.org/10.3389/fpsyg.2015.00155.

853 Pieter R. Roelfsema, Michiel Tolboom and Paul S. Khayat, "Different Processing Phases for Features, Figures, and Selective Attention in the Primary Visual Cortex," *Neuron* 56, no. 5 (2007): 785, https://doi.org/10.1016/j.neuron.2007.10.006

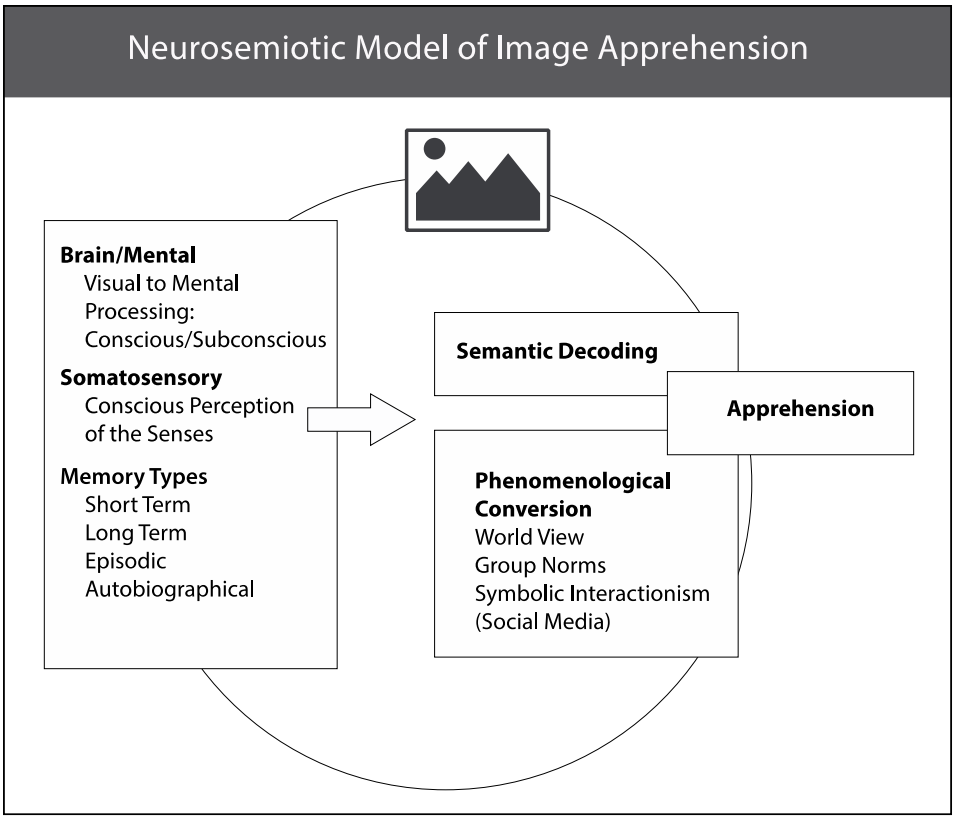


Figure 6.11. Neurosemiotic Model of Image Apprehension.

6.2.3 The Social Media Image

Social Media

Traditional Western cultural, semiotic and linguistic frameworks are not sufficient to help us understand social images. They are created for an environment where interaction occurs between people and not between the person and the image. Images facilitate social engagement in an intramediative environment in which they are produced and consumed, primarily using the smartphone.[854] Instantaneous capture and sharing of images with multiple users and the social interaction aspects of communication platforms, such as Snapchat, Twitter, Facebook, Instagram and Tiktok, inflect the image with a commercially contextualised mode of presentation.

A characteristic of networked technologies through which images are shared is the immediacy with which a person can be seen, heard and responded to by engaged participants on

854 Daniel Palmer, "The Rhetoric of the JPEG," in *The Photographic Image in Digital Culture*, 2nd ed., ed. Martin Lister (London: Routledge, 2013), 151.

social media platforms. As a result, the social image operates differently from their printed analogue counterparts.

The online social media image does not function in the traditional photographic sense of presenting us with a literal representation of something but is instead part of a new system of representation allowing us to express, interpret and make sense of the conditions of our everyday lives through conversation. These images are presented in an "oral-visual" mode and serve as social markers for:

- Self-representation.
- Devices used to favour oneself in online courtship rituals.
- Seeking attention and affirmation from online social groups.
- Signifying of presence.
- Affirming a sense of belonging.
- Just being there because a photograph online is "better than nothing."

The term "performative utterance" was initially used by J. L. Austin intending to mean "to say something is to do something."[855] As we express ourselves through the aspects of sociality listed above, images take on a unique combination of qualities, oral, visual and performative (saying and doing), becoming "performative visual utterances" in digitally networked social environments.

The performance component of social images is seen in the visual acts of self-representation of the selfie image, people in the everyday performance of creating a dinner dish or star jumping in a holiday snapshot. People perform to present the desired image of themselves before online audiences. In the social media context, images are powerful visual accoutrements of conversation.

855 John Langshaw Austin, *How to Do Things with Words: The William James Lectures Delivered at Harvard University in 1955*, ed. J. O. Urmson (Oxford: Clarendon Press, 1962), 12.

Banality is Unique

The conceptual meaning of banality is inverted when discussing social images. The term becomes a euphemism for a perverse form of uniqueness and significance that we can assign to them. The scale in ubiquitous repetitiveness of the "common" is inescapable on social media platforms. This is a unique feature as is their communicative power within online communication streams. They are an augmentation of the every day through inflections by other listeners to the online conversations in which they appear – sight, speech and performance facilitating human sociality through social media platforms. These experiences with images are phenomenologically lived by people in the "here and now" through online interactions, shaping apprehension (see Figure 6.12).

