Ducks, decorators, and the dialogical
An examination of approaches to information design

Eden Potter
Master of Arts (Art and Design)
2010

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A thesis submitted to Auckland University of Technology in partial fulfilment of the degree of Master of Art & Design

School of Art & Design
Faculty of Design & Creative Technologies
AUT University

"I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning."

Eden Potter
2010

For my daughter.
Who led me here.

A. Potter (2010). Life cycle of frogs.

ABSTRACT

This study is concerned with approaches to the design of visual information. It examines the persistent influence that formalist design approaches have within the field of information design and suggests how, when used prescriptively, the formalist approach undermines the fundamental role of information design: to make information accessible and relevant for people. With a primary focus on information graphics, the research explores how the deployment of a rhetorical strategy in the design of visual information promotes socially responsible design. It will be clear from this reading that I consider without reservation, traditionalist perspectives of information design, whilst having significant historical value, to be fundamentally flawed.

This thesis supports approaches sometimes considered postmodernist in that they tend to privilege the perspective of the reader, the user and those who are generally rendered less powerful by the rules and standards imposed by those who see themselves as experts in the field. This thesis regards the precepts of Modernist *objectivism* to be, in themselves, political and as such, implicated in the maintenance and propagation of a dominant ideology. Having said that, I hope to do justice to the excellent work done by the early (and later) Modernist theorists. I hope to bring to the fore some significant problems inherent in doctrinal approaches and to elucidate the importance of alternative and more inclusive perspectives on what I consider to be the vital and powerfully influential emergent discourse of information design.

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1.0
Background

1.1
Introduction and overview

This thesis identifies and evaluates approaches to the design of visual information. It discusses the problems inherent in formalism; a doctrinal approach to information design, and it offers alternative theoretical and practical perspectives, which incorporate inclusive communication theories focusing on the needs of people for whom information design serves. The thesis is composed of two parts. The first aims to give a critical overview of historical and ideological concerns that position the overarching argument. This establishes Modernism as an underlying, yet dominant influence in contemporary conceptions of information design. Further it implicates Modernism as instrumental in reductive, detached approaches to communication design still favoured in design schools and in commercial design practice, and problematises this in the discussion. Next, it examines approaches to information design that run counter to Modernist dictates, and which admit contemporary practice and concerns. This alternative approach, the dialogical makes no claims to be entirely innovative. Nonetheless, it is a perspective not fully articulated in information design discourse, in part due to the field's fragmentation.

Information design as a discipline is still in the process of self-identification. Whereas Horn (1999) admits that it is not a fully consolidated profession, Jacobson (1999) asserts: "... there is no agreement that a practice called information design actually exists" (p. 3). Information design interlocutors have offered specific frameworks for its conceptualisation and practice. Sless (1998) and Stiff (2005) have argued for the need to recognise histories of information design in order to draw together politics, themes and practices. Naturally, when the discipline and its fields are characterised, framing tends to inscribe boundaries. Schriver (1998) regards this, and its attendant implication of power and intent as problematic. She states: "it provides an occasion for others to evaluate the implications of the boundaries that the frame sets up and to ask what the frame includes and what it doesn't" (p. 11). She argues against favouring one over the other, suggesting instead that if information design is to move forward, it must embrace theories from all fields, including those exterior to information design practice (Schriver, 1998).

The discipline of information design hosts numerous fields. These include user-interface design and interaction design, instructional design, data visualisation, information architecture, library sciences and technical communication (Baer, 2008). Its interdisciplinary nature involves a range of activities; including

writing, research, editing, and the creation of visual representations. This study is concerned with information graphics, which stand as one of the more engaging and public-facing forms of visual information design (see *Glossary of terms,* Chapter 1.2). The discussion in this thesis is based in critical theory, exploring the *nature* of information design, its knowledge and conceptualisation. While it recognises that varying media for informational displays involve specific approaches to the design of information (for example, digital interactive displays have different design considerations from print-based media), it focuses on examining approaches to the discipline. It is not concerned with directly comparing or analysing qualities of media used within the fields.

This research did not start out as a critique of traditionalist approaches to information design. Initially I was interested in discovering how information graphics operate to communicate information and impart visual narratives to specific audiences (see *Methodology*, Chapter 3.5, page 15). This entailed a comprehensive study of the literature in the field, and it was here that I found myself querying some of the main precepts framing the discourse and practice of visual information design. The question emerged: *How can an activity purporting to help people understand complex information be predicated on a system of beliefs that appears to undermine the needs and values of the people who use the information?* As well as addressing this question, this thesis aims to highlight *meaning* and *understanding* as core components of information design. In the process, it articulates the ways in which prevailing ideologies that proceed from Modernism continue to cast a steadfast light on the teaching, theory and practice of visual information design.

1.2
Glossary of terms
Affective design
Design that elicits an emotional response in order to appeal to audiences and users of the design artifact. It recognises that the way people feel about a design artifact, and the way they experience it affects the way they use it.

Data
Raw, unstructured and unorganised units or facts, which are given form and translated into meaningful information. They can be analogue or digital.

Data visualisation
A field of information design that visualises data interactively for specialised aesthetic or utilitarian purposes. Usually associated with exploratory graphics.

Explanatory graphics

Visual representations of data that explain complex ideas and processes. Their self-contained, instructive nature sets them apart from other kinds of visual information such as navigational maps, icons and concept diagrams (charts, graphs). The majority of information graphics are explanatory.

Exploratory graphics

Visual data representations that analyse data. They facilitate reasoning for and explanations about the data in order to support decision-making.

Genre

The expression of information within standardised visual forms. For information graphics, this expression is of a technical, scientific and business nature, and the visual forms include charts and diagrams, tables, technical illustrations, infovis and graphs.

Information design

Translation and structuring of data into accessible, useful information that communicates to an audience or end user.

Information graphics (also known as infographics)

Visual representation of data in the form of words and images integrated into a consolidated communication unit. Are often used in popular media such as newspapers, journals, textbooks, and increasingly online in dynamic, interactive form.

Information visualisation (also known as infovis)

Interchangeable with the term "data visualisation". "Infovis" is a colloquial term.

Participatory design

A multidisciplinary design approach and philosophy that engages with the people who will be the end-users of a designed artifact. It embraces a collaborative process whereby the end-users participate in designing the artifact or system.

User-centred design

A design approach that has as its prime concern the needs and limitations of people who are the end users of a designed artifact or system.

2

Review of literature

2.1

Introduction

This thesis draws out various perspectives on information design and is specifically concerned with the design of information graphics. Throughout the discussion, these approaches are teased out and problematised. Thus, the thesis entirely frames the literature; that is, the main body itself acts as a critical review of literature. The purpose of this chapter is to draw the literature together into a meaningful context.

As mentioned in Chapter 1.2, *Glossary of terms* (page 3), information design is an activity that involves the planning, structuring, shaping and organising of data content into meaningful information. It is a discipline in its own right, comprising an array of fields each of which deals with varying aspects of information delivery. This thesis, while arguing for a particular approach to the design of visual information attempts to probe the issues and philosophies that underlie the discipline as a whole. It aims to add to knowledge by viewing the landscape of information design from above, and as such, literature spanning a wide range of fields was examined.

Figure 1 opposite overviews the key information design literature reviewed in this thesis. It is not a model or framework, but is intended to suggest the relationships between the approaches and the fields that are associated with various approaches. It also indicates the breadth of literature in this study. This is followed by a discussion of some of the specific fields, or information design activities that relate to the literature.

2.2

Fields within information design

The diagram in Figure 1 identifies three domains of literature covered in this study: *traditionalist*, *sensory/cognitive* and *rhetorical*. Within the domains, a range of information design-affiliated fields operates; although not all fields operate exclusively within a given domain, and the domains themselves are not fixed.

As previously noted, the thesis critiques approaches and contextual issues, rather than the information design fields and activity therein; thus I will briefly discuss three key fields in relation to the literature in this study, considering the arguments presented in this thesis.

TRADITIONALIST

SENSORY / COGNITIVE

RHETORICAL

BERTIN, Jacques
Semiology of graphics

BRINTON, Willard C.
Graphic presentation

TUFTE, Edward
The visual display of
quantitative information
Envisioning information
Visual explanations
Beautiful evidence

exploratory:
statistical graphics

DANZIGER, Michael
Information visualization for the people

KOSARA, Robert, et al.
Panel: Changing the world with visualization

FEW, Stephen
Data visualization, past, present and future

LOSEE Robert M.
A discipline independent definition of information

WARE, Colin.
Information visualization: Perception for design

visualisation:
infovis & information systems

HOLMES, Nigel & DE NEVE, Rose
Designing pictorial symbols
Wordless diagrams

MIJKSENAAR, Paul & WESTENDORP, Piet
Open here: The art of instructional design

SHEDROFF, Nathan
Information interaction design

SCHNEIDER, Andreas
Medical nursing support pictograms: Ashikawa
Red Cross Hospital, Hokkaido, Japan, 2008

explanatory: infographics
and instructional design

BRASSEUR, Lee E.
Visualizing technical information

DRAGGA, Sam & VOSS, Dan
Cruel pies

KIMBALL, Miles A.
London through rose-coloured glasses

KOSTELNICK, Charles
The visual rhetoric of data displays

SCHRIVER, Karen A.
Dynamics in document design

technical
communication

MOLLERUP, Per
Domesticating data—
functional simplicity
Wayshowing: A guide to
environmental signage

NEURATH, Otto
Gesellschaft und wirtschaft:
Bildstatistiches elementarwerk

HELLER, Steven
Ladislav Sutnar, pioneer of
information design

explanatory:
information design

ARNHEIM, Rudolf
Visual thinking

DONDIS, Donis A.
A primer of visual literacy

HORN, Robert E.
Visual language

KEPES, György
Language of vision

visual language:
theory

For the texts reviewed
in the research, this
diagram indicates :

1. The core focus. This
is its theoretical bias.
Designated here as
three spheres:
– traditionalist
– sensory/cognitive
– rhetorical

2. The affiliation with
a particular field of
practice or theory
within the discipline
of information design.

BAER, Kimberley
Information design workbook

ESBESTER, Mike
Designing time: The design and use of
Nineteenth-Century transport timetables

JACOBSON, Robert
Why information design matters

KINROSS, Robin
The claim of reason: A twenty-five year
argument about information design

information design:
history, theory & practice

SCHULLER, Gerlinde
Information design = complexity +
interdisciplinarity + experiment

SLESS, David
Theory for practice
On clarity

WURMAN, Richard S.
Information anxiety

VISOCKY O'GRADY, Jenn & Ken
The information design handbook

Information visualisation

Information visualisation (or infovis) presents data or concepts in visual form as a tool for quantitative data exploration, analysis and decision making (Ware, 2000). It includes scientific data representation, or *visual analytics* as well as those of a more artistic nature. Digital technologies and advancing information network flows have expanded the area of interactive, computer-based infovis conception and dissemination (Danziger, 2008), and its exponents include computer scientists, statisticians and interaction designers. It should be noted that the way in which these individuals perceive the practice of data visualisation depends on the community to which they are affiliated, and the aims of their practice. Stephen Few, an expert in "Visual Business Intelligence", works with businesses, nonprofit organisations and communities (Few, 2008). His focus is on helping people to locate, interpret, and represent information in the form of network diagrams, geo-spatial visualisations (like Google Earth) and information dashboards— single-screen computer interfaces that, like a car's dashboard, display composite sets of information. Few and computer scientist Colin Ware (2000) similarly propose that perceptual psychology provides the basis of rules for displaying information. The work of statistician Edward Tufte also addresses the business community, promoting principles of evidence-based reasoning to assist in the analytical presentation of data (Zachry & Thralls, 2004).

In the texts mentioned above, visualisation is not primarily concerned with artistry, its appeal or contextual relevance to people. Data visualisation proponents who place value on aesthetic or affective considerations include Michael Danziger (2008). He argues that increasingly, information visualisation appears in the public domain via social networking sites, through public policy agencies, and in the media. Danziger (2008) contends that "popular infovis design" (p.15) intended for the mass public, rather than exclusively for experts must emotionally engage the intended audience through user-centred design so that "information consumers" (Danziger, 2008, p. 22) are not alienated from the presentation form. Robert Kosara (2009) observes that there is a burgeoning need to visualise data for mass public consumption, which entails a thorough understanding of how to transform data into accessible and relevant information.

Explanatory information design

Public-facing infovis (as discussed above) is concerned with large and complex datasets, most commonly designed and displayed onscreen. Explanatory information design usually deals with smaller, less complex data and its representation is

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Figure 2. An example of infovis (2010). VisitorVille software for website traffic analysis. Parking area where buses represent search engines delivering visitors to the website.
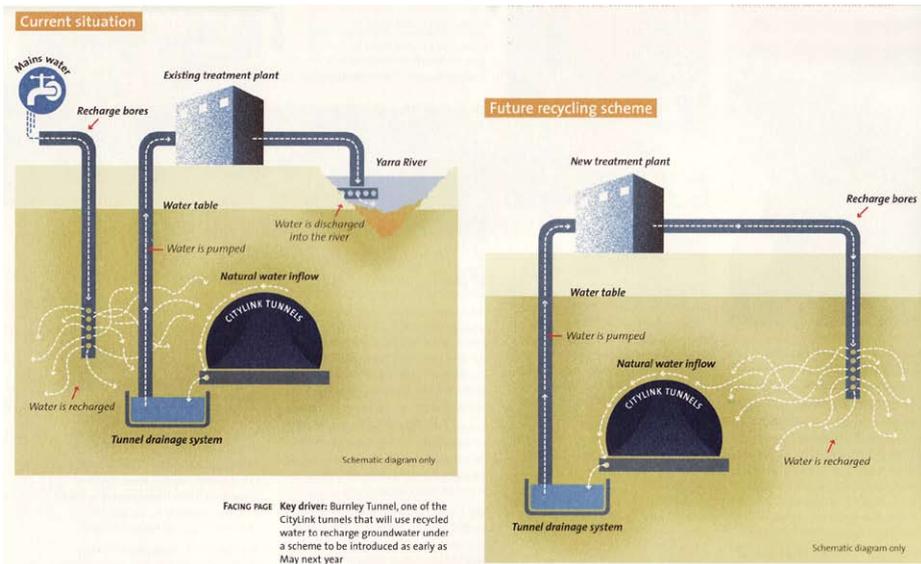

Figure 3. Eden Potter (2001). An example of an explanatory information graphic. Schematic of Burnley Tunnel showing use of recycled water to recharge groundwater (not to scale).

less interactive and dynamic (Danziger, 2008). It is usually more human-focussed in that it aims to educate, entertain, and inform its audience rather than exploring datasets and making hypotheses. Wurman (1989) suggests that information design places understanding as the link between raw data and knowledge; thus graphical information design is frequently found where explanation and instruction is required, for example in popular media, editorial, educational, and corporate material. The tight integration of visual language elements and text has a storytelling function. Nigel Holmes (Heller, 2006) considers information graphics to be "a branch of writing" (p. 101), one which employs techniques of grouping and hierarchy to guide the reader and facilitate effective comprehension. Explanatory information design combines formal structure and organisation of information chunks with affective design (Visocky O'Grady & Visocky O'Grady, 2008), while maintaining awareness of the information's specific audience.

Technical communication and document design
Technical communication is the art and science of preparing information for use by specific audiences (Schriver, 1997). Also known as document design or occasionally as information design, it employs a range of writing, analytical and visual skills, as well as field research into how people actually read and engage with texts. While the terminologies have changed since its inception in English exposition courses (Schriver, 1997), what is maintained is its focus on serving the needs of intended audiences, and its deployment of a rhetorical approach, where the relationship between the communicator, the audience, the content and the context are interplayed in the formation of a persuasive visual or verbal argument (Schriver, 1998; Ehses, 1984).

Visual rhetoricians and technical communicators are profoundly concerned with promoting the aims and values of readers. Brasseur (2005) and Kimball (2006) analyse the visual rhetoric of designed artifacts and suggest where it operates within specific communities to advance the shared literacy of particular graphic conventions. In this regard, Kostelnick (2004) states: "Information design also embodies the shared cultural knowledge—values, ideologies and aesthetic tastes—of its designers and readers at a given historical moment" (p. 239). Dragga & Voss (2001) argue that eliminating descriptive emotional appeals from a given information graphic is inhumane, "indifferent to the human condition it depicts" (p. 266) and thus challenges the ethicality of visual communication. Brasseur (2003) and Kostelnick (2008) critique the visual rhetoric of graphical devices (charts, diagrams, tables) and suggest that these devices' enculturation in society

through years of habitual use does not mean that they should be exempt from contextual analysis. Audience-centred concerns are at the core of technical communication, and thus this literature has played a formative role in the research.