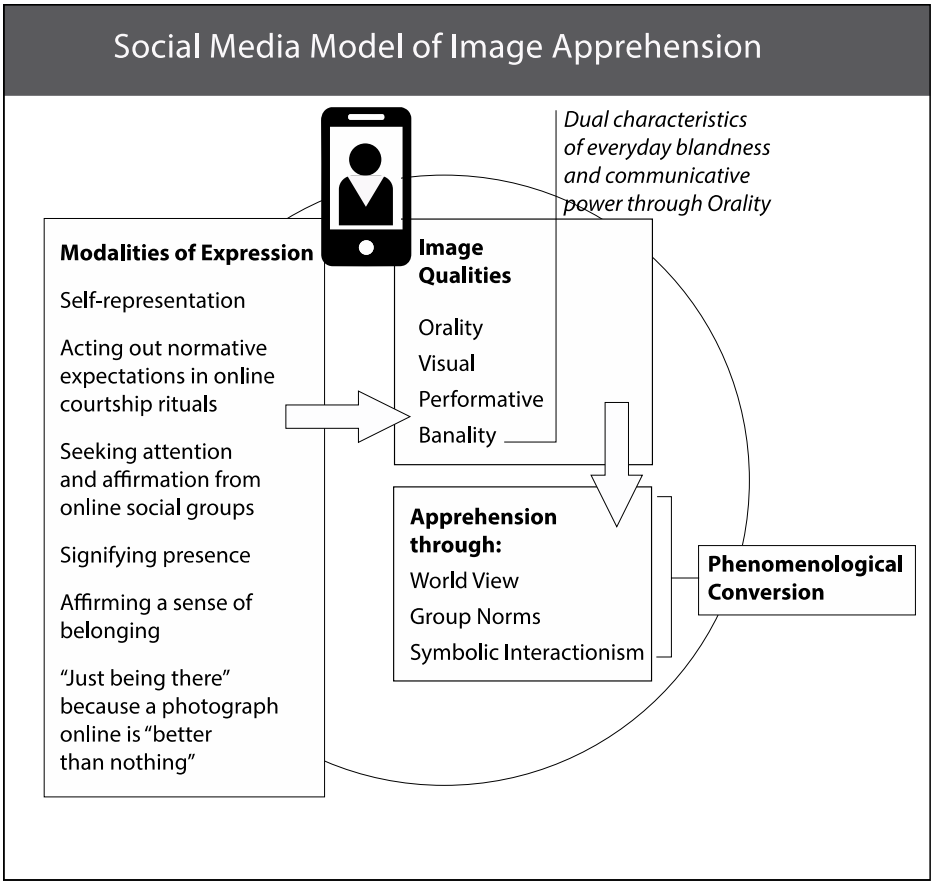


Figure 6.12. Social Media Model of Image Apprehension.

Summary

Research question two asked whether we can apply traditional Western cultural semiotic and linguistic frameworks to understanding image usage within the online context. The research indicates the benefits of a broader contemporary adaptation of semiotic theory. One that relocates from the "structuralist concern with the internal relations of parts within a self-contained system," espoused by scholars such as Saussere, Peirce, Lévi Strauss and Lacan,[856] to one that recognises the use and apprehension of signs as occurring in social, technological and environmental situations of mind and body in spatiotemporal moments.

6.3. Research Question Three

Question: Is image apprehension affected by the surrounding visual noise that we "operate" in?

Visual noise as defined in Chapter 5 is anything that may distort, transform, block or add to what we see. The data has shown visual noise has a major impact on image apprehension. The following discussion identifies the major influences on our ability to apprehend images.

Visual noise is dependent on factors such as environment, the technology used to view the image and any stimuli coming from both those areas. This is less of a factor with print communication as it is a medium primarily consumed in isolation. Although there can be interference by stimuli such as advertising surrounding an area being viewed, these distractions are less than what is experienced in digital viewing environments. In these environments competing stimuli for attention have increased, affecting the viewer's ability to comprehend visual information effectively.

856 Chandler, *Semiotics for Beginners*.

In digital environments the potential for visual noise comes from three main categories as indicated in Table 6.1.

Table 6.1. Visual Noise Categories	
Device-Based Noise (DBN)	Elements on a display, alerts from apps and message clients, pop-up advertising, cookie requests, competing images.
Environmental-Based Noise (EBN)	Noise occurring in the space or environment where the user is interacting with images.
Temporal-Based Noise (TBN)	The quantity of time available for the processing of images is a factor that transforms the way we see things and what we eventually see.

The vast amount and variety of stimuli coming from Device- (DBN) and Environmental-Based Noise (EBN) compete for an increasingly reduced percentage of human mind space that information, including images, can occupy. Temporal-Based Noise (TBN), in combination with DBN and EBN (Table 6.2), influence the way we process images creating cognitive overload which impacts our comprehension skills, preventing us from attaining clarity in meaning-making or even seeing an image at all. These effects are discussed in the following sections.

6.3.1 Visual Agnosia

> The neuropsychological disorder, known as visual agnosia, refers to the impairment in deriving the meaning of a visually presented stimulus, in spite of the affected individual having intact sensory and low-level vision, and normal language and semantic function.[857]

The phenomenon of visual noise has created a viewing environment where we present with effects similar to neurological disorders in the form of visual agnosia when viewing content in visually cluttered digital environments. For example, a lot of potentially unnecessary information increases the working memory's load and may result in distraction from the main message(s). These environments make it difficult to perceive and interpret visual information. This is speculatively discussed in this section, however participant viewing experiences in this study indicate evidence of visual agnosia characteristics during the image viewing process. This

857 Mariene Behrmann and Mayu Nishimura, "Agnosias," *Wiley Interdisciplinary Reviews: Cognitive Science* 1, no. 2 (March 2010): 203, https://doi-org.ezproxy.uws.edu.au/10.1002/wcs.42.

warrants further investigation into how visual noise from many *competing elements* within the digital media ecosystem affects our neurological processing of images. What does this mean for creating, viewing and apprehending images in digital environments?

There is an extensive taxonomy for defining different forms of visual agnosia that is beyond the scope of this study. So instead, the focus will be on two pertinent types of agnosia, apperceptive and associative. Their manifestation is associated with categories of visual noise, which in turn results in specific viewing behaviours (Table 6.2).

Table 6.2. Visual Noise – Effects on Image Apprehension

Category	Cognitive Effect	Viewer Behaviour
Device-Based Noise (DBN)	Visual Masking, Apperceptive Agnosia, Associative Agnosia, Attention Splitting	Not seeing an image Occlusion of image elements Apprehension is influenced by images or stimuli viewed before or after the target image
Environment-Based Noise (EBN)	Visual Masking, Attention Splitting	• Not seeing an image • Occlusion of image elements • Apprehension influenced by external stimuli during viewing
Temporal-Based Noise (TBN)	Visual Masking	• Not seeing an image • Occlusion of image elements • Apprehension influenced by the time allocated to the processing of images

Apperceptive visual agnosia is defined as being unable to construct a good perceptual representation or working model from visual input.[858] Associative visual agnosia indicates perception occurs, but recognition does not. This results from the viewer seeing but being unable to group the elements in an image despite allocating attention toward it,[859] preventing the image from being fully apprehended. In other words, Working Memory (the "small amount" of information held in the mind and used to execute cognitive tasks such as information processing

858 I. Biran and H. Coslett, "Visual Agnosia," *Current Neurology and Neuroscience Reports* 3, no. 6 (2003): 508, doi. https://doi-org.ezproxy.cqu.edu.au/10.1007/s11910-003-0055-4.

859 Abrams and Law, "Random visual noise impairs object-based attention," 349.

and comprehension[860]) becomes overloaded with extraneous information and has little in Long Term Memory (see Chapter 4.5) associated with such an image that would help processing. Therefore, the producer of the image needs to take great care in deciding what to include and what to leave out to make the image more brain-friendly and of greater utility for the user.

6.3.2 Visual Masking

The effects of visual masking reveal the way the nervous system reacts to competing visual stimuli. The various forms of masking are described in Chapter 4.6. These include forward, backward and simultaneous masking, which control the degree to which an image is cognised. They have temporal qualities, the rate at which competing visual stimuli (mask) enter the vision field. These qualities affect the visibility of the target image by diminishing its visibility through various optical effects, such as obscuring the target image or reducing its perceived lightness or contrast.[861] This controls the amount and quality of conscious registration of the image by validating visual input through "motor mechanisms"[862] before the conscious representation of the image. This affects the way the image appears in consciousness because the act of viewing is influenced by the stimuli we see before the target image, which Herzog and Koch refer to as "feature inheritance."[863] Features of one object are incorrectly associated with another affecting the way the image is apprehended.[864]

In this study, visual masking is considered a characteristic of visual noise that can interfere with the viewing task. This contributes to a phenomenon of "looking but not seeing" – visual

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860 Nelson Cowan, "Working Memory Underpins Cognitive Development, Learning, and Education," *Educ Psychol Rev* 26 (2014): 197, https://doi-org.ezproxy.cqu.edu.au/10.1007/s10648-013-9246-y

861 Nadège Bacon-Macé, Marc J.-M. Macé, Michèle Fabre-Thorpe and Simon J. Thorpe, "The Time Course of Visual Processing: Backward Masking and Natural Scene Categorisation," *Vision Research* 45, no. 11 (2005): 1467, https://doi.org/10.1016/j.visres.2005.01.004

862 Tomkins, *Affect, Imagery, Consciousness: The Complete Edition*, 989.

863 Michael H. Herzog and Christof Koch, "Seeing Properties of an Invisible Object: Feature Inheritance and Shine-Through," *PNAS* 98, no. 7 (March 2001): 4271, https://www.jstor.org/stable/3055406

864 Ibid., 4275.

access without phenomenal visual consciousness, preventing the progression of higher-order processing, such as assessing the semantic properties of the image. This process presents us with the challenge of understanding in which situations are the effects of visual masking more severe. How do we create arresting images in visually cluttered environments, and what components of the visual ecosystem need to align to achieve complete apprehension?

Summary

A Demonstration of Perceptual and Non-perceptual Outcomes

We can no longer contemplate photographic images as we once did in printed communication mediums where engagement occurred with a more fixated and mostly uninterrupted gaze, not always possible in the digital environment. In this instance, visual noise coming from multiple devices and information streams has altered how we process information resulting in the superficial reading of images.

This process is not necessarily an unfavourable condition to the way we read images because visual processing by the brain allows for a range of possible reactions, each with its modalities of attentional intensity. For example, through the cognitive state of "Hyper-attention" we can negotiate visually crowded and dynamic environments[865] by directing our attention to those images that affect us, allowing us to perceive their salient characteristics. This can occur in a visually cluttered environment, thus overriding the effects of visual noise.

There is no "one fits all" definition for an image. However, at the most fundamental level we can describe an image as a technical process where through recording various aspects of light, a likeness of an original or a visible impression of the object or scene presented before the "camera" is obtained.

From this perspective, through various human actions of intent, some technologically

865 Hayles, "Hyper and Deep Attention," 188.

influenced, the image becomes a manifestation of possible perceptual or non-perceptual outcomes. These are dependent on one's mental state, spaciotemporalities and conditions of viewing environment during engagement, including the medium-specific mode of reception.

Transcendental and Existential

The image is transcendental and existential, both present and prescient, capable of generating considered meaning, the visceral "wow" moment or the impaired act of "looking but not seeing." It can be experienced through the tactility of print and the visual physiological affordances of screen technologies.

From the existential viewpoint, the image is perceived through concrete human experience relying on prior semantic knowledge and observation – we autonomously create our "own values."[866]

Using Kant's definition, transcendentally, the image is experienced *a priori*, generating reasoning or knowledge from the affective experience of the moment of viewing or touching and not immediately from observation or experience.[867] The image is experienced instinctively and emotionally before conscious experience or knowledge. This can occur in both print and online mediums.

In social media, images are no longer physical entities to be kept and coveted. In digital form, they are no longer fixed forms. Still, they are shared and consumed in a virtual world, a utilitarian product for mass communication and consumption– necessary, helpful, functional, practical, augmented with value and prestige through likes, views and comments but ultimately replaceable. They are experienced viscerally in moments of fragmented temporality and can be

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866 Richard Gravil, *Existentialism*, ed. Mark Addis (Tirril, Penrith: Humanities-Ebooks, LLP, 2007), 7–8, ProQuest Ebook Central.

867 Immanuel Kant, "Part First--Transcendental Aesthetic," in *Critique of Pure Reason*, trans. J. M. D. Meiklejohn (New York, NY: Willey Book Co, 1899), 63, https://doi.org/10.1037/11654-008.

transcendental and existential.

The Multiple Personalities of The Image

The image, released into the "digital wild" with its chameleonic potential, assembled and reassembled as data, can be engaging, characterless, deceitful, forgettable and annoying. This occurs before any meaning-making we choose to impose.

Images can be banal yet unique, a technological mediation of our lives, augmentation of reality – sight, speech and human sociality delivered to us through social media platforms.

Images under these conditions can pose interpretive challenges if analysed through traditional semiotic discourses of representation and signification. For example, how do we classify them? What effect do they have on us? Are these images coded with meaning?