2.3

Framing the discourse of information design

In the course of this study it became clear that the disparate philosophies have resulted in a lack of consensus on a comprehensive definition of information design. Fragmentation of the discipline leads its discourse to be framed within limited parameters, ones that correspond with the situation of individual practices. For example, a data visualiser who is evaluating a given graphic's effectiveness will identify more with sensory theories of cognitive perception than with those of a rhetorical nature. Adherents to this approach believe that "if we can understand how perception works, our knowledge can be translated into rules for displaying information" (Ware, 2000, p. 3). A technical communicator, schooled in rhetoric will find less relevance in visual processing theories than in the way people think and feel when they view the graphic. This is not prescriptive, however. It is not correct that any information design approach is practiced exclusively of another; there will be inherent cross-overs. A user-interface designer will draw upon rhetorical codes in order to appeal to specific audiences, for instance. Cognitive, or sense-based theories, concerned as they are with *processing* information, can underpin the design process and provide a starting point for people's encounter with the information, excepting ineluctable context-dependent factors. Schriver (1989), in discussing theories useful for technical writing, puts this into context: "Although the cognitive approach concentrates on the individual and the social on the collective, the difference is partly an old one of figures and grounds—of what people choose to focus on" (p. 283). In this thesis, I suggest that even though the underlying approach, or philosophy weighs in to this choice and affects contemporary information designers' priorities, these approaches are still burdened by precepts carried through from Modernism.

3.0
Methodology

3.1
Introduction

This chapter discusses the ways in which paradigms and worldviews have contributed to shaping the design of this research and have influenced its interpretative and critical framework, as well as the selection of methods. Although this project is framed in terms of design research rather than the realm of *pure* social sciences, the literature used in qualitative research has been highly relevant to its development. Qualitative research is contrasted from its counterpart, quantitative research by its focus on the *quality* of a phenomenon, rather than numeric *quantity* (Miller & Brewer, 2003). Fundamentally, the core premise that qualitative research is based upon makes it relevant to this project, as Miller & Brewer (2003) suggest:

> The qualitative approach is based in an intensive study of as many features as possible of one or a small number of phenomena. Instead of condensing information, it seeks to build understanding by depth... Qualitative research seeks meaning (rather than generality as with its quantitative counterpart) and contributes to theory development by proceeding inductively. (p. 193)

The inductive nature of qualitative research, where specific observations lead to the development of broader conclusions and theories, allows for an accretive process of assimilating information and making connections at a deep level. This is indicated in Figure 4. Qualitative research also is predicated on studying the subject within its context (Miller & Brewer, 2003).

OBSERVATION ⟶ PATTERN ⟶ TENTATIVE HYPOTHESIS ⟶ THEORY

Figure 4. A diagram of the inductive research process in the social sciences.

There are three further reasons for the relevance of literature from the social science field. Firstly, central to theory in qualitative research is the notion of a "theoretical lens or perspective" (Creswell, 2009, p. 62) and this aspect is played out in the methodology (Creswell, 2009). Secondly, the reflexive nature of much qualitative research identifies and problematises assumptions and presuppositions (Alvesson & Sköldberg, 2000); and lastly, critical theory implicated in much social science research underpins a range of research approaches which defy clear

boundaries (Griffiths, 2009). Criticality, reflexivity and theoretical perspectives are central to the methodological underpinnings of this project.

Methodology is the comparative study of methods used in a research study (Friedman, 2009). While this definition distinguishes methodology from method, it is involved with more than method *per se*. It is "as centrally concerned with how we conceptualise, theorise and make abstractions as it is with the techniques or methods which we use to assemble and analyse information" (Miller & Brewer, p. 192). Crotty (1998) describes this as the "research design", the "strategy or plan of action" (p. 7), and furthermore suggests that the research strategy informs the choice of method (techniques and processes used in the research) and links the methods to desired outcomes. This study did not employ research methods such as primary data collection and analysis; it was grounded in secondary research and analysis. Crucial to the research however is a philosophical standpoint (Crotty, 1998; Corbin & Strauss, 2008; Guba & Lincoln, 1994) that "provides a context for the process involved and a basis for its logic and its criteria" (Crotty, 1998, p. 66). This position can be discussed in a general sense and also in specific terms that relate to this study.

The discourse of information design is diffuse, as it arises from a relatively exclusive and disparate community of stakeholders and commentators. This heterogeneity has been addressed in the previous chapter. Consequently, in the course of developing the thesis argument, certain ideologies, perspectives and doctrines have been "viewed from above" in order to locate both the research terrain and myself as researcher within this domain. This issue has been addressed in *Review of Literature*, Chapter 2.

3.2

Theoretical perspectives and research paradigms

To review methodology as a strategy or plan, it is helpful to consider how it sits within the research process. Crotty (1998, p. 4) describes this process as consisting of four elements which inform one another:

EPISTEMOLOGY ⟶ THEORETICAL PERSPECTIVE ⟶ METHODOLOGY ⟶ METHODS

Figure 5. Michael Crotty (1998). Basic elements of any research process.

Epistemology here refers to the theory of knowledge, a way of understanding and explaining how we know something (Crotty, 1998). The theoretical perspective has links with the way we view the world. Since the theoretical perspective can

be thought of as the researcher's philosophical outlook rather than as base theory (Corbin & Strauss, 2008), it follows that this outlook and the epistemology that establishes knowledge must be embedded in something larger, more all-embracing. This is the worldview or paradigm, as suggested by Guba & Lincoln (1994):

> A paradigm may be viewed as a set of *basic beliefs* (or metaphysics) that deals with ultimates or first principles. It represents a *worldview* that defines, for its holder, the nature of the 'world'. The individual's place in it, and the range of possible relationships to that world and its parts... (p. 107).

Therefore, the paradigm or worldview fundamentally guides all aspects of the researcher's approach. Particularly in a critical review of existing bodies of knowledge and theories (as with this inquiry; an examination of approaches to information design), the researcher must be aware of the belief systems, assumptions, and concepts that frame their approach to the research. The ideological stance I take inevitably colours my research strategy, from the selection of resources, to interpretation and critical evaluation. One cannot stand apart from one's worldview. An epistemological situation results where what can be known is immanent in the transaction between investigator (researcher) and the investigated object, and therefore knowledge must be value mediated (Guba & Lincoln, 1994). For this study, my personal values impact on my attitude to what I term the formalist approach; where I intuitively oppose a purist, truth-seeking, and rule-bound approach to information design, and instead support strategies that are inclusive of people's values, cultural background, and individual needs.

3.3
Reflection, interpretation and critical theory

Self-awareness and understanding of one's own position relative to the research, as discussed in the previous section demand a reflective approach. Alvesson & Sköldberg (2000) suggest that "reflective research has two basic qualities: careful interpretation and reflection" (p. 5), where attention is turned inwards towards both the researcher and the contexts that have influenced the situation of the research and researcher.

An interpretive approach, known as hermeneutics also characterises critical theory, which seeks to unravel mythologies, uncover hidden structures and critique politicisation that arises from society or from an object in society (Griffiths, 2009). It should be noted that with hermeneutics in the social science sense, there are no *true* or *essential* meanings that the researcher seeks to uncover, as is often the case with hermeneutics in the theological tradition. Rather, it studies social

phenomena, but interpretations are not fixed and stable (Miller & Brewer, 2003). By engaging a range of approaches to information design, this study aggregates multiple perspectives, discourses and histories, identifies hegemonic positions and recognises problems with persistent and dominant ideologies. It then suggests alternative ways of considering information design practice.

Critical theory is placed as a *lens* through which interpretation takes place, a way to focus attention and see the world in a particular way. Social science promotes the idea of a lens to orient the researcher's perspective in qualitative research. It can guide the researcher in the kinds of questions to be asked, can suggest how data might be analysed, and can be a means of informing the call to action. In discussing critical theory perspectives, Creswell (2009) suggests that this "theoretical lens" is concerned with "identifying the social, political, or historical context of the problem under study" (p. 176).

3.4
The scaffold

SPHERES OF INFLUENCE

WORLDVIEW / PARADIGM
EPISTEMOLOGY
THEORETICAL PERSPECTIVE
METHODOLOGY
METHODS
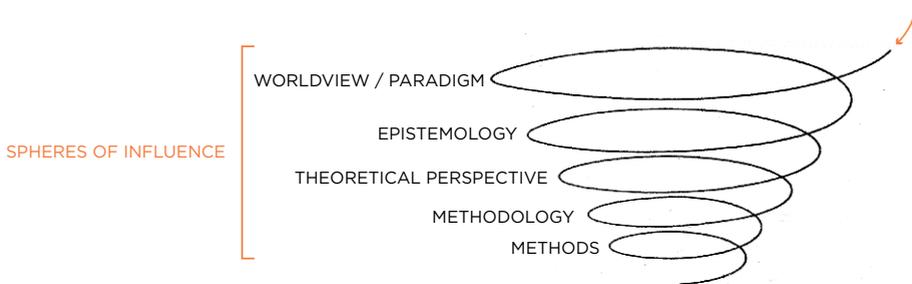
Figure 6. Eden Potter (2010). Helix diagram of research process showing spheres of influence.

In Figure 5 on page 11, a linear structure for the basic research process is indicated. Figure 6 shows a meta-diagram that has been customised for the research methodology of this thesis. It suggests that each sphere or level is affected by the ones before it, and each level associates with the next below in turn. It thus can be viewed as a scaffold (Crotty, 1998) for critical research. This scaffold is based partially on Figure 5 on page 11, however an important inclusion is the researcher's worldview, which defines key aspects of the enquiry as well as its methodology. In this project, my particular worldview slants the argument towards postmodern, anti-positivist perspectives and thus my reflections on information design discourse reject doctrinal approaches and critique those claims to knowledge that seek ultimate truth. As mentioned in chapter 3.2, the worldview affects every aspect of the research process in critical theory projects, and thus is a circumstance that is acknowledged in this discussion of methodology.

3.5
Design of the research

The research design links the methodology to the choice of methods and the ways in which the methods are utilised (Crotty, 1998). This section aims to give an overview of the design of this research, followed by a discussion of the stages undertaken to realise it. Figure 7 gives an overhead, diagrammatic perspective. Note that the phases and photographic images in the diagram are intended to correspond with the discussion that follows.

NOTE: divergent arrows denote research into a variety of areas related to that Phase. For details of topics listed above, see Figure 8, page 16.
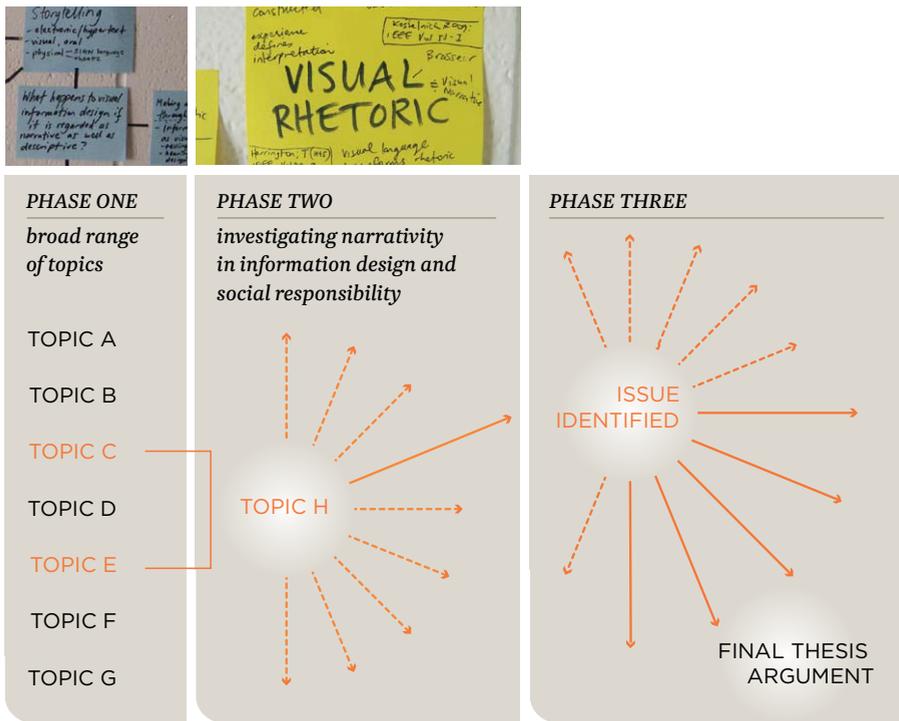
Figure 7. Eden Potter (2010). Overview of research phases.

In the early stages of this project's research, a number of other personal interests were also being explored, or had been investigated, thus in the early stages there existed many seemingly disparate research focal points. These were informally mapped to determine whether any patterns might be found or connections made, as seen in Figure 8, page 16. This is an example of the open-ended inductive research process, and enabled me to form connections throughout the research.

On analysing this map, I observed that the areas of interest were not completely divergent. Possibly related themes were those concerned with socially-useful design and information design as visual narrative. The project area was thus refined and the research question, *how might I connect narrative in information design directly to the practice of socially responsible design?* was determined. Thus, a range of literature was targeted to expand knowledge specific to this area (see Chapter 2.6, page 17 for details on selection and analysis of texts).

This was followed by a period of reading and reflection. In the process of note taking, some significant ideological and political spheres were evident in the historical trajectory of information design. These were identified and recorded, and placed in context with other relevant keywords to form a landscape. Key phrases, texts and interlocutors were grouped and noted, as shown on inset detail in Figure 9, page 16. They were not physically linked by any device, but their positions relative to each other indicate classifications into themes. The overarching focus was on *meaning making*.

By this stage the project's focus had started to shift. Reading and note taking (see Chapter 3.6, page 17) evolved a set of keywords and themes amongst which narrative and ethics were only two, and therefore were no longer the central focus. Characteristics such as *rational* and *aims at clarity*, which were emerging from subjects such as Isotype were echoed in other correlated readings. Crucially, *Isotype* and *Visual Rhetoric* were marked by contrasting philosophies. This signalled a turning point in the research, as evidenced in the thesis abstract from that time, which stated in part: "*If meaning making in diagrams is contingent on narrative and is socially mediated, then a strictly rational and cognitive-perceptive communication approach valued by the field must necessarily be challenged. 'Graphics reveal data' (Tufte, 1983), but what are the graphics actually saying or doing*?" The apparent disparity between the two approaches to designing visual information demanded further examination. From this point, the decision was made to investigate more closely what was meant by *objectivity, clarity,* and *truth* in relation to information graphics and their purpose. With the core issue identified, the project had evolved into a critical review of approaches to information design.
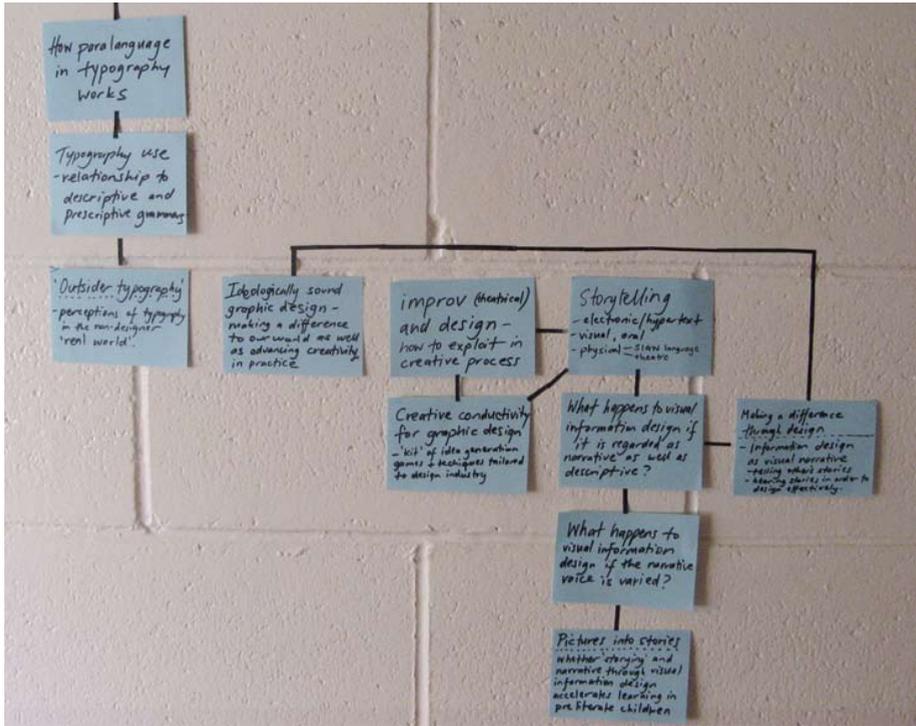
Figure 8. Eden Potter (2008). Mapping areas of interest to see connections.

Figure 9. Eden Potter (2009). Mapping themes following information gathering.

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3.6

Methods

Research methods are the "techniques or procedures used to gather and analyse data related to some research question or hypothesis" (Crotty, 1998, p. 3). They can be tools used or activities undertaken, depending on the nature of the research. This project was realised through a number of stages based in secondary research. They involved the following:

A. SELECTION OF TEXTS

B. GATHERING INFORMATION

C. ACTIVE REFLECTION ON THE INFORMATION

These will be discussed in terms of the tools and techniques used to interact with the literature in this study.

A. SELECTION OF TEXTS

The literature reviewed was drawn from a range of sources. Critiques and theoretical discussions of information design were mainly found in journal articles and conference papers, while didactic books formed the majority of the historical and *how-to* sources. Theses and practitioner papers in specialist areas such as infovis provided currency and pragmatic perspectives. Information graphics were collected from websites and digital files, as well as scanned from books.