This study has acknowledged emerging neuroscientific literature on this topic and argues the benefits of broadening photographic image discourse from traditional semiotic theories into the areas of neurophenomenology and affective and embodied human experience. However, let us also acknowledge the importance of our experience of these images, the affect, without concern for deconstructing their semiotic anatomy, which may very well reveal an absence of signification or meaning.

CHAPTER 7 – CONCLUSION

7.1 Overview - Addressing the Aims and Objectives

The overview begins with contextualising this research to its origins. The genesis for the study came about from an initial observation by the researcher of students in a tertiary classroom setting performing a Google search for images. They were browsing and scrolling through a multitude of images delivered on-screen. These images were miniature representations of their larger versions that could be summoned to appear through a hyperlink connecting the smaller to the larger version. Many students had multiple project windows open, and the following questions came to mind. How would they choose the right image for the project? What was the decision-making process toward the final choice? What effect must this viewing environment have on their ability to make critical choices? Would the choices be based on their knowledge or physiological responses influenced by the viewing conditions?

In this scenario, the initial assumption was that the viewing conditions would alter the students' perceptions and final apprehension of the images viewed and selected. For example, would there be differences if the same task was performed by selecting images from printed magazines or stock photo library books? What would the differences be?

These considerations led to this research to gain insights into understanding if and how the apprehension of images has changed from their use in traditional modes of printed communication to their use and appearance in the online environment. Does technology affect this process? The study explored this through the following three research questions.

1. Has the apprehension of the two-dimensional photographic image changed as a result in the shift from traditional forms of printed communication and information dissemination to digitally based information exchange and communication systems, devices and applications?

2. Can traditional Western cultural semiotic and linguistic frameworks be applied to understanding image usage within the online context?
3. Is image apprehension affected by the surrounding visual noise that we "operate" in?

An interpretive paradigm set the foundation for exploring these questions and was supported by the literature review chapters providing a framework for the data exploration and analysis. The literature provided insights into emerging theories relating to the changing nature of photographic image practices. These insights were presented through the following sections:

1. The Image and Digital Culture
2. The Image as Seen Through Semiotic and Emerging Interpretive Theories
3. The Image as Fauxtography
4. The Image and the Technological Affect
5. Does Size Matter
6. The Online and The Printed Image
7. Neuroscience and the Phenomenology of Body, Mind and Image
8. The Recall and Retrieval of Memory

The interpreted findings in Chapter 6 revealed important key insights into how we engage with images. Data was gathered using qualitative methods involving students and practitioners, including photo-elicitation surveys and individual and focus group interviews allowing student participants to engage with images actively. This provided them with the opportunity to express their viewing experiences in "the moment." In addition, the discussions encouraged viewpoints from both sample groups related to their understanding of, and engagement with, images in situations outside of the data gathering environment, including images in social media, work and home environments.

The data was analysed using NVivo qualitative analysis software where categories and connections were established around phenomena discovered in the data, ensuring relevance to the research questions. The categories were further analysed, refined and conceptualised, revealing eight key considerations pertinent to the research questions that are interpreted as the key insights from this research (see Chapter 6).

The data gathering and analysis effectively revealed the nature of our interactions with images as rich and complex. It also brought to light the cognitive aspect of apprehension, from how images were traditionally experienced through the printed medium and the new experiences aided by the definitive changes made possible by digital forms of communication practices.

The data and the literature showed that environmental and mental aspects such as visual noise and masking affect our interpretation. Traditional Western cultural semiotic and linguistic frameworks were revealed as still relevant in certain situations when considered from a phenomenological point of view of understanding the world through our situatedness within it. Our experience of that world allows us to arrive at meaning. Phenomenological intentionality toward the image is essentially the same whether viewing images in printed or online mediums. Still, due to mediating factors argued in this study, final apprehension can be different. Considering this, the researcher argues the need for expanding traditional semiotic frameworks for understanding our interactions with images to include neurological, sensory and spatiotemporal aspects of image engagement.

7.2 Significance and Contributions to the Field

This study's significance lies in drawing together a substantial body of literature with the critical insights established in Chapter 6. This research combines established and emerging theoretical discourse around image usage practices with the key insights to provide integrative theoretical models of image apprehension. These are presented through the broad visual apprehension framework of the P.E.M.I. Effects Compass model of image apprehension (see

Figure 6.6). We can separate this model into three methodological categories of understanding: sensorial experience (see Figure 6.7), neurophenomenology (see Figure 6.11) and the social media model (see Figure 6.12).

These methodologies present new ways of understanding photographic image apprehension, expanding upon traditional semiotic frameworks and broadening the conceptual possibilities of understanding how we experience and make meaning from images.

This research also fills a gap in the literature, presenting insights into how image apprehension has changed and is evolving by making direct comparisons between the image operating through digital technologies and the antecedent technologies of print. The brain's plasticity responds to changing viewing modes allowing for cognitive processing and apprehension to occur in different ways, even in "cluttered" digital environments. How this happens warrants further investigation.

7.4 Personal Reflection and Limitations

In undertaking this research, and during the data analysis stage, it was found that there was an overabundance of redundant questions relating to quantitate aspects of technology and image use, such as: "How many hours per day do you spend on devices?" (see Appendix 1: Research Instruments). Initially, the researcher included these questions to ascertain whether someone spending time with technology apprehended images differently than someone spending less time. However, these questions did not provide any insights into the research questions and were omitted when performing the data interpretation.

Limitations included the following and were primarily associated with the photo-elicitation process:

- The photo-elicitation process was conducted in the static environment of a classroom setting.
- The small sample size of 10 students and five practitioners made comprehensive

statistical analysis difficult. However, the study was conducted from a qualitative standpoint and designed as an exploratory gathering of information that successfully provided insights into the research questions.

- Technologies for viewing were limited to desktop computers and printed magazines.
- The *Australian Geographic* Magazine and the companion website were the only source of images. These images were general in nature.
- It is acknowledged that viewing the same set of images consecutively on both the website and the magazine influenced participant responses (see Chapter 4.5).
- The images presented in the photo-elicitation were two-dimensional photographic images.
- The image viewing order and close temporal viewing time frames did not account for the various types of memory recall, such as primacy and recency effects. The image viewing sequence influenced participants' recall of specific images over others and is acknowledged in Chapter 4.5: The Recall and retrieval of Memory.

These are acknowledged as limitations considering images are viewed using various technologies and in many more scenarios and environments, all associated with their unique factors affecting the image apprehension process. In addition, the static setting of the photo-elicitation tasks did not allow for the full spectrum of online experiences with images, particularly when considering the ubiquity of smartphone usage when accessing online content.

The photo-elicitation data collection was useful in allowing participants to better express their experiences in an "in the moment" and "hands-on" situation rather than from recollective experience. The photographs viewed were also a tool enabling participants to verbalise and elaborate upon their experiences.

The richest data came from focus group interviews which enabled participants to reflect on their image usage practices that extended beyond the classroom environment.

If this research were to be conducted again, the researcher would streamline the research instruments to eliminate questions such as "How do you capture photos?" These did not facilitate the answering of the primary research questions. Instead, questions would focus more on image

apprehension's experiential and cognitive aspects and would exclude ones related to extraneous media such as posters and billboards (see Appendix 1: Research Instruments). From the researcher's perspective, introducing too many media categories in which images appeared made the data collection process unwieldy and prolonged. In addition, this approach can make the experience onerous for participants.

It is also acknowledged that while participants were asked not to look at textual information while viewing images, images were presented together in a magazine setting with captions, headings and editorial content. This visible text may have an "anchored" meaning to the image. Barthes emphasises the role of the linguistic message in the form of text is to anchor the meaning of the image, which works to secure this by "avoiding many possible interpretations."[868] This may have influenced participant responses to questions relating to describing the meaning, narrative and symbolism in an image.

Although the research was limited to the study of two-dimensional photographic images, the researcher considers this type of image presentation as the fundamental unit for image usage in other mediums, including video and emerging technologies such as virtual, mixed and augmented realities, deep fakes and artificial intelligence. Therefore, Image practices related to these technologies are beyond the scope of this study.

It was noted during the data analysis, that there were no discernible differences in the views of the practitioner or student sample groups. Their responses to questions aligned in many areas and indicated both groups were familiar with print and digital technologies despite the generational divide of over two decades.

868 Roland Bathes, *Image, Music, Text,* trans. Stephen Heath (London: Fontana Paperbacks, 1984), 39.

7.5 Recommendations

The researcher recommends further exploration into the area of photographic image apprehension with special attention to the neurological and sensorial aspects of image processing. Future research into this area could integrate data collection techniques used by the sciences such as eye tracking, EEG (electroencephalogram) and MRI (Magnetic Resonance Imaging) to map visual activity and stimuli to brain responses during image viewing, thus combining both quantitative and qualitative research investigation techniques into a research project. This offers the possibility for a broad and rich range of findings that are not confined to only one approach. Most of the research using techniques such as eye tracking, MRI and EEG has focussed on cognitive functional aspects of viewing, such as effects of viewing conditions on perceptual load,[869] internet search tasks and reading text,[870] visual masking effects[871] and "real world" scene perceptions,[872] while others are more closely related to visual communication and have focussed on areas such as online advertisement cues[873] and evaluating the appeal of body representations in artistic and photographic images through neurocognitive processing.[874] Little research has been conducted specifically examining photographic image apprehension using these techniques.

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869 Lavie, "Distracted and Confused?" 75.

870 Gary W. Small, Teena D. Moody, Prabha Siddarth and Susan Y. Bookheimer, "Your Brain on Google: Patterns of Cerebral Activation during Internet Searching," *American Journal of Geriatric Psychiatry* 17, no. 2 (February 2009): 116, http://ezproxy.uws.edu.au/login?url=https://www.proquest.com/scholarly-journals/your-brain-on-google-patterns-cerebral-activation/docview/195989662/se-2?accountid=36155.

871 Ansorge et al., "Visual Masking and the Dynamics of Human Perception," 2-8.

872 Russell A. Epstein and Chris I. Baker, "Scene Perception in the Human Brain," *Annual Review of Vision Science* 5 (September 2019): 373–397, https://doi.org/10.1146/annurev-vision-091718-014809.

873 Chiahui Yen and Ming-Chang Chiang, "Examining the Effect of Online Advertisement Cues on Human Responses Using Eye-tracking, EEG, and MRI," *Behavioural Brain Research* 402 (26 March 2021): 113128, https://doi.org/10.1016/j.bbr.2021.113128.

874 Aline Lutz, Armin Nassehi, Yan Bao, Ernst Pöppel, Anikó Sztrókay, Maximilian Reiser, Kai Fehse and Evgeny Gutyrchik, "Neurocognitive Processing of Body Representations in Artistic and Photographic Images," *NeuroImage* 66, no. 1 (February 2013): 288–92. https://doi.org/10.1016/j.neuroimage.2012.10.067.

In addition, the researcher makes the following recommendations. Firstly, due to the small sample group engaged, this study should be used as a preliminary investigation into the changing practices of image usage and the diverse situations and localities where this can occur. Secondly, a larger sample group should be engaged with the photo-elicitation tasks administered using specific technologies, particularly smartphones. Thirdly, the researcher recommends a longitudinal approach. This method would enable the effects of temporality and environment to be examined in richer detail.

Other recommended areas of research are as follows:

- Comparison of different types of images together with human affective responses in Augmented Reality and Virtual Reality environments.
- Investigating differences in apprehension between computer (such as deepfake images) and human-generated images.
- Neurological aspects of affect comparing images containing different content, tonal and colour values.
- Explore the theme of image orality in the context of social media image use.
- Research exploring the concept of the power of banality and its inclusion as a valid photographic genre that is an expectation of images presented in social media.

The integration of interpretive features of this study may be adopted and incorporated into visual literacy curriculum at a tertiary level. The recommended focus is understanding how images make meaning in digital environments, how visuality and our engagement with it are changing, and how the different presentations of the image affect our critical engagement and experience of it.

In conclusion, this thesis has made several significant contributions to research. Firstly, several models are proposed that can be applied to better understand our interaction with images through Neurophenomenological, Affective and Socio-cultural models of apprehension.

Secondly, the substantive, conceptual and methodological ideas explored in this thesis are intended to encourage further research into the area of image apprehension. Of particular importance is integrating quantitative and qualitative approaches to provide a holistic exploration of the areas examined in this study. Finally, the findings in this research expand current photographic image theory research and practice and have highlighted implications for visual literacy pedagogy and practice.