An overview of the information design discipline necessitated reviewing a broad range of literature related to information design. Edward Tufte's texts were selected as a starting point because of his renown; a colleague offered the suggestion of Tufte's work as a key frame of reference in the academic literature on information design. It was in reading and reviewing Tufte's books that some of the contradictions inherent in information design discourse became apparent to me. It led me to question the doctrinal approach to information design, and to assert my enquiry into how and why such an authoritative and universalist approach was regarded as seminal in what is held to be a human-centred design field.

In this process of hypothesis formation, I noticed patterns emerging, for instance that critiques of Tufte were clustered in three areas of information design discourse: user-centred information design, semiotics and technical communication. This steered the enquiry towards approaches to information design within these previously mentioned areas in order to locate where, how, and why the critiques emerged. Thus, literature that involved meaning making in technical communication, participatory design and semiotics was also investigated.

B. GATHERING INFORMATION

Coverage of the literature was extended by following up texts' bibliographic references as they were reviewed, and then once located, searching for further literature by those authors or designers. Oftentimes, references to the work of specific authors or designers appeared in several locations, and across varying fields. This form of cross-referencing proved a useful way of establishing who were the main interlocutors, and importantly, how they related to the issues of approaches to information design. The visual examples of information graphics were always recorded within the context of either the written text that accompanied them, or the context of their viewing. For example, if an information graphic was sourced from a web log and had evoked comment in that forum, all of the commentary entries were recorded along with the visual element as shown on Figure 34 on page 69. This dimension was significant, since attitudes and responses to information graphic examples formed part of the argument.

Information was gathered in both annotated hard copy and digital format, and literature was filed and ordered. The hierarchy and naming system was designed using two combined ways of organising information from Wurman's "five ultimate hat racks" (Wurman, 1989, p. 59) system for structuring information. Those pertinent to my research process were filed by category, where all texts pertaining to a given area were grouped; and by continuum, where the texts are further organised in terms of value or importance to the project, as seen in Figure 10.
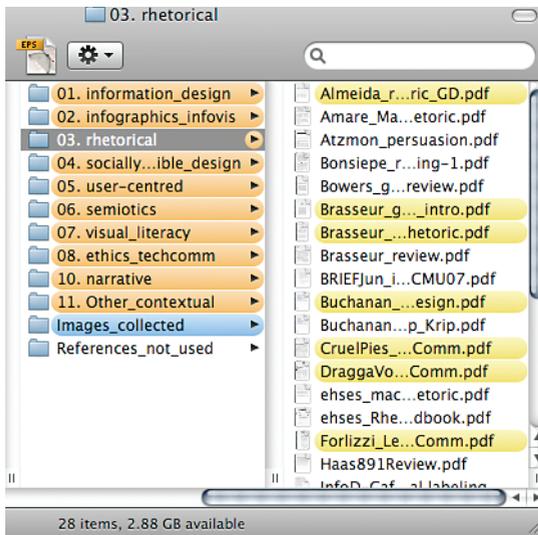

Figure 10. Eden Potter (2010). Screen snapshot of filing system.

C. ACTIVE REFLECTION ON THE INFORMATION

The methodic approach to analysing the literature in this study substantively involved my writing practice. Note taking and reflective personal writing were instrumental for making links and discoveries. Note taking involved composing commentary notes following each quoted text excerpt as it was recorded (in writing) from the reference material. Personal writing included a series of research journal entries and textual mapping.

Note writing was not a pre-planned strategy, but evolved in response to the observations I was making as I recorded relevant quoted texts and filed collected images into working files. Any thoughts, conclusive statements, questions or links to other texts were recorded at the end of each quoted text excerpt. This promoted critical evaluation of the textual content as it was being logged and categorised for later use in shaping argument. Often the suppositions and observations contained in these notes were unbalanced, but they were composed at the time without overt judgment, and resulted in insights that I could draw on in the writing process.

GRAPHICAL INTEGRITY

p. 9 Tufte, 2006

"Making an evidence presentation is a moral act as well as an intellectual activity. To maintain standards of quality, relevance, and integrity for evidence, consumers of presentations should insist that presenters be held intellectually and ethically responsible for what they show and tell. Thus *consuming* a presentation is also an intellectual and a moral activity."

[An important statement. This is the ONE main area in which I agree with Tufte—for the most part. But he seems to be advocating that presenters need only be concerned with the choices they make in presenting the data with integrity ("…a deep caring about the content" p. 23 - 2006)—i.e. it's about the data itself (form, content, accuracy), rather than how the 'consumers' interpret it. Again, it's assuming everyone reads information exactly the same way.]

p. 55 Tufte, 2001

"A graphic does not distort if the visual representation of the data is consistent with the numerical representation." [cf. the Lie Factor]

[Inherent CONTRADICTION? Tufte notes that visual representation has to do with individual perception—he then suggests that his principles of number representation might address this with "uniformity"]

p. 55–56 Tufte, 2001

"Different people see the same areas somewhat differently; perceptions change with experience; and perceptions are context-dependent."

[This is the first out of only 2 occasions in this text where Tufte acknowledges social context in meaning-making. The other is p.190. Context that he focuses on is contextualizing data sets; i.e. how one set sits with another and how this can alleviate graphical misrepresentation p. 59. He tends to dismiss anything to do with individual or social interaction with the graphics as something that designers can't do much about, but need to overcome in other practical ways]

Figure 11. Eden Potter (2009). Critical note taking in the process of information gathering.

At the start, journal writing was a method for recording key points from supervision meetings. However, the journal became much more than documentation. Along with tracking meeting outcomes, it was a tool for self-reflection and included my impressions, breakthroughs and frustrations. In Figure 12 it can be seen that some of these entries acted as a point of reference, some were instructional, and others were a *talk-back* mechanism. Preston and Thomassen (2010) suggest: "Diaries provide a designer a vehicle to carry out self-reflective modes of inquiry and analysis as well as include subjective, associative, automatic dialogue with the process" (Preston & Thomassen, 2010, p. 49).
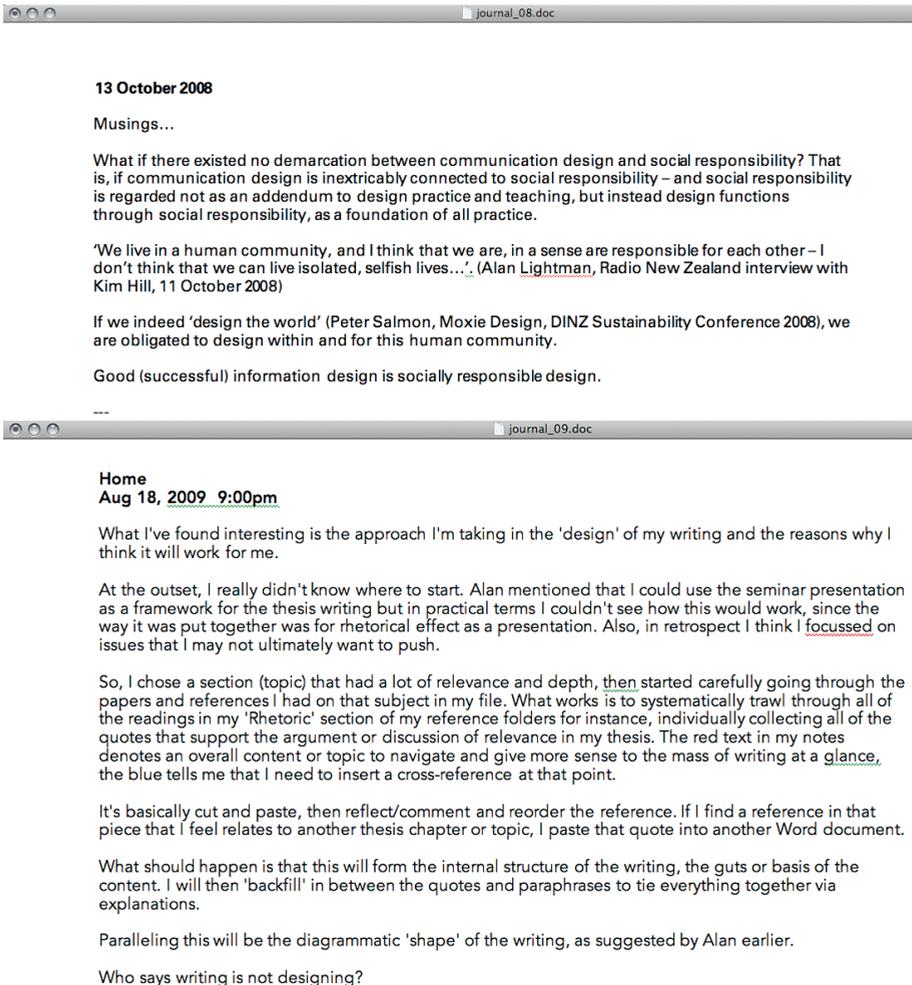

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13 October 2008

Musings…

What if there existed no demarcation between communication design and social responsibility? That is, if communication design is inextricably connected to social responsibility – and social responsibility is regarded not as an addendum to design practice and teaching, but instead design functions through social responsibility, as a foundation of all practice.

'We live in a human community, and I think that we are, in a sense are responsible for each other – I don't think that we can live isolated, selfish lives…'. (Alan Lightman, Radio New Zealand interview with Kim Hill, 11 October 2008)

If we indeed 'design the world' (Peter Salmon, Moxie Design, DINZ Sustainability Conference 2008), we are obligated to design within and for this human community.

Good (successful) information design is socially responsible design.

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Home
Aug 18, 2009 9:00pm

What I've found interesting is the approach I'm taking in the 'design' of my writing and the reasons why I think it will work for me.

At the outset, I really didn't know where to start. Alan mentioned that I could use the seminar presentation as a framework for the thesis writing but in practical terms I couldn't see how this would work, since the way it was put together was for rhetorical effect as a presentation. Also, in retrospect I think I focussed on issues that I may not ultimately want to push.

So, I chose a section (topic) that had a lot of relevance and depth, then started carefully going through the papers and references I had on that subject in my file. What works is to systematically trawl through all of the readings in my 'Rhetoric' section of my reference folders for instance, individually collecting all of the quotes that support the argument or discussion of relevance in my thesis. The red text in my notes denotes an overall content or topic to navigate and give more sense to the mass of writing at a glance, the blue tells me that I need to insert a cross-reference at that point.

It's basically cut and paste, then reflect/comment and reorder the reference. If I find a reference in that piece that I feel relates to another thesis chapter or topic, I paste that quote into another Word document.

What should happen is that this will form the internal structure of the writing, the guts or basis of the content. I will then 'backfill' in between the quotes and paraphrases to tie everything together via explanations.

Paralleling this will be the diagrammatic 'shape' of the writing, as suggested by Alan earlier.

Who says writing is not designing?

Figure 12. Eden Potter (2008 & 2009). Excerpts from research journal.

Figure 13: Eden Potter (2008). An example of textual concept mapping to design content.

Textual concept mapping, as shown in Figures 13 & 14 was another design tool deployed in the writing process. Here, a framework of the argument being constructed was visualised on a wall as interconnecting text blocks. Notes in handwritten and in typeset format (see note taking process in Figure 11) provided critical narrative pathways to guide the structure, while its mapped visual form displayed a snapshot of the topic under consideration. The formal complexity of each map varied depending on the structure of the argument being designed. On the use of diagrammatic notation Preston & Thomassen (2010) state:

> Understood as two-dimensional maps, diagrams are known for their ability to order complex scenarios with an abstract and graphic clarity capable of conveying the essential nature of the subject at hand. Their power lies in their ability to draw out relationships between and amongst concrete entities and abstract notions... (p. 51)

In this regard, the scope of the reference material for a given topic was considered and contextualised, and at the same time, content gaps and contradictions in the visualised information were determined. Diagramming was thus used as an analytical tool to facilitate immersion, criticality, and flow; with the writing process forming the final stage.

Figure 14. Eden Potter (2008). Textual concept mapping for Chapter 5.2 of this thesis.

4.0
Modernism and formalism

It must be recognised that Modernism, far from being a single unified discourse, is more of a catch phrase that circumscribes a wide range of often contradictory philosophical, aesthetic and communicative technologies and approaches. This makes it available for diverse discursive frameworks, and this thesis attempts to draw out and problematise some of the contradictory elements that traverse the fields of information and communication design.

Key themes of Modernist approaches include simplicity and clarity. In information design these themes tend to be framed in terms of effectiveness of communication. Another key theme that sometimes but not always intersects with those mentioned above, is that of honesty. The philosophical relationship between honesty and simplicity is sometimes conflated with the aesthetic relationship between the two, yet the link is contentious. Indeed, I argue that, at times, the mistaken belief in this relationship and the related insistence on purported simplicity in fact leads to a reduction of both honesty and efficiency of communication. I argue that this occurs through a notion of Modernism as a system of ideals in which the system becomes intrinsically more persuasive and pervasive than any of the individual processes out of which it is constructed. This is not a new argument, but I hope to show that information design still struggles under the weight of its historically flawed precepts.

This chapter argues that far from *meaningful order* argued for in information design the strict Modernist aesthetic/philosophy militates against the purported clarity of meaning striven for in the most prominent of these approaches, and in fact could be seen as at least as manipulative and directive through its Modernist significations as the most frivolously decorative displays of information design. It will discuss Modernism's inception and history in relation to dominant social and attitudinal forces in the Twentieth Century, in order that its association with what I term the *formalist approach* is established.

Modernism as a movement and as a collection of ideas can be described as rational, essential and pure, as well as heroic and absolute. Although it reached its apotheosis in the Twentieth Century, its historical antecedent is in the period known as *modern*, which is associated with Eighteenth Century Enlightenment. The governing beliefs of Modernism flowed out of this era, whereby rational and objective reason were necessary to create order and where order was deemed necessary for social progress (Klages, 2003). Modernity held science and reason

to be the defining factors for enabling control and influence over nature through which progress could lead to eternal freedom from ignorance (Crotty, 1998). It is a state wherein a societal shift and destabilisation of established values was effected (Miller & Brewer, 2003). Robin Kinross, in his preface to Jan Tschichold's 1928 treatise, *Die Neue Typographie* describes the mood of the times thus (Tschichold, 1995):

> Life has changed, it is mechanized, urban, faster; emphasis is now on the social, the collective, rather than the individual; on the impersonal and factual, rather than the romantically indefinite; human liberation can come through the standardization of material artifacts, through equality of provision; no longer the artist and the privileged sensibility, but the engineer and the ordinary citizen. (pp. xxi–xxii)

This change of thought that permeated social life, art and industry in Western Europe was impelled by shifts in values and attitudes following World War I. The explicit need for control and order (an order, that is, which was thought to facilitate freedom), the quest for universality and systemisation may to some extent be considered a collective reaction to the chaos, anxiety and perceived futility brought about by war (Ilyin, 2006). There was a flurry of intellectual, artistic and cultural activity as "new forms of representation were experimented with in the effort to grasp the contingent and fleeting nature of modern life" (Miller & Brewer, 2003). As such, it was a quest for a new age, one that from 1917 until 1933 ushered in art, design and architectural movements such as De Stijl, constructivism, the Bauhaus, and the New Typography (Meggs, 1998). While these movements varied in their creative output and were particularised within their socio-political and geographical spheres, they all had in common an aspirational drive towards absolute, yet objective harmony, universal visual laws and collective expression (Meggs, 1998).

In the early period of the Modern movement, architects were influenced by industrial structures, including factories and mechanical forms. This was clearly not a randomly-chosen style; Venturi et al. (1977) contend that for Mies, Le Corbusier and Gropius, industry represented aspirational ideals of progress through science, technology and social advancement, a climate that prevailed in Europe between the Great Wars of the 20th century. Similarly in the era of the International Typographic Style (the Swiss Style), Max Miedinger's typeface Helvetica (1957), with its forward-facing, utilitarian, and neutral persona was affiliated with the West's corporate sphere. Design that aims to achieve high functionality along with straightforwardness was expressed through Tschichold's work in the New Typography

during the 1920s. This Modernist goal is summed up well by Meggs (1998) as: "The ability of elemental forms to express complex ideas with clarity and directness" (p. 335). In parallel with systems-oriented innovations of this time, Otto Neurath was developing the Vienna Method of pictographic statistics (see pages 30 – 31) and Henry C. Beck published his 1933 schematic map of the London Underground, both which marked conceptual leaps in diagrammatic representations of ideas and information (Meggs, 1998). These graphics had much in common with the work of their contemporaries in typography, art and architecture. They expressed system-based thinking, simplification and abstraction of forms, underpinned by a strong focus on functionality.

Modernist design reached its climax with the International Typographic Style of the 1950s, also known as Swiss design (Meggs, 1998). Such was impact of, and zeal for the International Style that its aesthetic visual characteristics and systematic processes are still taught and practiced today. Two characteristics of Modernist design are the idealisation of form and the reliance on formula in order to produce a *purportedly objective* and eternal design expression. In relation to Swiss Modernism, Meggs (1998) further posits that one leading exponent of the International Typographic Style, Josef Müller-Brockmann was successfully able to relinquish subjectivity and banish persuasive techniques in his oft-emulated graphic communications. Indeed while this may have been Müller-Brockmann's aim at the time, particularly within the context of the Modernist movement, the suggestion that his work achieved *neutrality* is contestable.

The discussion above articulates some core Modernist ideas. While it might appear to be a *drive-through* of the influential themes and movements within Modernism, it is also necessary here in order to frame the way that Modernist precepts have shaped information design. It is precisely the attitudes and conventionalised practices of Modernism that, I argue recur in contemporary approaches to information design. These include lack of contextual relevance, excessive concern with form over meaning, and functionality predicated on prescribed rules and principles. In this thesis, I term this approach formalism.

This chapter focuses on Modernist practitioners of typography and graphic design. As already noted, one of the key proponents of, and the single most influential writer on, a Modernist approach to information design is Edward Tufte. The following section will start to tease out formalism's effect on information design and then will attempt to draw out the specifics of Tufte's approach, its relationship to Modernist precepts and its influence on contemporary information design. I will consider (and critique) this approach largely through its adherence to a purportedly unbiased statistical and diagrammatic formalism.

4.1

Ideology of formalist approach

4.1.1 Formalism and universalism in early Modernism

Formalism is a term that can apply to any traditional design field (and is also used in art). Its characteristics include extreme and unwavering adherence to prescribed forms, and a tendency to de-emphasise meaning (Pearsall, 1998). In information design, formalism confers strict standardisation using organising principles. It is indeed the case that information design aims to bring order to data and concepts so that complex systems, events and processes can be more easily understood by people. It does not, however, follow that simply ordering and arranging information makes it understandable. In order to truly comprehend visual information, the audience must possess a reasonable level of graphicacy— the ability to understand a graphical form (Pearsall, 1998). In addition to being able to interpret the information, people must be aware of the agenda, or motivation of the graphic (why it is communicating), and thus aspects of context and positioning are implicated. A strictly formalist approach to the design of information graphics means that in the tradition of Modernism, standards are imposed with minimal or no regard for either context of use; or what the information, its form, or its arrangement, means for a given audience. In other words, it is concerned only with how the information is transmitted, rather than how, or whether it communicates.

The Modernist designers' attitude is exemplified here (Meggs, 1998):

> More important than the visual appearance of their work is the attitude developed by its early pioneers about their profession. These trailblazers defined design as a socially useful and important activity. Personal expression and eccentric solutions were rejected, while a more universal and scientific approach to design problem solving was embraced. In this paradigm, the designer defines his or her role not as an artist but as an objective conduit for spreading important information between components of society. Achieving clarity and order is the ideal. (p. 320)

In this way, the designer in the Modernist tradition is charged with communicating objectively and dispassionately, thus acting as a *conduit* for dissemination of information. It is as if the designer is a channel, transmitting visual concepts to an unspecified audience in much the same way as an electronic signal is encoded for transmission, and then decoded and received (Losee, 1997). The contextualised, human-centred aspects of meaning making in the communication process are thus disregarded.

In the same vein, Kinross (1989) suggests that the precepts of information design familiar today, "the belief in simple forms, in reduction of elements, apparently not for reasons of style but for the most compelling reason of need… and to improve communication" (p. 148), arose from the period of Modernism. *Need* here refers to one conception of design's goal; to meet needs and to improve existing situations (Friedman, 2003). The Modernist movement's commitment to improvement underlies present-day information design, where data in its raw and chaotic state is given structure and form in "an effort to impose meaningful order" (Papanek, 1984, p. 4). However, in the formalist approach the meaning, that is, the concern for how the information is interpreted by the audience is omitted from this process of shaping of data into an orderly form.

The discussion now moves towards the ways in which one key aspect of Modernist thought—universality—manifests as instrumental to formalism in information design. A precept of Enlightenment thinking, universality—a questing for common and axiomatic states, where cultural or medium-contingent factors are transcended—infused the early goals and ideals of information design. Since the first decade of the Twentieth Century, many who work with visual information have aimed at standardisation and autonomy. These endeavours have included the quest for an international pictorial visual language, to a system of typographic standards as exemplified by Figures 16 and 17 on the following page, which forms "transcend individualism and nationalism in their appearance" (Tschichold, 1995, p. 12), as well as conventions in the organisation of textual information. The Modern Swiss grid was founded on dual themes of appearance and structure, transformed by its adherents into what Williamson (1989) describes as an anti-individualist, rational, "future-oriented design tool" (p. 180) that represented the "invisible field of universal physical law" (Williamson, 1989, p. 178).

A deep faith in the universality and power of visual language in the mid-Twentieth Century is clear in this euphoric statement from designer György Kepes in 1944:

> The visual language is capable of disseminating knowledge more effectively than almost any other vehicle of communication. With it man can express and relay his experiences in object form. Visual communication is universal and international: it knows no limits of tongue, vocabulary, or grammar, and it can be perceived by the illiterate as well as the literate. Visual language can convey facts and ideas in a wider and deeper range than almost any other means of communication. (Kepes, 1967, p. 13)

Figure 15. Michael George Mulhall (1885). Production of meat, lbs. yearly per inhabitant.

Figure 16. Jan Tschichold (1928). Size of postcard with gummed flap for address (in mm).

Figure 17. Jan Tschichold (1928). Postcard in standard format. In this example, hole punched. Original in black and red on yellow card.

Although a universal language was imagined as early as the Seventeenth Century (Holmes & De Neve, 1985), the formal development of visual language systems came about in the early to mid Twentieth Century. This was a probable reaction to the unstable political and social state of Europe and the West, where existing written languages were perceived as disingenuous and divisive, fostering an international language barrier (Patton, 2009).

The progenitors of these picture languages had in common with the Modern movement (and with information design today) rationalist and socialist values—albeit idealistic and salvation-oriented—as Charles K. Bliss contends, "a simple semantics which could help even children to recognize (and avoid) those dangerous words by which demagogues and dictators in the homes and nations threaten the peace of mankind" (Dreyfuss, 1984, p. 23). Bliss aimed to replace alphabets (not languages themselves) with his radical Semantography system. One hundred semi-abstract images were formed from geometric shapes, where the basic number of signs were less than a true pictographic system, but instead were augmented with inflective signs intended to encompass and convey all of the nuances of feeling and human emotion through symbols (Holmes & De Neve, 1985). Despite its inventor's efforts to promote Semantography towards international adoption, it was not taken up widely and exists today as Blissymbolics, a communication aid for people with severe mental and physical impairment (Patton, 2009).

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Figure 18. Charles J. Bliss (1984) Examples of Semantography symbols.

Like Bliss, Otto Neurath as founder of logical positivism[1] believed in the primacy of pictures to impart information. Along with his team of *transformers*, he began in the 1920s to develop a system known as Isotype (International System Of TYpographic Picture Education). The Isotype pictograms devised were based on his belief that visual perception might hold the key to a more natural, innate link to language through abstract symbols, forming an international picture language (Lupton, 1989) to articulate certain concepts more clearly than he felt was possible with words (Twyman, 1975). Neurath's main focus throughout the project was on education. The pictures and their system were devised to communicate social and economic data of the day so that people would understand it and be more likely to remember it; a kind of pictorial statistics. As a system, it was characterised by the way it sought to determine the most essential, direct and simple representation of significant data; and numerical and quantitative comparisons were shown, rather than stated, as shown in Figures 19 and 20 (Dreyfuss, 1984). Isotype operated within two basic rules. First, no perspective was used; and second, each symbol represented an amount of things, and depicting a greater amount of symbols indicated a greater quantity overall. It was thought that the use of strict conventions allowed structure and consistent ways of reading and recognising the system, and that once these conventions were learned, meaning through Isotype would be derived by its context, much as we gain meaning through verbal nuances (Twyman, 1975).

When discussing approaches to information design, concepts of universality should not be confused with systemisation. Systems such as these developed by Neurath can be the foundation of successful information design. The best system designs arise from the designer seeking to make good sense of the information at hand, for the specific communication needs and audience. Universality, on the other hand is a worldview, a philosophy that pervades one's outlook on the world in a more general sense. Lupton (1989) argues that Neurath maintained an uncompromising view on universality, and suggests that Isotype was not only borne out of universality, but it that it blindly sought universal application.

---

[1]A European school of thought developed in the 1920s and 1930s that brought together two apparently opposing philosophies: *rationalism*, an epistemology that places reason ahead of experience; and *positivism*, or empiricism, which claims that knowledge can only be gained through the senses (Lupton, 1989). They regarded traditional language as a means of representing ideas as limited, and believed that empirical languages of mathematics and logic were able to move beyond this.

However, as Twyman (1975) notes, Neurath hoped that his picture language might be universal yet was aware that the symbols used in Isotype are relevant to and contingent on the context of the times. As such, they dated more quickly than word-based languages, and he acknowledged that their universality was limited, that it might not be in fact, an eternal language.

Nevertheless, Neurath's aspirations towards universal communication through Isotype typifies the Modernist focus on clarity, reason and formal systems. Like the principles of the grid structure established in European (Swiss) Modernism, Neurath assumed that his principles existed *a priori* to their application. The universality of human vision, it was thought, provided the theory for a visual language, and the principals wherein "are universal—like mathematics, the laws of Nature, the deep structure of language—and are not tied to any particular language, culture, style, century, gender, or technology of information display" (Tufte, 2006, p.10). While the whole extent of Neurath's utopian vision was not realised, the legacy of his ideals for a universal visual language exist today in the widely-recognised system of symbols used internationally in airports, public transport and other public utilities. It is ironic, Patton (2009) points out, that nowadays these established icons stand for capitalist initiatives rather than representing the socialist, educative enterprises of the era between the Twentieth Century World Wars in which they evolved. Indeed, how the initial socialist politics of Modernism became, through the years and through the successes of Modernism, a politics that so well suited and represented the dominant ideology of capitalist enterprise would make a fascinating Masters or Doctoral thesis in its own right.

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Figure 19. Otto Neurath (1929–1930). Entwicklung der Kautschukproduktion seit 1895. Trans: Development of rubber processing since 1895.

Figure 20. Otto Neurath (1929–1930). Religionen der erde. Trans: Religions of the world.

4.1.2 Personal style competes with universality

As discussed previously, formalism in many design fields can be linked to Modernist doctrines, specifically those which reject the consideration of meaning through form. While the Modern movement can be characterised by economy and purity, where form is created out of function, Smith (2005) reminds us of an alternative approach to Modernism, one practiced by graphic design luminary Paul Rand. In Rand's work meaning was consciously expressed through form, and Rand believed that everything in design involved the relationship between form and content—that content was the idea, and the form was what you did with the idea (Kroeger, 2008). It is possible that Rand's distinctive and expressive personal vocabulary owed much to his identification with the more idealistic, ethically-oriented approach of the de Stijl movement (Nunoo-Quarcoo, 2003), and is not typical of formalism in that it admits meaning and personalisation of the design process and outcome. However, *meaning* for Rand is not contextual or culturally specific; it is not concerned explicitly with how the audience makes meaning. It instead appears to be involved with the poetry of visual relationships, with the refined melding of form and content, with universality and simplicity, as suggested in the list below, part of Rand's 1965 poster on the notion of *Quality*:

> Quality is concerned
> with truth, not deception
> with ideas, not techniques
> with the enduring, not the ephemeral
> with precision, not fussiness
> with simplicity, not vacuity
> with subtlety, not blatancy,
> with sensitivity, not sentimentality.
> (Hiebert, 2003)

Like Rand, Czech information designer and professed Modernist Ladislav Sutnar also possessed a distinctive personal visual style. Sutnar's systematic approach to catalogue design evolved a visual language of functional graphic elements, which stood out against the neutrality demanded by Modernist exponents from the post World War II period (Heller, 1997). Testimony to Sutnar's individualism is the enduring effect that his signature styles and emphasis on *function*, *form* and *flow* (Meggs, 1998) have had on the design of visual information systems in complex business information. As well as introducing the concept of designing

information over two-page spreads, Sutnar and his collaborator Knud Lönberg-Holm (Heller, 1997) developed a playful graphic vocabulary of navigational devices, including arrows, icons and brackets to codify a system and to direct the reader. These are ubiquitous in visual information displays today, but were highly innovative and non-formulaic compared with the work of design peers in the Swiss School of the 1950s. However, Sutnar and Lönberg-Holm did not set out to be different or to consciously assert an aesthetically-driven personal style. Rather, their work moved beyond formalistic standards established through the New Typography in order to achieve their aims of maximizing efficiency, clarity and navigability in complex information, with the aim of aiding readers' understanding.

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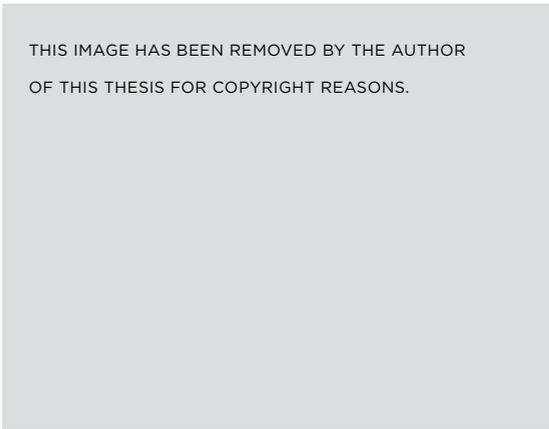
Figure 21. Ladislav Sutnar & Knud Lönberg-Holm (1950). Spreads from Catalog Design Process.

4.2

Prevalence of formalist approach

4.2.1 Emergence of information design

The previous section discusses the ideology of formalism and suggests its exceptions in Modernist communication design. The following section describes formalism's scope and use in the field of information design and attempts to explicate the causes for its prevalence in the new discipline.

As an interdisciplinary field, information design draws in theorists and practitioners from a range of areas, some more and some less connected to visual communication. These include instructional and cognitive science, technical communication, interaction design and graphic design. Within the graphic design sphere, antecedents to information design exist in corporate identity and corporate communications. Business and industry, which since the mid-1950s has experienced an upsurge of interest in corporate identity (Schriver, 1997), is strongly affiliated with the design of visual information. Information visualisation is deployed as an explanatory means of communicating to employees and customers, and increasingly as an explorative means of conducting scientific research, financial and market data analysis, maintaining digital libraries, and enabling manufacturing production control (Schriver, 1997). Non-design practitioners allied to business have an interest in knowing more about effective information displays. In the area of tertiary education many graphic design students, accustomed to viewing dynamic online infographics and interactive social data graphing displays, regard information design as a challenging area of practice, usually encountered for the first time in undergraduate graphic design or communication design courses.

4.2.2 Importance of Tufte to the formalist approach

Someone interested in learning more about visual information design might well start with an Internet search to locate some background reading on the subject. If they were to search for best books on information design, they would see a pattern emerging. Both in the best-seller lists and in *most popular books on information design* at least one of the four books by Edward R. Tufte (Yale Professor Emeritus of Political Science, Computer Science, and Statistics) would feature prominently, often in number one position. A Google Internet search using the keywords "Edward Tufte" and "information" reveals about 101,000 references. This compares with around 29,600 for "Richard Saul Wurman", author of *Information Anxiety* and pioneer in the area of understanding information. A similar search on prominent data visualisation consultant Stephen Few indicates 24,700;

significantly less references than those for the keywords "Edward Tufte". A search on "Otto Neurath", originator of Isotype receives about 18,900 references. However imprecise, this cursory search points to Tufte's dominance in the discourse of information design.

As Edward Tufte is the progenitor and populariser of the contemporary formalist approach, this chapter examines the predominance of his work in the field of information design, and suggests why the theories he espouses are so widespread and accepted. Additionally, it discusses the effect a formalist approach has on the domain of public-facing information graphics design. It should be made clear at this point that the core of Tufte's work focuses on the design of statistical graphics, although his theories have influenced a much wider range of information design fields, including those designed to explain concepts and processes to non-expert audiences. Tufte's ideas are not essentially concerned with merely explaining; rather, they hail from a conviction that displays are visual evidence, and must be seen as tools for reasoning and data evaluation. Statistical displays are used for exploration or analysis, and are closely connected with the physical or social sciences. This is a distinctly different sphere of interest from *explanatory graphics,* which comprise the majority of information graphics designed for public consumption (see Chapter 1.2, *Glossary of terms*, p. 3). Explanatory information graphics are concerned with making complex information easier for people to understand—it is about *understanding,* not *analysis*. Tufte dispels claims that he is attempting to influence information design practice as a whole. While he admits to "an effort to raise standards" (Zachry & Thralls, 2004, p. 456) by promoting his theories on statistical visualisation, he essentially views his "high and noble principles" (Zachry & Thralls, 2004, p. 456) as coming from his hypothetical investigations and intended for his own kind of work, rather than for an undefined, general community of information designers.