APPENDIX 1

Research Instruments - Students

First Name: _____

Family Name: _____

Age: _____years

☐ Male ☐ Female

Course being studied: _____

Place of Study: _____

Cultural background: _____

Stage 1: Focus Group Facilitated Discussion - Part A

1. When reading texts without images, do you have a preference to read a printed book or an e-book? Explain your reasons.

2. When reading texts with images, do you have a preference to read a printed book or an e-book? Explain your reasons.

3. On which of the following devices/mediums do you think an image's meaning is easier to comprehend? Why?

    1. laptop
    2. tablet
    3. smart phone
    4. desktop computer
    5. printed magazine
    6. newspaper

4. Do you think viewing images on digital devices such as smart phones, tablets and desktop computers has altered the way people interpret images? If so, in what ways?

5. Do you normally assume photos in print are representations of reality? Explain your reasons.

6. Do you normally assume photos in online are representations of reality? Explain your reasons.

7. Do you agree there are differences in the effectiveness of images as a means for communication when viewed online compared to print? If so, describe the differences.

8. Do you think the viewer's interpretation of the meaning of the same image would change when viewing the image in the following online environments? Describe how the meaning would change.

    1. Websites
    2. Blogs
    3. Social Media Sites
    4. Google Search
    5. Photo sharing sites

    8.1. In which of the environments mentioned above do you notice images the least? Why?

    8.2. In which of the environments mentioned above do you notice images the most? Why?

9. Do you think the viewer's interpretation of the meaning of the same image would change when viewing the image on the following digital devices? Describe how the meaning would change.

    1. Smart Phone
    2. Tablet
    3. Laptop
    4. Desktop Computer

    9.1 On which of the devices mentioned above do you notice images the least? Why?

    9.2. On which of the devices mentioned above do you notice images the most? Why?

10. Do you think the viewer's interpretation of the meaning of the same image would change when viewing the image on the following printed mediums? Describe how the meaning would change.

    1. Printed magazine
    2. Newspaper
    3. Billboard
    4. Poster

10.1. On which of the printed mediums mentioned above do you notice images the least? Why?

10.2. On which of the printed mediums mentioned above do you notice images the most? Why?

11. Images can be created to convey meaning through the composition of various elements depending on the message that the author would like to convey. In the following scenario, a person could view the same image on a website or in a magazine. Do you think the interpretation of meaning in the image by the viewer would be different if viewed on a website or in a magazine? If so, explain your reasons.

Part B

1. Do you think the viewer's ability to absorb information presented in the same image changes when the image is viewed on either a) smart phone, b) tablet, c) desktop computer, d) laptop?
   If so in what way do you think these devices affect the viewer's ability to comprehend and absorb information?

a) smartphone.....
b) tablet .....
c) desktop computer?.....
d) laptop? .....

2. Visual noise is anything that may distort, transform, block or add to what we see. Do you think the multiple channels of communication that now exist and can be accessed on a variety of digital devices have:
   a: affected the communication value of the image? If so, describe this affect……
   b: affected a viewer's ability to absorb information? If so, describe this affect……

3. What do you think about the following statement: Technology determines the way we communicate. We have little control over technology and will have to adapt to changing

communication mediums so that we can send and receive messages and information like everyone else.

Part C

1. What do you think about the following statement: Images are understood through the culturally and socially constructed meaning placed on them by the individual.

2. What do you understand by the term, 'visual language'? Does this differ from verbal or textual language? If so, how?

Stage 2: Photo-Elicitation-Printed Magazine - Part A

1. You have two minutes to look at the images on pages 61–71, 78–85 and 89–93 in the *Australian Geographic* magazine. After two minutes without looking at the magazine, briefly describe the five most memorable images. Write your description in the list below with 1 being the most memorable and 5 being the least memorable.

Briefly describe what made the image marked as number one the most memorable.
Briefly describe what made the image marked as number five the least memorable.

1. (most memorable)_____

Describe your reasons_____

_____

_____

_____

_____

2_____

3._____

4._____

5. (least memorable)_____

Describe your reasons_____

_____

Part B

1. In the *Australian Geographic* printed magazine turn to pages 120–121. Without looking at the text describe the narrative in the series of images.
Image 2B-1: *Australian Geographic* magazine

Part C

2. In the *Australian Geographic* printed magazine turn to pages 44–45. Describe what you see in this image.
Image 2C-1: *Australian Geographic* magazine

3. In the *Australian Geographic* printed magazine turn to page 34. What does this image symbolise to you?
Image 2C-3:

4. In the *Australian Geographic* printed magazine turn to page 57. Look at the image. What does this image mean to you?
Image 2C-2:

Stage 3: Survey Questions

1. How many hours per day do you spend on devices?

   ☐ Less than 1 hour ☐ 1 hour to 3 hours ☐ 3 hours to 5 hours ☐ Over 5 hours

2. How many hours per day do you spend watching TV?

   ☐ Less than 1 hour ☐ 1 hour to 3 hours ☐ 3 hours to 5 hours ☐ Over 5 hours

3. How many hours per day do you spend reading books?

   ☐ Less than 1 hour ☐ 1 hour to 3 hours ☐ 3 hours to 5 hours ☐ Over 5 hours

4. How many hours per day do you spend reading magazines?

   ☐ Less than 1 hour ☐ 1 hour to 3 hours ☐ 3 hours to 5 hours ☐ Over 5 hours

5. Do you think images online are manipulated?

   ☐ Always ☐ Often ☐ Sometimes ☐ Rarely ☐ Never

6. Do you think images in print images are manipulated?

   ☐ Always ☐ Often ☐ Sometimes ☐ Rarely ☐ Never

7. Images can be viewed across many mediums from printed publications through to different digital devices. The act of viewing images can occur in different locations both outdoor and indoor. From the following two lists place a number from 1 to 8 for the locations where you notice images most, with number 1 representing the most noticeability and number 8 the least noticeability. Give the reasons for choosing number 1 and number 8.

   List 1: Viewing online images

   ☐ At your place of study
   ☐ At home
   ☐ On public transport
   ☐ Walking down the street
   ☐ While waiting for public transport
   ☐ At work
   ☐ In a park
   ☐ Other……..

   List 2: Viewing printed images

   ☐ At your place of study
   ☐ At home
   ☐ On public transport
   ☐ Walking down the street
   ☐ While waiting for public transport
   ☐ At work
   ☐ In a park
   ☐ Other……..