Despite Tufte's assertion that his principles are intended for a narrow sphere of influence and application, the sheer breadth of adherents to his approach suggests otherwise. Proponents include data visualisers and computer scientists, website developers and designers, statisticians, technical communicators, graphic designers, and increasingly, business leaders who (as mentioned previously) value effective data displays for analysis and marketing. He is popular with the data visualisation community; for example data visualisation expert Stephen Few (2006) describes Tufte as "a mentor" (p. 1), a major contributor to the knowledge of Few's own work in information dashboard[2] design and in communicating quantitative

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[2] In information technology, a form of graphical user interface (GUI).

business information. Few (2006) especially eulogises Tufte's invention of "sparklines", the data-intense, word-like graphics considered so essential to data visualisation that Microsoft has lodged a patent claim for "sparklines in the grid" to be implemented for their Excel application in 2010 (Tufte, 2009). Aside from consulting with NASA, IBM, Bose, Sun Microsystems and other organisations, (Smith, 2007, March/April), Tufte's work is well-known in parts of the business community; a result of over 160,000 people attending his one-day courses on "Presenting Data and Information", which tour the US annually (Smith, 2007). Tufte (Zachry & Thralls, 2004) admits to his evangelising tendencies:

> In my work, there is an effort to raise standards—by admiring excellence, saying that there are things that are good and there are things that are bad, so get out and tell the world about it... Public discussions are part of what it takes to make changes in the trillions of graphics published each year. You have got to get the word out... A curious consequence is that I have become a minor celebrity. (p. 458)

While his day-long courses continue to deliver his philosophy and principles in his charismatic and convincing style, it is Tufte's four books that provide an engaging and accessible foundation for his theories of analytical data design. These books, published between 1983 and 2006 make no compromise to lesser production standards; the elegant design, art book printing quality and image resolution, paper stock, and binding all lend authority to the series. As artifacts, they also assume a physical beauty not usually seen in didactic texts within what is usually considered to be a technical discipline. The books were not intended by the author to act as manuals for best practice. They are not physically designed to impart information in an accessible, quick-reference textbook form; numbered principles are peppered throughout the text and require sustained contextual reading.

In all four books, Tufte assembles and analyses specific examples of visual information in order to articulate coherent and logical principles of data design and visualisation. These visual examples are drawn from an eclectic range of cultural backgrounds, eras and disciplines, from Galileo's observations of Jupiter's moons in 1612–13 and Cézanne's still-life paintings to infographics in *The New York Times*. The sense here is that theories of visualisation are somehow eternal and traverse time and culture. Tufte's theories and practice embrace the domain of fine art, thereby enthusing him to aficionados of art history. *The New York Times* describes him as the "Leonardo da Vinci of data" (Tufte, 2001, p. 4) while data visualiser Jorge Camoes (2009) describes Tufte as an "artist" in the sense that his work ascribes more to aesthetic sensibilities than to the rigid measures of

engineering. In classifying significant information design professionals within a historical context, Horn (1999) identifies Tufte as principal among his category of *aesthetes*, praising his series of books on data visualisation for supplying "the field of information design with pioneering studies in how communication can be both beautiful and useful" (Horn, 1999, p. 20). Moreover, his mode of presentation acts to foreground examples of "beautiful evidence" which inspire and enthrall. A Tufte diagram, according to designer James Souttar is "a lovely thing" (Souttar, 1999, para. 2), his books "a superbly crafted showcase of interesting visuals" (Engelhardt, 2007, p. 190). The peppering of catchphrases and neologisms throughout the series: "visual confections"[3] (Tufte, 1997, p. 121), "sparklines"[4] (Tufte, 2006, p. 47), "flatland"[5] (Tufte, 1990, p. 12), "The Lie Factor" (Tufte, 2001, p. 57), "chartjunk", and "graphical duck" (Tufte, 2001, p. 107) make his key ideas accessible to graphic designers and non-designers who hope to impart authority, timelessness and integrity in their information displays. More than *empty styling,* these examples have gravitas and offer an analytical bias that appeals to these audiences.

Prevailing views conceive of *art* and *science* as being mutually exclusive. Tufte's work sets new parameters for visual information design as well as enhancing its vocabulary with *Scientific American* in 1984 describing his work as "cognitive art" (Morrison, 1984, p. 28). Thus, the field recognises Tufte's work as successfully spanning art and science; Tufte's books, with their idiosyncratic and charming collection of visuals, and their convincing, often abstruse writing style reminiscent of an art critic's, appeal to art appreciators as well as people who are interested in information displays. His work hits the "sweet spot", perfectly positioned for maximum coverage across visual, academic,and professional arenas.

If a person wanting to understand more about visual displays of information was to examine other contemporary instructional texts on information design, they would find functional and practical grounding on aspects of practice, where examples are subsidiary to the didactic or theoretical components. More than half of Visocky O'Grady's *The Information Design Handbook* and Baer's *Information Design Workbook* is devoted to definitions, history, research and principles, followed by contemporary information design case studies from a number of

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[3] An arrangement of visual statements into story form.

[4] Condensed, yet simple, word-like graphics.

[5] Two-dimensional visual planes of screen and print from which Tufte exhorts data designers to escape. Tufte borrowed this term from the title of Edwin A. Abbot's 1884 novella *Flatland: A Romance of Many Dimensions.*

leading practitioners, and, in the case of Baer's text, substantial chapters explaining user-centred design processes and audience response. By contrast, Tufte's classic texts evolve general principles for broad application.

As shown in Figure 22, Tufte's series of texts feature on recommended reading lists of undergraduate design project briefs on information design. At times they are the only recommended texts concerned specifically with information design.
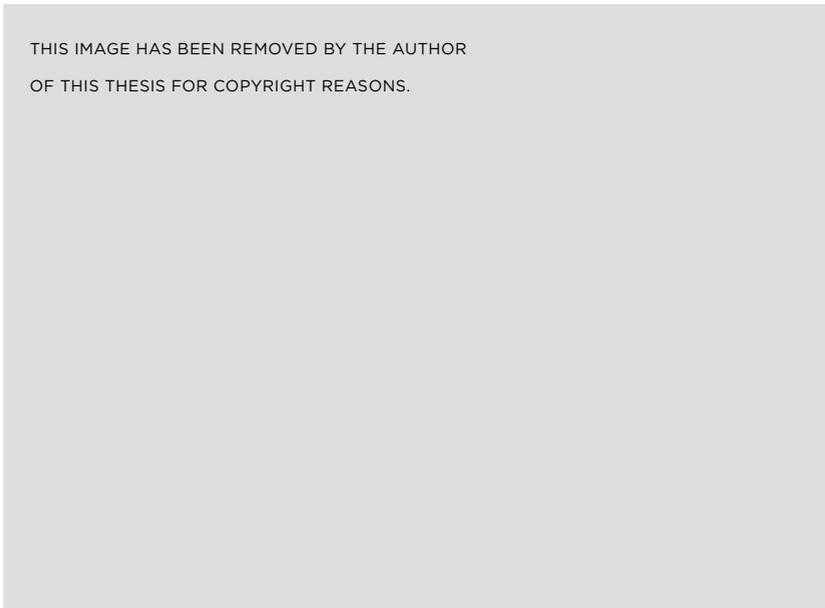
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Figure 22. Samples of project briefs for information design projects in an undergraduate graphic design programme (2010), focusing on the *Key References* list.

CRITIQUES OF TUFTE'S APPROACH

The formality and beauty of Tufte's books is reassuring for students; as Holmes (Heller, 2006) comments regarding Tufte's work, "people do love rules—they will follow them to the letter if they are stated authoritatively enough" (p. 77). Tufte's technique is based on a restrictive Modernist "explicate, then illustrate" approach which Sless (personal communication, April 14, 2009) claims demonstrates Tufte's concern with isolated graphical elements and their relationship to each other, thus impeding any insight into the real-world use of a given information artifact. In graphic design education, this can promote what McCoy (2003) calls "the detachment problem" (p. 7); a hangover from the formal exercises taught in Basel and the Bauhaus schools. She states (McCoy, 2003): "Divorcing design form from

content or context is a lesson in passivity, implying that graphic form is something separate and unrelated to subjective values or even ideas" (p. 7). Similarly, designer and design critic Natalia Ilyin remonstrates against the effect of formal rules and standards inherited from Modernism, which she terms "the box":

> The modernists built us a box—a box of rules and grids and values that keep the pain of reality at bay... Teaching the box has not made things better for design. Teaching ironic distance, a disregarding of reality, a belief in our own narrow, and often narrowly educated, view of the world has not made design better; it has made it an exercise in novelty and in narcissism. (Ilyin, 2006, p. 98)

The issue here is that left unchecked and unexamined, this attitude becomes internalised, leading to a disconnection from reality that is carried from academia into professional practice. Here, the *myth* of objectivity is preserved. This is evident in the following comment by information design Gerlinde Schuller (ironically, stated an article where she discusses experimental information design):

> Technical and graphic standards are an important part of information design's repertory. In addition to claiming absolute objectivity, they are often indispensable for applied information design solutions. However, it is frequently the case that a subjective bias of information design representations cannot be avoided and that standard models at times do not achieve their purpose. (Schuller, 2007, para. 8)

This critique does not arrive out of the ether but from a wider and concerted critique of Modernism itself. In order to fully appreciate this critique and further specific critiques of Modernist approaches to information design, it is worth taking a moment to consider some of the key points of argument against both the philosophical precepts and the aesthetic conventions of Modernism.

4.3
Critique of Modernist approaches

One of the key critiques of information design and, I argue, the central area of contention in formalist graphic design approaches comes out of architectural discourse, in the shape, metaphorically and literally, of a duck. An astute critique of High Modern architecture, *Learning From Las Vegas* (1972) was a pioneering text of its time, profoundly influencing the burgeoning Postmodern movement. In Part 2 of their analysis, *Ugly and Ordinary Architecture, or the Decorated Shed*, the authors, architects Robert Venturi, Denise Scott Brown and Steven Izenour

overturn established conventions of thought by rejecting the paternalist and visionary convictions held by past and present Modern architects. At the time it was first published, Modernism had presided over the first half of the twentieth century as a dominant influence in architecture. The *machine aesthetic* was embraced—Le Corbusier's 1923 maxim that "the house is a machine for living in" encapsulated the spirit and tenets of High Modern architecture—flat, undecorated aesthetics, and culturally non-specific, universally applicable programmes for design. A work such as Bunshaft's *Lever House* (1950–1952) as depicted in Figure 23, page 42 "shuns explicit symbolic ornament" (Venturi, Scott Brown, & Izenour, 1977, p. 101) that carries obvious denotative meaning.

However, the now well-known argument is that the sterile, undecorated facades of Modernist structures are no less symbolic in their significations. Venturi et al. (1977, p. 93) claim the Modernist building still communicates heroic and original connotative meanings through its focus on purity of form and on structural space; it is a symbolic ornament itself. The authors explain:

> Ironically, the Modern architecture of today, while rejecting explicit symbolism and frivolous appliqué ornament, has distorted the whole building into one big ornament. In substituting "articulation" for decoration, it has become a duck. (Venturi et al., 1977)

Here, the authors refer to the duck-shaped store now known as 'Big Duck', in Flanders, New York (Figure 24, page 42). Built originally in 1930–31 to promote the sale of ducks and duck eggs within the building, it exists today as a popular landmark. In *Learning From Las Vegas*, an "architectural duck" stands for High Modern architecture, where the actual building and what the building represents (its connotative meaning) are collapsed together into the structure itself, as its form becomes its product (Lupton & Miller, 1996b). In this way, it is claimed that the *symbolic form* overrides the *functional architecture*. Although the duck-form store strikes one as a comical exaggeration of representational architecture, Venturi et al. (1977) contend that Modernist edifices designed by acclaimed architects like Mies van der Rohe and Le Corbusier are no less symbolically exaggerated.

The memorable "architectural duck" concept has passed into the vernacular of architecture, to denote any building that is itself a sign and, somewhat ironically it is this notion that is appropriated and then distorted by Tufte to construct his own argument for functional clarity. In his first book on information design, *The Visual Display of Quantitative Information*, Tufte introduces his own conception of the "architectural duck" in which he defines the "duck" as decorative and

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Figure 23. Gordon Bunshaft. (1950–1952). Lever House, New York City.

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Figure 24. Marcel Maurer (1930–1931). The Big Duck store, Flanders, Suffolk County, New York.

superfluous elements in a graphic, or ornamental style that trumps quantitative data. He derides the "self-promoting graphical duck" (Tufte, 2001, p. 107) as a gimmicky device which leads to simplistic and misleading displays of complex data presentations by cluttering, deforming and exaggerating data, trivialising its content[6]. Consistent with the principles of Modernist architecture, this labeling of particular graphics is based on a rejection of ornament and is impervious to variables such as use, audience, context and medium of display. It thus exemplifies a formalist approach. As such, a key critique of this approach is the same as that of architectural Modernism.

As well as a censuring of Modernist values and aesthetic preferences, *Learning From Las Vegas* is a call for reevaluation and acceptance of the everyday "ugly and ordinary" (Venturi et al., 1977, p. 85) and a call for "an architecture of inclusion" (Venturi et al., 1977, p. 53); one of relevance to urban inhabitants. They suggest:

> Allusion and comment, on the past or present or on our great commonplaces or old clichés, and inclusion of the everyday in the environment, sacred and profane— these are what are lacking in present-day Modern architecture. We can learn about them from Las Vegas as have other artists from their own profane and stylistic sources. (Venturi et al., 1977, p. 53)

Venturi et al. (1977) claim that Modern architecture's unconscious embodiment of a "symbolism of the heroic" (p. 130) is unsuitable for the era and environment, that the Modern aesthetic is empty, dull and "in the end, irresponsible" (Venturi et al., p. 103). They suggest that images and iconography of the everyday world are more socially responsible associations for civic buildings that are utilised by everyday people.

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[6]While the authors of *Learning From Las Vegas* use the "duck" metaphor to attack the purist-leaning tenets of Modernism, Tufte, in quoting the closing passage from *Learning From Las Vegas* (on page 163 of that book) overlooks the authors' intentions, inadvertently disclaiming his attachment to Modernist principles. He uses the "duck" as a metaphor for ornament that corrupts visual displays of information, rather than regarding the "duck" as representing a perception of graphic-itself-as-symbol. As Denise Scott Brown states in the preface to the revised edition (1977) of *Learning From Las Vegas*, the subject of their study was not Las Vegas, it was the *symbolism* of Las Vegas.

As previously noted, information design traverses numerous fields and the resilience of the formalist approach is attested to by the continued prevalence of its basic precepts in most of these fields. For this reason, it is important to elucidate the basic precepts which continue to inform the discipline. With that in mind, the following sections will describe these precepts and their associated influences and approaches, and where possible, I will highlight arguments both for and against their use. The central precepts and areas of contention are explored in the next section, which looks at the principles and rule based approaches to information design. Here, I explore four main approaches ranging from those closely connected to a positivist Modernism to more structuralist semiotics approaches. Following this I explicate four key terms that, through an understanding of the different ways these have been defined and used in information design, we may glean a richer appreciation of the discourse and the sometimes indistinct meaning of information design. These terms are *content, clarity, integrity,* and *neutrality*.

4.4
Information design as principles and rules
4.4.1 Principles and rule based systems

As information design is still formulating its sense of self, is in the process, one might say, of emerging as a discourse, sets of rules advanced in a convincing manner encourage information designers, students and professionals to believe that there exists a universal, underlying structure to guide practice; one that, argues Sless (Sless, 2007b), means that just like the separation of form and values described above, rules can be regarded as being separate from practice. In this way, people view rules as somewhat "superior to practice" (Sless, 2007, p.114), where rules cannot emerge from practice in a constructive sense, but are literally applied.

As a discipline closely linked with human communication, information design is continually augmenting its theoretical knowledge base to establish clear and effective methods for presenting data. Rule-based principles are prevalent in theories of information design, a factor of the predominance of relevant research coming from science-oriented fields, such as psychology, quantitative data visualisation, and interface design. While the sensory-perceptive field dominates analytical displays of information, there also exists a convergence with the linguistic field, through a consolidation of what we term the *language* of visual information. From this, a diverse body of principles—assertions that form the basis for a particular belief or claim—has evolved. The following section outlines and problematises

some of the historical, technological, and social movements that have influenced the formation of information design principles, and evaluates their usefulness in the context of a formalist design approach. These approaches to information design are different models, but all have their own reliances on sets of rules and principles, and come from widely varying influences not least because of the discourse's varied uses across different fields of practice. As such, any categorisation of these influences is destined to be reductive and somewhat inaccurate. The following sets should therefore be understood as broad discursive brushstrokes with lines, which in reality cross and intermingle, and sometimes come together or separate over time. With this in mind, the most useful categorisation of influences currently (as all histories, from Foucault, are histories of the present) sees four broad areas:

A. SCIENTIFIC THEORIES
B. MODERNIST GESTALT
C. THE LANGUAGE OF VISION
D. THE SEMIOTICS APPROACH

A. INFLUENCE OF SCIENTIFIC THEORIES
The imperative to originate "scientific" theories of information design through studies of visual perception has arisen from a confluence of knowledge in a number of design and technology areas. The formalist approach as it applies to the design of information graphics today can be traced back to a number of converging cultural events of the twentieth century. These are broadly grouped into two cultural movements: an accelerated interest in science and technology and Modernism.

Empirical research into the most effective ways to present data dates back to the 1920s (MacDonald-Ross, 1977), when an accelerated interest in military operational research and information technologies during and after World War II inspired science-based studies of communication in the United States and Western Europe. One influential example is information theory, developed in the 1940s. The work of Claude Shannon and Warren Weaver was originally intended to measure how well signals could be transmitted over radio channels or telephone lines, but the model they developed in their published research, *The Mathematical Theory of Communication*, known as the Shannon-Weaver model (Figure 25, page 46) has since become a fundamental communication theory, adopted by the social, as well as the physical sciences. This occurred despite Shannon's reservations that the model would be suitable for use in anything but electronic communications,

since it was formulated purely as a "theory of communication, useful in under-standing telecommunication systems" (Losee, 1997, p. 263). That person-to-person communication was habitually considered in the same terms as electronic signal transmission is indicative of society's desire for machine-like control and predictability in the mid Twentieth Century (Kinross, 1989). It is not surprising then that this influence has its detractors. Sless and Shrensky (1995) question the viability of the model, and argue that conflating the Shannon-Weaver model notion of transmission with the idea of communication "has relegated communication to a purely instrumental function, a tool for doing things" (Sless & Shrensky, 1995, pp. 33–34), and they suggest that this functional, operation-oriented notion of communication persists today.

INFORMATION SOURCE → TRANSMITTER [CHANNEL] → SIGNAL → RECEIVED SIGNAL → RECEIVER → DESTINATION

NOISE SOURCE

Figure 25. Claude Shannon & Warren Weaver (1949). Model of the communication process.

B. INFLUENCE OF THE MODERNIST GESTALT
As discussed previously, principles and rules prevailed through the Modernist era. In art and design a rigorous, rule-based theoretical foundation emerged from post-World War II avant-garde art movements in Europe, such as Constructivism, the Bauhaus and de Stijl. The Modernist movement of this period emphasised perceptual principles to understand how people assemble their visual inputs; the most enduring and influential of these derives from experimental Gestalt psychology, led by German scientists in the 1920s (Lupton & Miller, 1996a). The Gestalt principles of perception (or Gestalt laws) are based on the theory that the brain is self-organising and seeks patterns from visual stimuli. The Gestaltists were concerned with understanding the relationship between different component parts of the whole—and the interplay between the individual parts of a composition in parallel with the whole composition. They offer six general principles to suggest how people perceive visual components spatially (Schriver, 1997). These are especially prominent theories in document design, HCI and interaction design, where designers aim to maximise communication and usability.

It must be noted that even well researched and tested principles of visual perception like the Gestalt principles of perceptual organisation are not entirely logical or certain. Empirical testing of principles is no guarantee that once applied, the results will be universally consistent. Pander Maat & Bierman (2005) contend

that research into lay readers' perception of Gestalt principles has shown that these laws are not stable, but may operate differently when tested using differing formulations of network charts. They are mutable precisely because they cannot account for every visual configuration that the human perceptual-cognitive field might interact with. The Gestalt principles in the visual design field are frequently misstated as prescriptive rules for practice (Schriver, 1997), while other factors (such as rhetorical purpose and audience response to the design) are overlooked. The Gestalt principles are not explanatory; they are purely descriptive and were intended to describe the effects on perception of particular groupings of elements. This means that they do not imply directives for practice, but simply describe how our mind "sees".

Principles delivered through scientific research form the mainstay of data visualisation and prescribe rules for practice (Few, 2007):

> Data visualization... mostly involves science, a set of rules based on what we know about visual perception and cognition, which we can follow to display information effectively. When these rules are understood and software is designed to support them, then, and only then, great things can happen. (p. 9)

Thus infovis, or data visualisation, which originated as a scientific tool to support research, itself relies on scientific research into cognitive-perception to establish its principles (Danziger, 2008). The focus on perception as a basis for design principles is part of what computer scientist Colin Ware (2000) calls "a growing interest in the relationship between the way we present information and the way we see" (p. xvii).

C. THE LANGUAGE OF VISION

Cognitive science uses a model of human information processing. The processing input stage connects perception to the physical senses—predominantly the sense of vision; it is "the power to organize the visual information seen" (Dondis, 1973, p. 106), and this organisation of visual inputs is a cognitive process; that is, a mental action. Principles for visual display based on cognitive perception then, rely on the interaction between the eye and the brain's organising capacities. The physiology of the eye is at one with the brain's constituents, claims Tufte, and since the retina is made up of brain cells, "seeing turns into thinking right there" (Zachry & Thralls, 2004, p. 450). This claim is indubitable, since it is actually the brain which does the "seeing". However, Ware (2000) takes this notion further, asserting that the close interrelationship between perception and cognition means that "the

words 'understanding' and 'seeing' are synonymous" (p. xviii). Various interlocutors however question this assertion. The cognitive-perceptual paradigm tends to conflate *seeing* and *understanding*—generating principles that presume visual perception is the same phenomenon as understanding. Commonly, however *seeing* does not connote the purely visual. It suggests clarity and comprehension; we say "I see what you're saying" when we mean "I understand". Perception and thinking, according to Rudolf Arnheim are inextricably interwoven, but are not one and the same, thus the physical activity of *seeing* is not the same as *understanding* (Arnheim, 1969). Lupton and Miller regard reductive claims like Ware's as placing *understanding* as a rational and wholly physical phenomenon, barring context or individual interpretation (Lupton & Miller, 1996c).

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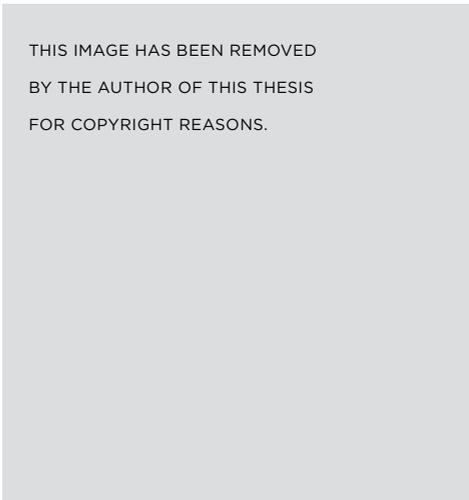
Figure 26. ScienceGL (2009). Blood cells, volume measurement tool, 3D axis.

Consolidating and inducting principles for practice into the formalist sphere is made simpler by the assurance that "processing of certain kinds of sensory information is hard-wired and fast" (Ware, 2000, p. 15), and that visual information of this kind is innate and doesn't need to be learned. This corresponds with the ideals of stable, objective and reliable systems of thought upon which a theory can be built; one that strives for repeatable systems, which do not exist in reality. In his discussion of visual representations of information, Ware (2000) delineates two codes: "arbitrary" (not perceived but learned meaning), and "sensory" (perceived without learning, innate and predetermined). Although viewers may not understand what it is they are looking at without special training, the three-dimensional

surface such as that in Figure 26 is clear since our perceptual systems are able to recognise three-dimensional forms. Thus Ware claims that comprehension of the content is learned (arbitrary), but perception of spatial qualities is inherent (sensory). Ware stresses that this code distinction is not clear-cut or applicable only to particular visual stimuli, but that designers of information displays should identify both the sensory and arbitrary aspects of meaning making and design accordingly.

The distinction between *sensory* and *arbitrary* codes of meaning as discussed above presents a challenge to rule-based principles for designing visual information. Tufte (2001) admits this frustrating reality in his consideration of graphical distortion:

> Different people see the same areas somewhat differently; perceptions change with experience; and perceptions are context-dependent. Particularly disheartening is the securely established finding that the reported perception of something as clear and simple as line length depends on the context and what other people have already said about the lines. (pp. 55–56)

Despite the acknowledged existence of contextual anomalies, the formalist approach supports following sensory perception-based rules, otherwise data will be misleading and unintelligible (Ware, 2000). Tufte's example above, however, brings to the fore the difficulty of imagining how design principles striving for universality might incorporate both the constancy of sensory codes and the capriciousness of arbitrary codes. An alternative, more holistic model of perception might be made up of three components: *sensory mechanisms* (our physical receptors), *processing* (cognition), and the *meaning* we attribute to those sensory inputs (Whitehouse, 1999). *Meaning* by this definition is an interpretative faculty, based on an individual's culture and experience in order to make sense of the information. Because aspects of the formalist approach are bound by concepts of sensory perception and cognition, important and inevitable facets of individual interpretation are diminished.

D. THE SEMIOTICS APPROACH

Following from the difficulties above, a different approach brings its own rules to bear. This set of rules originates in linguistic studies. The linguistic concept of grammar produces a fixed, rule-based, and familiar system theory for understanding visual communication, one that is derived from the way we make and use language, and includes such related fields as semiotics, semantics and morphology. Structural analyses of word-based language focus on grammar, thus for various

scholars and theorists studying non-verbal communication, the rules and systems of linguistic analysis are easily transliterated into a system applicable to *visual language*. Speech-based grammar falls into *prescriptive* or *descriptive* approaches. Prescriptive refers to formal rules established by convention that are meant to be applied to language, while descriptive relates to rules identified within language use; that is, from the way language is actually used. These classifications can be applied to visual language—theorists who are aligned with Michael Halliday's systemic functional approach to linguistics (notably Gunter Kress and Theo Van Leeuwen in their social semiotic formulation of the grammar of visual design) follow a *descriptive grammar* model. Similarly, Robert Horn (1998) offers a visual language morphology using functional semantics, which analyses the relative effects of the tight integration of words and visual elements.

The Twentieth Century semioticians, social scientists, and educationalists whose aim was to develop a universal pictorial language focused on the consistency and rule-based conventions of a formal grammar. Cartographer Jacques Bertin, in *Semiology of Graphics* (Bertin, 2010) also adheres to aspects of formalism. He uses a semiotic approach to analyse graphic representations of data in the form of diagrams and maps, and suggests a language system of linking the characteristics of data to visual elements, resulting in a taxonomy of graphics which is compared with Mendeleev's (1869) periodic table of the elements (Friendly & Denis, 2009). By codifying data and their spatial relationships in this way Bertin lays the foundation for any kind of graphical constructions used in information visualisation. Aspects of his theories are so fundamental that many mappings, such as the $x\,y\,z$ construct, constitute our basic literacy of information visualisations, as taught in schools and promoted through their use in standard graphing applications, including Microsoft Excel (Danziger, 2008).

4.4.2 Limitation and benefits of rules and principles

Principles are formed by abstract generalisations. They provide the parameters of what is known and are intended for use in exploring and discovering what is not yet known, serving an important purpose in any discipline. Moreover, as Sless (1997) suggests, the notion that principles and rules are cultural inventions seems to be overlooked. He claims they have become so much a part of the way we explain processes and practices that people assume that they are "part of the natural order of things: that underlying all surface phenomena there must be deeper causes and explanations" (p. 4).

Reviewing the theoretical investigations discussed in this section, from which principles relevant to information design have emerged, these basic approaches can be seen from another perspective. These see principles as either innate (natural), cognitive (physiological), or linguistic. Linguistic principles assume a universal viewer and emphasise both the learning of conventions, and the passive decoding or translating of the subject matter. They are useful for understanding and analysing the constituents of visual language, but less helpful in understanding how individual audiences interpret information (Tyler, 1995). Similarly, while cognitive-perceptual theories such as the Gestalt laws have provided useful guidelines in a generalised sense, they are limited since they "place on the periphery any discussions of social and contextual factors, unless they apply to such perceptual factors as colour responses in different cultures" (Brasseur, 2003, p. 3). They do have the advantage of being founded on human-based studies—ostensibly, human physiology—and are not derived either from tradition or from laws of nature. However, if we take the activity of information design as planning and shaping information to make it usable by people, then a body of firmly determinist principles that completely disregards the needs, literacies, capacities, and physical limitations of people is by definition, limited. Any principle based on innate laws—laws claimed to be common to all of humanity throughout history, where rules for practice are fixed at the expense of actual use—could be seen to challenge the essence of information design which aims to help other people to achieve their own goals of understanding information. A more beneficial perspective may be gained by exploring in more detail a key component of information design. To this end, this enquiry turns now to how *content* is understood in the field of information design.

4.5
The role of content in information design
4.5.1 The meaning of content

All design disciplines work with content in some form, however in information design theories the notion of content and precisely what is meant by the term, is contentious, and tends to depend on the wider philosophical approach being supported. In information design, content and communication are closely merged and constantly inform each other in the design process (Baer, 2008). Content in information design comprises the "fields of meaning" (Jacobson, 1999, p. 5) that are shaped into communication artifacts. It is the *stuff* that makes meaning, and an important argument centres on whether or not this *stuff* is confined to data.

In earlier approaches, particularly those where theoretical traditions are aligned with cognitive science, content is regarded purely as data, and therefore their focus is on bringing "*absolute attention* to data" (Tufte, 1997, p. 48). Later writers contend that content is any visual artifact in a graphic, whether it purposefully carries information or whether it is redundant[7].

4.5.2 Differing approaches to the relationship between data and information

For some information design practitioners, the data constitute the content. This is particularly the case with designers in the formalist tradition. A prime consideration in all of Edward Tufte's work is *data as content*—"self-effacing displays intensely committed to rich data…" (Tufte, 1990, p. 35). Key to the design of visual information displays is not "distorting what the data have to say" (Tufte, 2001). In this view, data are thus placed in the role of lead stage actors with speaking parts, and suggests that meaning resides in data alone. If it were actually the case, then data would not need to be artificially presented (consciously designed) since they "have something to say". This apparent self-contradiction attributes intellectual qualities to data that in reality only exist through an individual's interpretation of a given data display.

The formalist approach emphasises the designer's, as well as the viewer's cognition. In its most extreme form it holds that *form comes from logic*. Such a premise has important implications for exploratory data design and data visualisation, since it suggests that if data is translated into "the appropriate visual representation, its structure may be revealed" (Ware, 2000, p. 239). It is as if raw data possess an innate logic with form-giving potential that is released once data is visualised. This data translation process is not based on arbitrary, aesthetic, or user-centred design decisions. Rather, it proceeds from the processes of analytical thinking, with the form arising from exigencies of the specific "thinking task" (for example to show cause and effect) demanded by the purpose of the display (Tufte, 1997). This is sympathetic with the Modernist dictum *form follows function* in that the demands of practical use take precedence over design aesthetics, and at once

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[7] Redundancy refers to unneeded information which is purposefully repeated in the message to aid its understanding. For example, reiterating the subject matter of a graphic by including in it an icon or element that echoes the subject matter may seem repetitive (especially if the graphic's subject is explicit in the title and context). However, it may reinforce the message and help comprehension. Minimalism is the contrasting principle (Mollerup, 2005).

more radical than *form follows function* in that the "thinking task" is claimed to arise from "the universal character of physical laws" (Tufte, 2006, p. 138), and it is from these universal laws that principles for practice are derived.

The lionizing of statistical material used in graphics translates into Tufte's principles, where his stated design strategies such as "to clarify, add detail" (1990, p. 37), "show the data" (2001, p. 13), "maximize data density" (2001, p. 168), and "forgo chartjunk" (2001, p. 121) all focus attention on the *content* of data graphics, proposing practical ways they might efficiently and effectively present information to viewers. However, it has been argued that *data* and *information* are not the same. Shedroff, for example, suggests that a list of figures or images is not information; it is data. It will only be useful information when it is organised and presented in context, in a way that communicates meaning (Shedroff, 1999).

These approaches are more audience-centred and pragmatic. *The Information Design Handbook*, for example, explores "the connections and convergences between human perception, thinking, and learning how we transmit knowledge, share concepts, and process information through language; and how structure and legibility affect the visualisation of messaging" (Visocky O'Grady & Visocky O'Grady, 2008 p. 53). Thus, the didactic focus is not on the innate qualities of data, but on how designers transform the data into meaningful information for their audiences.

4.5.3 Aesthetics and affective content

Contemporary information design approaches to aesthetics align with affective, asor emotional design principles. These are employed in order to evoke an emotional and psychological response to the content in the graphic (Danziger, 2008). The formalist approach to aesthetics has little to do with 'style', fashion, or desired audience response. It suggests that the attractiveness of graphics is not strategically applied in the design process; it is a *byproduct* of successful data design—complex, clear, and efficient displays are inherently beautiful. Tufte (2001) claims that the aesthetic appeal of graphics accords with the importance or value of their content, where critical issues can engender more attractive graphics than can insignificant issues:

> Visually attractive graphics also gather power from content and interpretations beyond the immediate display of some numbers. The best graphics are about the useful and important, about life and death, about the universe. Beautiful graphics do not traffic with the trivial. (p. 177)

Here, the cultural worthiness of a graphic's referent denotes its aesthetic quality. One might argue, however, that at best, this criterion can only ever be a subjective assessment. Furthermore, some would contend, with good cause, that it is unrealistic. By this definition, popular graphics about geeky travel trivia like the visualisation in Figure 27, or data maps tracking a person's daily activities over a year are less visually attractive than one depicting Iraq War casualties (Figure 28). The "power from content and interpretations" of the Digg Labs Arc visualisations such as the kind in Figure 27 might actually be the sheer volume of real-time data on the Internet and the complex relationships between data and users. Not about life and death, perhaps but of interest to everyday people.
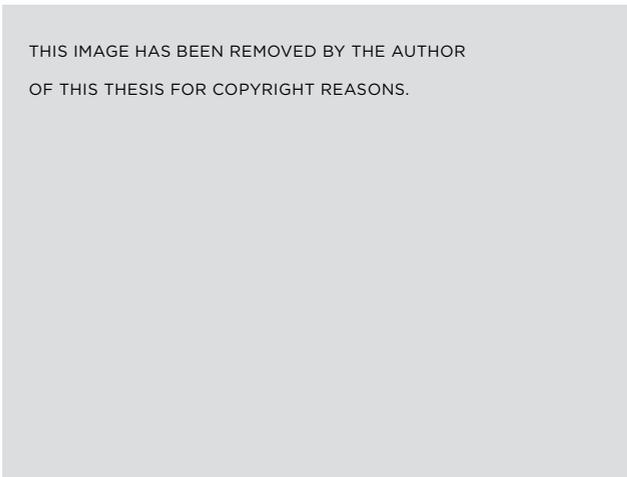
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Figure 27. DiggLabs (2010). Who knew? Geeky travel trivia, Arc–7 interactive visualisation.