8. How do you capture photos……..

9. How do you capture video……

10. Do you share images online? ☐ Yes ☐ No

11. Describe the type of images you share online? ……

12. What is the source of the images you share online? Place a number in the checkboxes from 1 to 5 in level of importance.
(1 being the most important and 5 the least important)

☐ Search Engines
☐ Websites
☐ Images you have taken or created
☐ Images from friends or colleagues
☐ Other (please explain)…….

13. How do you share images online? Number the checkboxes from 1 to 6 in level of importance. (1 being the most important and 5 the least important)

☐ Upload them to a photo-hosting site (e.g. Flickr) Which site?……..
☐ Upload them to a social networking site (e.g. Facebook) Which site?.....
☐ Email them to people
☐ Print them and send or give them to people ……..
☐ Share them on Snapchat
☐ Other (please explain)……

14. What digital devices do you mainly use to share images?

☐ Smart Phone ☐ Tablet ☐ Laptop ☐ Desktop Computer

15. I take more notice of images when I view them online than I do with print.

☐ Strongly agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly disagree

Stage 4: Photo-Elicitation-Website - Part A

1. You have two minutes to look at the images 61–71, 78–85 and 89–93 on the *Australian Geographic* website. After two minutes without looking at the website, briefly describe the five most memorable images. Write your description in the list below with 1 being the most memorable and 5 being the least memorable.

   Briefly describe what made the image marked as number one the most memorable.
   Briefly describe what made the image marked as number five the least memorable.

   1. (most memorable)_____

   Describe your reasons_____

   _____

   _____

   _____

   _____

   2_____

   3._____

   4._____

   5. (least memorable)_____

   Describe your reasons_____

   _____

   _____

   _____

   _____

   _____

Part B

1. In the *Australian Geographic* website navigate to pages 44–55. Describe what you see in the image.
Image 4C-1:

2. In the *Australian Geographic* website navigate to page 57. Look at the image. What does this image mean to you?
Image 4C-2:

3. In the *Australian Geographic* website navigate to page 34. What does this image symbolise to you?
Image 4C-3:

Part C

4. On the *Australian Geographic* website, navigate to pages 120–121. Without looking at the text describe the narrative in the series of images.
Image 4B-1:

Stage 5: Photo-elicitation Survey Questions

1. Do you agree or disagree with the following statements? Explain why?

   a) Viewing the images on the *Australian Geographic* website was easy
   ☐ Strongly agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly disagree

   Why……....

   b) Viewing the images on the *Australian Geographic* magazine was easy
   ☐ Strongly agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly disagree

   Why……....

   c) The computer seems to get in the way of viewing the images.
   Very often ☐ Sometimes ☐ Never ☐

   Why……....

   d) How easy was it to describe the images you viewed in the online version of the *Australian Geographic* magazine. ☐ Very easy ☐ Easy ☐ Neither easy nor difficult ☐ Difficult

   Why……....

   e) How easy was it to describe the images you viewed in the printed version of the *Australian Geographic* magazine. ☐ Very easy ☐ Easy ☐ Neither easy nor difficult ☐ Difficult

   Why……....

2. When viewing the images which medium provided the strongest memorability?

   ☐ The *Australian Geographic* magazine

   ☐ The *Australian Geographic* magazine website.

   ☐ Memorability was the same on both.

Explain your reasons
……...……...……....
……...……...……....
..……...……...…….....

Stage 6: Photo-elicitation Memorability

1. Do you remember viewing the following images? Circle either yes or no. If you circled yes place a number from 1 to 5 next to each image, 1 being the most memorable and 5 being the least memorable. Choose the source of the image from the options on the right.

Image 6A Yes / No Number ☐		I remember this image from the: (Tick one) ☐ *Australian Geographic* magazine ☐ *Australian Geographic* website ☐ Both the website and the magazine
Image 6B Yes / No Number ☐		I remember this image from the: (Tick one) ☐ *Australian Geographic* magazine ☐ *Australian Geographic* website ☐ Both the website and the magazine
Image 6C Yes / No Number ☐		I remember this image from the: (Tick one) ☐ *Australian Geographic* magazine ☐ *Australian Geographic* website ☐ Both the website and the magazine
Image 6D Yes / No Number ☐		I remember this image from the: (Tick one) ☐ *Australian Geographic* magazine ☐ *Australian Geographic* website ☐ Both the website and the magazine
Image 6E Yes / No Number ☐		I remember this image from the: (Tick one) ☐ *Australian Geographic* magazine ☐ *Australian Geographic* website ☐ Both the website and the magazine

Source: The *Australian Geographic* Magazine and Laman Tim, (Image 6C), Tasmania May–June Edition 2016.

Stage 7: Photo-elicitation Focus Group Facilitated Discussion

1. Describe your experience when viewing images in the *Australian Geographic* Magazine website.

3. Describe your experience when viewing images in the *Australian Geographic* magazine (print).

4. When viewing the images in both mediums did you find that any aspect/s of the process made your task more difficult or much easier? What were they?

5. From all the images viewed which one do you remember most? Why?

6. What is the most memorable image you have seen and why? Where did you see it?

Research Instruments – Practitioners

Survey

Fast Image: A Study of Photographic Image Usage and Apprehension by Graphic Design Students and Practitioners Comparing Print and Online Media.

First Name: ————————————————————————————————————

Family Name:————————————————————————————————————

Age: ————years

☐ Male ☐ Female

Industry Sector: ……

Your Job Description:……

Time in the Industry: ————years

Survey Questions – Part A

Q1.There are differences in the effectiveness of images used in a communication context when viewed online compared to print?

☐ Strongly agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly disagree

Q2.Search engine results where images are displayed can impact the way meaning is derived from an image?

☐ Agree ☐ Disagree

Q3.In general audiences are more visually literate today than they were 10 years ago?

☐ Strongly agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly disagree

Q4.The same image can be interpreted differently when viewed on a computer screen than when viewed in a magazine.

☐ Strongly agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly disagree

Q5.How would you rate the retention of an image's message when viewed on a desktop computer screen?

☐ High ☐ Moderate ☐ Low

Q6.How would you rate the retention of an image's message when viewed on a smart phone screen?

☐ High ☐ Moderate ☐ Low

Q7.How would you rate the retention of an image's message when viewed on a tablet screen?