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Figure 28. Matthew Ericson (2007). The toll of war: Deaths in Iraq (detail). Infographic for *The New York Times.*

The Digg Lab designers see their work in popular visualisation as science experiments, useful for reasoning and data evaluation (Baer, 2008), albeit with an entertaining edge. The formalist approach views any representation of data—whether images, words or numbers—as *evidence* and the visual presentation of evidence is a stage in an analytical process, a way to think through and about data. In this way, it suggests that all design decisions should be based on how effectively the data display's form and structure assist in analysis, in understanding causality, and making comparisons in the data (Tufte, 2001). One can see this as a generalisation about the use and value of graphical information. However, not all displays are tools for exploratory analysis—some are explanatory, some are propaganda and others are *infotainment*. The theories of the connoisseur, it would seem, are positioned as universal when they only work successfully within a discrete, simplified reality.

4.6
Clarity in information design
4.6.1 The place of clarity

As with the notion of content, that of clarity is similarly contentious, and the issue has become exacerbated by digital technologies. In *Information Anxiety* (1989), Richard Saul Wurman anticipates the effects on society of the immense weight of data precipitated by the advances in the technological flow of data and information, a phenomenon known by the now stock term "information overload". Wurman's techniques for selecting and processing information to make it meaningful, like many other communication principles used to organise information—hierarchy, structure or legibility, for example—presuppose an objective of creating order. It is interesting to note however, that definitions of information design do not admit *clarity* as an aim of the discipline[8]. Clarity is an implicit goal of all approaches to information design, formalist or otherwise, but articulating exactly how clarity might be defined within the field is complex and imprecise (Kostelnick, 2008). In the formalist tradition, particularly in the "perceptual cognitive-based school of thought" (Brasseur, 2003, p. 4), there exists a qualitative understanding that effectiveness of visual information displays is measured by clarity, efficiency, and speed of information transmission. What is plain however is that clarity is an attribute of a message, not a method of *communicating* a message. As a designer, it is not possible to apply the overarching *principle of clarity*, as one might apply

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[8] See Chapter 1.2, *Glossary of terms*, page 3 for definitions of information design.

a grid system or Miller's Magic Number[9]. Unlike the before mentioned communication principles, clarity is not solely a means to achieve a particular end, but is considered an end in itself (Sless, 2008), a state of being clear, and an outcome of effective design. This chapter enumerates several conceptions of clarity as evaluated in the formalist approach, and following this, it examines concepts of clarity in wider contexts.

4.6.2 Definitions of clarity

The New Oxford Dictionary of English defines the core sense of clarity as "the quality of being clear" (Pearsall, 1998, p. 337). A number of sub-senses are suggested: in brief, intelligibility and coherence, sharpness, certainty, and purity. These specific qualities of clarity align with ideals of excellence that are endorsed in visual displays of information; clear, unambiguous, and efficient design that properly represents complex information (Tufte, 1983/2001); displayed "as simply as possible without any form of distraction" (Few, 2009, p. 2). These qualities of clarity additionally conform to Modernist ideals of simplification and stability, transparency, and function ahead of form. The alliance of clarity with Modernism reinforces the reductive and neutral aesthetic we customarily attribute to clear displays. It needs to be recognised therefore that, far from being a simple objective phenomenon, there is a politics in the use of the term clarity. This politics can be illuminated through an exploration of other key terms that surround the concept.

4.6.3 The relationship between perception and clarity

When considering clarity through the lens of formalism, several criteria are evident. These are by no means segregated and are frequently merged in practice. First is *optimum perception*—which corresponds with the above mentioned sub-sense of *sharpness*—and is a purely perceptual attribute. Tufte (1983/2001) suggests, "Central to maintaining clarity in the face of the complex are graphical methods that o*rganize and order the flow of graphical information presented to the eye*" (p. 154). An example of such a graphical method, *eye tracking* studies how people scan visual stimuli and is particularly concerned with where our gaze fixates, or pauses. The perceptual research in this field is over 50 years old, but has experienced a resurgence of interest within the fields of computer user

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[9] Miller's Magic Number (1956), or *chunking* is a formula developed by psychology professor George Miller. It allows large units, or chunks of information (for example, telephone numbers) to be recalled more easily by the viewer's short-term memory.

interface and information dashboard design[10] (Visocky O'Grady & Visocky O'Grady, 2008). The main fixation points, or *hotspots* are of interest to researchers and designers in order to evaluate how fast people read particular areas on a page or screen. Similarly, just-perceptible differences in the way people experience sensory stimuli can be determined and codified as a constant rate of change, or *difference threshold* so that designers can predict optimum perceptual contrasts for size, shape, and colour of elements in the display. Deployment of this principle, known as Weber's Law can affect clearer hierarchies of information (Visocky O'Grady & Visocky O'Grady, 2008). A secondary benefit of deploying the difference threshold, which Tufte (1997) interprets as "the design strategy of *the smallest effective difference*" (p. 73), is that the process of enacting these just-noticeable differences in design elements has the effect of reducing clutter, increasing visual salience of the primary elements, and thus increasing the efficiency of information reception.

4.6.4 The relationship between efficiency and clarity

Another sense of clarity as it applies to visual information design is *efficiency*, which conforms to Modern preoccupations with function, stability, and direct transmission. Efficiency attributes importance to surface accessibility—to be efficient, information displays aim to be instantaneously coherent. It should be noted here that efficiency in the formalist sense is not a matter of *understanding the meaning of information*; it is concerned with its transmission or cognitive translation. In his discussion of the way that inefficient colour use can generate unintended puzzles in statistical graphics, Tufte (2001) states: "By contrast, in a non-puzzle graphic, the translation of visual to verbal is quickly learned, automatic, and implicit..." (p. 153), and is thus efficient.

For certain graphical artifacts such as pictorial symbols or pictographs, denotative pictures have been distilled to their most recognisable characteristics. When images of reality are abstracted into icons, and their descriptive qualities simplified, they lose their visual real-world context, taking on the form of symbols (McCloud, 1993). It is this, according to Neurath that makes the picture language symbols of Isotype able to be read (Dreyfuss, 1984) and recognised. By this description, stand-alone pictographs are efficient—although, one might note, meaningless outside the context of a data display.

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[10] A single-screen visual display that monitors the information needed to achieve one or more objectives. See *Information Dashboard Design* (2006) by Stephen Few.

Clarity is individualised in the digital medium of visual displays, due to its multimodality and interactive nature. Digital data displays are often visually dense and complex, yet they are not limited by the physical, two-dimensional confines of print. Users are able to select and choose which information they need by actively drilling down past the surface complexity. Tufte, in discussing the use of *small multiples* for depicting comparisons, posits that even though computer displays allow efficient organisation of complex multiple image displays, this efficiency gain is compromised by the need to move temporally from one screen view to another, as opposed to scanning across a page spatially (Tufte, 1997). It should be noted, however, that since his claim is unsupported by user-based research, it perhaps speaks louder of Tufte's preference for the durability and physicality of paper for disseminating his own work (Zachry & Thralls, 2004) than as an endorsement of proper data arrangement to determine efficient information uptake. Nevertheless, it does suggest that complexity and efficiency are intertwined; at the same time that it points to the limitations of universal, multi-applicable guidelines for designing-in efficiencies.

4.6.5 The relationship between simplicity and clarity

The pervasiveness of the Modern legacy has lead to a generalised acceptance that *simplicity equals beauty*—a philosophy that has thus far held dominion over the formalist information design aesthetic. In formalist visual information design, aesthetic or affective (emotional) factors are subordinate to explicitly communicative factors, such as how the design organises and articulates information clearly. Additionally, beauty is a matter of elegant functionality, and is perceived as an intrinsic feature of excellent graphics. Attractive design means "simplicity of design and complexity of data" (Tufte, 2001, p. 177), achieved by following normative, rational guidelines for balance, proportion and scale. By contrast, the beauty of data visualisation in the website *Information Aesthetics* is plainly and honestly *aesthetic*; it is imbued with the rhetoric of self-expression and poetry, not science (Kostelnick, 2008). This Internet web log provides an online gallery for information visualisations, particularly those that are considered innovative in design, inspirational, and visually seductive. It operates as a forum to share and discuss information visualisations that do not function as exacting scientific data analyses and where the aesthetic experience is superior to the level of functional usefulness.

The question thus remains: *does making a display simple give it clarity?* For formalists, this depends on how simplicity is defined.

That simplicity means reducing or eliminating the quantity of elements cluttering a graphical display is challenged by Tufte (1990):

> So much for the conventional, facile, and false equation: simpleness of data and design = clarity of reading. Simpleness is another aesthetic preference, not an information display strategy, not a guide to clarity. What we see instead is a rich texture of data, a comparative context, an understanding of complexity revealed with an economy of means. (p. 51)

It is not information that is inherently complex, claims Tufte, rather, the designer has been unsuccessful in selecting and organising data so that clarity is achieved; the design has failed. As a strategy for improving clarity, Tufte (1990) also suggests adding detail to illuminate data. Here, the designer is placed as master-in-command of information, using *complexity* to gain clarity and in so doing, asserting a position that is essentially subjective. The designer's decision-making—how much, or what data to add, and the interrelationship of elements—is based on subjective judgement and experience. In the manner of Modernism, it seeks the "internal system logic[11]" of the display.

Per Mollerup (2009) offers a slightly more outward-looking frame of reference for simplicity. The theory of functional simplicity in information design "is concerned with improving usability and utility of information and… means more understanding with less reading" (para. 3). Like Tufte's additive approach to a display, functional simplicity does not ascribe to a visually spare and "minimalist" model for information design. Instead, it puts forward a model based on a measured balance of redundancy and data-carrying elements that varies and structures data to retain visual interest, whilst retaining information necessary to communicate the message. By comparison, Tufte's *data-ink principle*, which suggests that all "ink" within a display should be used to call attention to variations in the data, does not clearly acknowledge the value of redundancy, that unneeded information which is purposefully repeated in the message to aid its understanding. It is Tufte's view that if a visual element is not data carrying, it is merely decorative clutter. In contrast, Ladislav Sutnar's and Knud Lönberg-Holm's design approach was premised on judicious use of redundant elements (refer Chapter 4.1.2, pages 33–34).

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[11] A term used in an undergraduate graphic design brief. The task was to design a data map to chart variables of a dynamic event. Use of this term suggests that there exists an essential, inherent structure within data and information.

Mollerup and Tufte are both concerned with aspects of simplicity and clarity, and they each use formal techniques of organising data for the purpose of gaining informational clarity. The differences may seem slight, but the consequences of each approach to clarity will affect how, and whether the information is understood. Mollerup focuses on usability and on the reader's comprehension of information while it is Tufte's view that as long as the visual elements are in the proper relationship, clarity is assured. However, they are similar in that each promulgates views that bring close attention to *the micro-aspects of information design*, striving for clarity solely through a harmonious balance of elements. Thus, the message content is abstracted from its actual use, its mode of viewing or context of interpretation.

It is perhaps simplistic to suggest that achieving clarity is just a matter of properly constructing and configuring the elements of a display so that optimum perception, efficiency, truthfulness and integrity are attained. If this were the case, then clarity would be an attribute of data, which it is not. There are powerful arguments being made that clarity is not immanent in information, even when an information display is designed effectively. Realising clarity facilitates the audience's reception of the information and their understanding of it, which calls for recognition of mediating factors (Sless, 2008). These include the purpose of the information, the situation of viewing the display, and the differing ways that individuals and groups interpret information and construct meaning (Kostelnick, 2008).

4.6.6 Context of clarity: Purpose

It is generally agreed then, that the *clear graphic* is designed to suit the purpose and context of the information and its audience. Recent arguments suggest that to achieve this, designers must understand the rhetorical basis for the information graphic they are designing and identify whether it is explanatory, exploratory, or aesthetic. The purpose of the graphic, the relative complexity of the concepts involved in presenting the data, and the capabilities of the audience to understand the graphic are implicating factors. The latter consideration acknowledges that individuals vary in their interpretative frameworks (Kostelnick, 2008). Holmes (Heller, 2006), a designer of explanatory graphics gives an example of this:

> … an editor of an academic or scientific journal sees something I've done and asks me to give a critique of the graphics in his publication. They are often dry and unintelligible to the average reader, but they are just right for the readers of the journal. But shouldn't they be more like an industry leader such as TIME? he might suggest.

He is mixing up who reads what and why. While I could perhaps explain the process in one of his diagrams to a lay reader in a clearer way, it is not appropriate for that readership, which often knows enough to allow any diagram to appear much too cryptic for a less knowledgeable reader. (p. 15)

By this approach, a graphic or chart in a technical manual may be clear to one audience, but to another audience it means little, since no matter how many graphical interventions are applied to make them clear, graphics are not universally understood. As Wurman (1989) suggests, "Information must be that which leads to understanding. What constitutes information to one person may be data to another." Scientific charts and graphics compel a close reading of the data—this is their intention, and a highly motivated reader will comply. A perceptually clear graphic in which the data requires micro-reading will be compromised by a lack of design detail, such as not enough contextual labeling or omission of grid lines. Conversely, a graphic whose aim is to scale complex numbers or ideas to suit a broader, less expert audience should deliver recognisable and memorable visual cues (Danziger, 2008). Danziger claims that if the intention is to design highly specialised graphics suitable for an uninformed audience, graphics will require, at the very least, an entry-point—"semantically meaningful 'ducks' [12]" (Danziger, 2008, p. 52) to attract them to the graphic and to hold their attention.

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Figure 29. Good Magazine / Open (2010). Transparency: Which countries are happiest? This employs effective use of "graphical ducks" to draw in the reader.

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[12] Here, Danziger refers to the much-maligned "graphical ducks" that populate graphics designed for public consumption—see Chapter 4.3.

4.6.7 Context of clarity: Situation

Another contextual issue that affects clarity is the situation of viewing, or experiencing the graphical information display. These variables include the physical location of the display, and in a general sense, the circumstances of time and of history (Kostelnick, 2008). The interpretation of a graphic—how it is read—depends on whether it is part of a projected display, a shared experience, where appreciation of detail is subsumed into the *performance* aspects, and where each viewer's varying perceptual abilities affect the clarity of viewing the projection; or whether it is viewed in print form, that is, intimate, personal, not directly performative (Kostelnick, 2008). One could argue that to disregard this means that the designer risks failing "to distinguish between the needs of the audience at an oral presentation and the needs of readers of printed documents" (Engelhardt, 2007, p. 191). Situational clarity also varies depending on whether the viewer's participation is required; for instance, interactive digital displays presume that viewers have a certain level of competency in the medium and demand that they take an active role in exploring the graphics. Interpretation is influenced by conditions relating to the precise time and place that situates the display (Kostelnick, 2008). For instance, our present-day interpretation of a war-related graphic from the 19th Century as shown in Figure 30 differs from that of a current war event as depicted in Figure 31. Kostelnick (2008) reminds us that we cannot interpret the Minard data map in anything other than from a retrospective position. Thus, conjectures might be made about its intention—that at the time of its construction it was "an anti-war poster" (Tufte, 2006, p. 134)—but we do not have the means to confirm this in the context of those times, or indeed, whether the emotional power of the graphic, *A Year in Iraq and Afghanistan* will be diminished years from now, when the event itself is consigned to history.

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Figure 30. Charles Minard (1861). Cartes Figurative des pertes successives en hommes de l'Armée Française dans la campagne de Russie 1812–1813.

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Figure 31. Alicia Cheng (2007). A Year in Iraq and Afghanistan.

4.6.8 Context of clarity: Interpretation

Many recent approaches to information design regard that cultural values and social interactions play a major part in communal (rather than individual) identification with graphics. Visual information displays do not just decorously "serve up" the information, conventions of an information display must be learned, and are consequently embedded within a culture. Some forms are adopted more easily into the mix of graphing styles because they allow better semantic mapping, that is, the way abstract data is mapped to visual elements, and are therefore efficient. An example frequently seen on the Internet is the *tag*, or *word cloud* shown in Figure 32, which takes advantage of a simple semantic mapping technique. Here, the quantity of the words appearing in the dataset is mapped to font sizes of the words that make up the display; it is this, along with the recognition of the name *cloud*, which makes this type of display intuitive and therefore more popular than complex, less intuitive forms (Danziger, 2008). Such forms and practices are continually negotiated, adapted, and refined as communication codes are shared. In this regard, clarity is seen as a factor of a community's sum experiences and influences (Kostelnick, 2008).

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Figure 32. TagCrowd (n.d.). Tag, or word cloud created on Web application called TagCrowd.

For those with postmodernist leanings, purportedly universal principles for practice based on eternal and innate laws are limited predictors of clarity in this regard, as they overlook everyday socio-cultural influences, mode of information display and purpose of the graphic. As Tufte (1983/2001) asks rhetorically, "...what is a poor designer to do? A different graphic for each perceiver in each context?" (p. 56). Obviously, there has never been, and will never be, a generalised solution that covers each and every situation. The designer must, it seems, at the very least ask who the display is for and what it must do. Perceptual, stylistic and structural principles may help achieve a degree of clarity, but in the end, principles form only part of the designer's toolkit.