☐ High ☐ Moderate ☐ Low

Q8.How would you rate the retention of an image's message when viewed in a magazine?

☐ High ☐ Moderate ☐ Low

Q9.Images are understood differently when looking at the same image in print or on a website.

☐ Strongly agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly disagree

Q10. An image's message is more clearly understood in print than online.

☐ Strongly agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly disagree

Q11. The size of screen impacts the viewer's ability to comprehend an image's message.

☐ Strongly agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly disagree

Survey Questions – Part B

Q1. Digital technology influences the way people interpret images?

☐ Strongly agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly disagree

Q2. Visual noise is anything that may distort, transform, block or add to what we see. Digital technology has contributed to this visual noise?

☐ Strongly agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly disagree

Q3. Visual noise interferes with a person's perception of an image?

☐ Strongly agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly disagree

Q4. Visual noise occurs more when viewing information on a website than when reading a magazine.

☐ Strongly agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly disagree

Q5. People are not affected by visual noise because they are able to focus on what they need to see?

☐ Strongly agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly disagree

Q6. People are more likely to understand an image's message when they have more time to view the image.

☐ Strongly agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly disagree

Q7. People pay less attention to images today than they did 10 years ago.

☐ Strongly agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly disagree

Q8. We have less time to comprehend information represented in an image today than 10 years ago.

☐ Strongly agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly disagree

People see a vast number of photographic images every day. Images are seen on many different devices from digital through to print and in many different locations from billboards to train stations. This phenomenon has reduced the significance of images as an element of communication.

☐ Strongly agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly disagree

Q10. Within which communication environment can an image's message be best comprehended? Number your choices, number 1 being the best device where comprehension is most likely to occur.

☐ Social Media ☐ Newspaper

☐ Website ☐ Billboard

☐ Blog ☐ Poster

☐ Printed magazine

Q11. On which device can an image's message be best comprehended? Number your choices, number 1 being the best device where comprehension is most likely to occur.

☐ Smart Phone

☐ Tablet

☐ Laptop

☐ Desktop Computer

Survey Questions – Part C

1. Images are understood through the culturally and socially constructed meaning placed on them by the individual.

   ☐ Strongly agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly disagree

2. Consider image apprehension as a sequence involving the producer of the image, the image itself and the viewer of the image.

   1a. Do you think when viewing images through technology, in the viewer's mind the role of the 'image producer' has been eliminated from the above sequence?

   ☐ Definitely ☐ Probably ☐ Possibly ☐ Probably not ☐ Definitely not

   If so what has that role been replaced by?

3. Consider the image as a sign that has two components
   a: the form which the sign takes
   b: the concept it represents.

   3a. Concepts conveyed by images are more easily interpreted when looking at an image online.

   ☐ Always ☐ Often ☐ Sometimes ☐ Rarely ☐ Never

3b. Concepts conveyed by images are more easily interpreted when looking at an image in print?

   ☐ Always ☐ Often ☐ Sometimes ☐ Rarely ☐ Never

lnterview

Interview Questions – Part A

1. Do you think viewing images on digital devices such as smart phones, tablets and desktop computers has altered the way people interpret images?
   If so in what
   ways……..

2. Do you agree there are differences in the effectiveness of images as a means for communication when viewed online compared to print?
   If so describe the
   differences……..

3. Digital technology has allowed for the increased ability to produce and disseminate images rapidly. Large quantities of photographic images inhabit many online environments such as search engines' results pages, websites, photo-sharing sites and social media sites.
   What effect if any does viewing images in these environments have on the viewer's interpretation of the meaning of an image?
   ……

4. Setting the production process aside, if you were creating graphic communication with the same message to the same audience across print and digital would you change the genre or type of images used depending on whether the medium was print or digital? Explain why or why not……...

5. In your experience do you think audiences are more visually literate today than they were 10 years ago? Explain your answer…….

6. When creating online communication material what would be your image selection criteria? For example, what properties or qualities (not related to production) would the images require? …….

7. When creating printed communication material what would be your image selection criteria? For example what properties or qualities (not related to production) would the images require? …….

8. Has the way you have used images to convey meaning changed in the last 10 years?
   If so describe the change and the reasons for the change…….

9. Do you think there would be a difference in interpretation by the same audience of the same image when that image is viewed on a website compared to a magazine? Why or why not?……

Interview Questions – Part B

1. Do you agree that computer technology has modified human behaviour toward viewing images?
   If so in what way?.....

2. Do you think the viewer's ability to comprehend and absorb information presented in the same image changes when the image is either viewed on a a) smart phone, b) tablet, c) desktop computer?
   If so, in what way do you think each of these devices affects the viewer's ability to comprehend and absorb information?.....
   .....

3. Visual noise is anything that may distort, transform, block or add to what we see. Do you think the multiple channels of communication that now exist and can be accessed on a variety of digital devices have:

   a: affected the communication value of the image? If so, describe this affect……

   b: affected a viewer's ability to absorb information? If so, describe this affect……..

Interview Questions – Part C

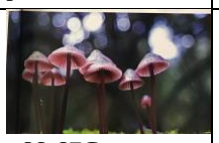
1. Images can be created to convey meaning through the composition of various elements depending on the message that the author would like to convey. In the following scenario, a person could view the same image on a website or in a magazine.

   Do you think the interpretation of meaning in the same image by the viewer would be different if viewed on a website or in a magazine? If so explain your reasons.

APPENDIX 2

Photo-elicitation Images

All images viewed in the *Australian Geographic* magazine and the *Australian Geographic* magazine website with image codes.

 p61	 p63	 p63A	 p63B	 p63C	 p64-65
 P66-67	 p66-67A	 p66-67B	 p66-67C	 p66-67D	 p68A
 p68B	 p70-71	 P70-71A	 P70-71B	 p70-71C	 p70-71D
 p78	 P70-71B	 p79	 p79A	 p79B	 p79C
 p80	 p79A	 P82-83	 p82-83B	 p82-83C	 p82-83D
 p82-83A	 p84	 p85	 p85A	 p85B	 p85C
 p85	 p89	 p90	 p91	 p91A	 p91B
 p90	 P92	 p93			

Source: The *Australian Geographic* Magazine and Laman Tim, (p89-p93), Tasmania May–June Edition 2016.

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