4.7

Integrity

4.7.1 The importance of integrity

Thirty years before the design field was introduced to the concept of "chartjunk" and the "Lie Factor", an entertaining short book by Darrell Huff, *How to Lie with Statistics*[13] was published. In the introduction describing deceptive data, Huff (1973) uses the analogy of makeup's ability to mask facial wrinkles:

> Like the 'a little dash of powder, little pot of paint', statistics are making many an important fact 'look like what she ain't'. A well-wrapped statistic is better than Hitler's 'big lie'; it misleads, yet it cannot be pinned on you. (pp. 10–11)

Even before Huff wrote his popular book as a way to inform people of the statistical malpractice that flowed out of commerce, industry and public service activities in the mid-1950s, people have been associating graphical charts and diagrams with the word "lie" (Tufte, 1983/2001). A post-World War I advisor of corporations and government departments on effective information management, Willard C. Brinton also published literature as early as 1914, which aimed to reveal and explain malpractice in data displays (Brinton, 1939). That today's public remains highly critical of statistical displays is a measure of the widespread awareness of deceptive graphics, propagated by literature such as Tufte's books on information design. The close affiliation of science with analytical data where science strives for rigour and integrity, imbues graphical displays with a moral imperative to disclose the 'truth', and present rational, unadulterated data (Kostelnick, 2008). The propensity for visual displays of information to be misleading means that ethical concerns shadow the design of any information graphic, making data design "a moral act as well as an intellectual activity" (Tufte, 2006, p. 9)—thus misleading graphics are seen as a scourge to be eliminated. This chapter recognises that "graphical integrity" (Tufte, 1983/2001, p. 53) is an essential consideration in information graphic design, and examines the strategies that ethical design places on the formalist design approach.

Lying graphics are variously claimed to be a result of unscrupulous commissioners, personal bias, disregard for numbers, and ignorance of the graphical skills needed to produce "truthful" graphics. (Huff, 1973). While deliberate

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[13] While *How to Lie With Statistics* (Darrell Huff, originally published 1954) is not mentioned in any of Edward Tufte's texts, many of the key principles in his theory of graphical integrity are the same as those in Huff's book.

corruptions are few and far between, and partisan displays are inevitable due to the fact that organisation of data is subjective, designers can demonstrate lack of regard for the content of the graphics they conceive and for their audience. Tufte (1983/2001) observes that many place artistic skills ahead of statistical or quantitative skill when designing data graphics Tufte (1983/2001) in particular takes a strong position on graphical integrity, attacking designers' tendency to assume a lack of viewer sophistication. He rails against the dumbing down of some mainstream graphical presentations, where audiences are assumed to be ignorant and uninterested in the substance of graphics; consequently much graphical information is oversimplified intellectually and jazzed up visually.

When we say that a verbal or written statement is not telling the truth, it is the words and phrases that are scrutinised, as we look for "signs" of their mendacity in relation to the meaning the statement purports to convey. Similarly, the established view is that in order to improve graphical integrity, attention must be focused around the elements of the data display, seeking to configure data, as well as non-data elements into a form that does not misrepresent the "story" told by data. Certain graphical distortions are repeatedly executed; it is these that form the basis for principles of graphical integrity, and include common sense guidelines based on Tufte's "Lie Factor" such as avoiding omission and dequantification. It is not the purpose of this thesis to enumerate and explain these individually[14], however one example in particular, "chartjunk" (Tufte, 1989/2001, p. 107) will be discussed and critiqued in some detail, as it represents a common design trope that, I will argue, eludes a firm and stable ground for definition, and therefore, compromises the dictum that it must be avoided.

4.7.2 The relation of "chartjunk" and integrity

To preface his discussion on graphical practices that he claims degrade and trivialise the content and credibility of data presentation, Tufte (1983/2001) states:

> The interior decoration of graphics generates a lot of ink that does not tell the viewer anything new. The purpose of decoration varies—to make the graphic appear more scientific and precise, to enliven the display, to give the designer an opportunity to exercise artistic skills. Regardless of its cause, it is all non-data ink or redundant data-ink, and it is often chartjunk. (p.107)

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[14] See Tufte, 2001 (original work published 1983) p. 77 and Huff, 1973 (original work published 1954), pp. 49–51, pp. 61–65.

Chartjunk, first coined by Tufte in his before mentioned text, is a term used widely both within and outside the graphing community. It has become a catchword for any element, or entire graphic that is deemed to be purely decorative, entertaining, and content-free. It entails that the use of data-ink ("ink" is used metaphorically if the graphic is not print-based) on a graphic should be maximised for the data-carrying elements, thereby minimising its "meaningless" application to non-data constituents. Chartjunk can be as seemingly innocuous as extra grid lines on a chart, and complex shading effects; or as blatant as the "graphical duck" in Figure 33. It has been proliferated in business communications, in education, and in popular media.

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Figure 33. Condom prices around the world.

Tufte asserts that chartjunk compromises graphical integrity because data is overpowered by styling, where the form usurps the content, thus hindering viewers' ability to comprehend the data. It is not only unethical, he suggests, but it is contemptuous and insults the audience's intelligence. He provides no evidence for his claims that chartjunk interferes with understanding, but this has not deterred designers and visualisation aficionados from embracing the concept of chartjunk, providing them with a qualifier for critiquing any information graphic, regardless of its intended context of use. For example, the web log *Junk Charts* is dedicated to analysing and critiquing graphics that are deemed to obscure information.

The identification of chartjunk has raised awareness of graphical integrity and affirms the unethicality of undermining the data's accuracy—a positive outcome. As an ethical concern, there is no grey area—"a deceptive communication, regardless of motive or utilitarian justification, is unethical and should have no place in acceptable technical communication" (Herrington, 1995). What is called into question however is where the parameters of deception should be drawn—which part of the graphic is deceptive? Is it deceptive, or merely engaging? And for whom is it deceptive—is this universal? Indiscriminate and uncritical use of such criteria as

an evaluative measure of graphical integrity ignores an appreciation of how a given graphic would be read by its intended audience, and is therefore limiting in practice.

A key argument then could be that design embellishment of graphics is unsuitable for certain rhetorical situations; for example, in serious technical or academic communication. These would not benefit from an engaging or humanistic approach, since this is not what the audience expects, and it is not demanded by the subject matter. Such a contention is refuted, however, by Dragga and Voss (2001), who argue that when the objective of designing with integrity focuses solely on avoiding "graphic lies" through techniques of abstraction and simplification of data (that is, deploying standardised graphical forms, rather than using descriptive and pictorial visuals), the emotion of the event represented in the graphic is ignored, and that this aspect is unethical. The authors posit that a "cruel graphic... grimly tabulates" (Dragga & Voss, 2001, p. 269) data in a depersonalised and inhumane manner, so that statistics that tally fatalities, for example are just that— mere statistics—devoid of emotion, and divorced from their human dimension. To humanise graphical displays, the authors recommend an extremely literal solution; that is, including pictures, photographs and icons embedded in a display to literally show what happened and to emphasise that real people were involved. An example of their redesign of Minard's data map is shown in Figure 35. Despite their exhortation to consider the rhetorical situation and exercise careful judgement about the appropriateness of such humanising additions to graphics, their extreme premise appears caricatured and trivialising. Holmes, in his efforts to add interest and liveliness to time magazine graphics inadvertently caused offence by his use of a stereotyped depiction of a hostile Arab; which, by being so provocative, drew all attention away from the data being presented (Lupton & Miller, 1996c). Even if the non-expert audience is catered to, it is these errors in judgement; the lack of understanding of design's rhetorical implications that debases any positive communication potential of emotional, or aesthetic design of information graphics.

Notwithstanding the deleterious effects of misuse, aspects of aesthetic, or affective design draw readers in to the graphic in public-facing applications. Nigel Holmes (Heller, 2006) clarifies the affective role played by his metaphorical, highly pictorial, and distinctively humorous news graphics:

> ...TIME magazine charts were aimed at lay readers, not unintelligent ones, but busy ones. I knew they'd get the point quicker if they were somehow attracted to the graphic... I never saw it as 'dressing up' the numbers (as though they were too boring by themselves), I was simply trying to get people to look at them all. (pp. 76–77)

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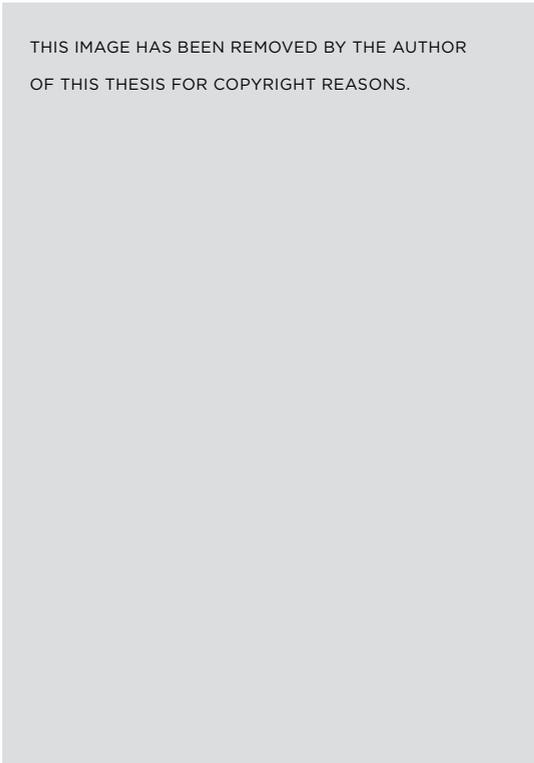
Figure 34. Useless chartjunk to attract readers. (2005). Screen snapshot from Photostream site.

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Figure 35. Sam Dragga & Dan Voss (2001). Pictographic version of Charles Minard's depictions of Napoleon's casualties.

That data is claimed to be interesting in itself—that "the wonder of the data" (Tufte, 1983/2001, p. 121) will capture viewers' attention so that even aesthetically bland displays will inspire extended scrutiny—might hold for viewers of analytical or statistical graphics, but it could be argued that this is not the case for all audiences, such as the mainstream, "Joe Public" audience. Even the most powerful data is useless if people are not drawn to it, and instead overlook it altogether. As Neurath (1925) asserts: "to remember simplified pictures is better than to forget accurate figures" (as cited in MacDonald-Ross, 1977, p. 385). It could be argued that bland graphics, which do not attract attention to important issues, are indeed unethical in their passivity. Holmes (Heller, 2006, p. 106) remarks, "Why do they [Holmes's detractors] think sterility is better than feeling in information graphics? Is it because they define 'information' as being the perfectly honest truth?" This "sterility" incorporates the values of formalist approaches, but it comes with inherent contradictions. Avoiding chartjunk is at odds with the advice, "to clarify, add detail" (Tufte, 1990, p. 37). To follow both edicts, designers must discern which details are chartjunk and which are clarifying, and for which audience this applies—a challenging, and all too often impossible task (Kimball, 2006).

It is difficult then to determine precisely how to qualify graphical integrity within a set of formal guidelines. Prescriptive approaches such as Tufte's, which are based on showing examples of good and bad practice, are inflexible; they seem easy to apply, but include criteria that are not applicable in all situations. They tie graphical integrity to the fixtures of the display, rather than aligning it with the broader context of interpretation. As long as facts are presented truthfully and objectively, it is suggested, the graphic will accordingly be truthful. However, when the potential for bias actually commences *at the point of data selection*, objectivity is unattainable. Holmes (Heller, 2006, p. 24) asserts, "Everything is selection. Not just because there is room for only so much, but, more importantly, because a point has to be made". The designer thus has control of what is and is not presented; inclusion and exclusion is never apolitical and can challenge ethicality. To not include a specific minority, or indigenous demographic within a graphic visualisation of social data, for example, tells as much about the politics of the issue and the moral values of the commissioning body as it does about the specifics of the data (Kostelnick, 2004).

Formal constituents of a graphic—its visual elements—can also impart specific biases. Placement of text and its alignment, choice of typeface, size and style (bold or italic, all upper case or a combination of upper and lower case), even use of colour and white space affects readers' understanding of the graphic. Larger, or bolder elements demand more attention; this expresses greater importance,

as does white space used to isolate an element (Herrington, 1995). Visual communication is built "on the basis of more or less conventionalised signs belonging to many kinds of codes of disparate languages" (Ehses, 1984, p. 192). For designers, these socially determined languages are instrumental in determining efficacy of the graphic's intended communication.

Kremers notes that graphical integrity should be considered as a process, instead of an outcome (Kremers, 1989). What this means for designers is an active engagement in ethical reasoning relating to personal, as well as shared values. This approach promotes an awareness that all data and non-data elements of a graphic are to some degree biased or influential, and that the process of graphical integrity starts when designers make choices about which data to include. It also suggests, claims Kimball (2006, p. 379) that "using information graphics ethically and well will require acknowledging their limits and our own."

4.8

Focus on neutrality

In typography and graphic design, Louis Sullivan's "form follows function" and famously, Modernist architect, Mies van der Rohe's contention that "Less is More" mandates severe reduction of visual form, a stripping back of ornamental flourishes and overt structural features. The formalist approach to information design has inherited elements of this abstracting tendency. Tufte contends (1990):

> By giving the focus over to data rather than data-containers, these design strategies are transparent and self-effacing in character. Designs so good they are invisible. Too many data presentations, alas, seek to attract and divert attention by means of display apparatus and ornament. (p. 33)

References to notions like *invisible* and *container* accord with *The Crystal Goblet* ideals of Beatrice Warde, a key commentator on typography in the Modernist movement. She argues that good typography should be a transparent vessel for textual content, with the design rendered invisible and free from any decorative elements so that the meaning of the text, that "beautiful thing" (Warde, 1955) is revealed to the reader. The significance of this viewpoint for visual information displays is that a data-container is perceived to be separate from data. In fact, even suggesting that a data carrier exists implies that data is separate from the data container. Kinross, however, notes that this not only elevates the importance of data, but also that it wrongly implies that the non-data elements are valueless and carry no meaning (Kinross, 1991).

Warde's transparency corresponds with the concept of neutrality in information design. Neutrality here is idealistic; it is a quest for homogeneity of formal expression and a filtering out of subjectivity. As noted, however, many argue that it is not possible to ascribe neutrality to the most prosaic elements in a visual information display. Elements including framing and navigational devices, such as type, symbols, arrows, boxes and rules actively make meaning beyond their obvious navigational qualities. A simple diagram using text combined with arrows such as Figure 25 on page 46 "...conveys a strong sense of 'impacting' or 'targeting', which is quite absent in the verbal translations which come most immediately to mind" (Kress & van Leeuwen, 2006, p. 66). The transaction between elements suggests the action of "doing something to"—an emphatic action which can work rhetorically to draw attention and to persuade (Kostelnick, 2004).

Drucker (2008) claims that "graphic devices constitute their own order of meaning-producing elements. Their syntactic and semantic qualities enact a powerful rhetoric of inter-textual connections and structures... they are frequently integral and substantive aspects of meaning" (p. 125). The communicated message does not live outside of the apparently incidental structures in a diagram, which depends on them for narrative and for the expression of argument. These devices work not only on a functional level to guide, to point to causal relationships, and to highlight information; their arrangement and presence is inherently rhetorical. Kress and van Leeuwen (2006) make this point clear in their analysis of diagrammatic narrative:

> Variants of the arrow may affect the meaning of the process in narrative diagrams. A curved arrow, for instance, partakes of the symbolic value of the circle, so that the process is represented as 'natural' and 'organic'. (p. 71)

Panels and gutters in traditional multi-frame comics provide a rhythm of time- and space-based story fragments for which viewers provide the *closure*, enabling them to mentally compose the contents of individual panels into a unified idea (McCloud, 1993). This phenomenon in comics relies on the apparently invisible device of space to interpolate meaning between frames.

Formalist or not, the overwhelming expectation and assumption is that information designers retain neutrality and objectivity in their work. On this issue, Nigel Holmes (Heller, 2006), a specialist in the design of explanatory graphics contends: "I have never felt truly able to be impartial or even-handed. There's usually some angle or message to my work, and this can lead to disagreements

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Figure 36. Scott McCloud (1993). Panels from comic narrative.

with clients nowadays" (p. 26). While some might dismiss this attitude as self-indul-gent, it brings to the fore the reality of the designer's involvement in shaping data into meaningful information. "There is no such thing as 'facts displayed', pure and simple" (MacDonald-Ross, 1977, p. 360); like a copy editor, the designer decides which data should or should not be included (Heller, 2006). In the process of orga-nising and designing information, subjective editing will affect the data's ultimate meaning and thus eliminate any possibility of neutral information display. Sless (1997) puts this into context:

> All information activities take place within a political environment, by which
> we mean that there are always particular organisational or personal interests at
> work in information activity. There are no disinterested players; even information
> designers see information design and its use from a particular point of view. (p. 3)

Information visualisation (infovis) used in the presentation of statistical data is commonly depicted as "neutral" tables, graphs and charts, or similar. In 1973, Herman Chernoff introduced an alternative visualisation form for large tables of plots of variable data which are often plotted into abstract graphical visualisa-tions, such as the star glyphs in Figure 37. *Chernoff faces* (see following page) condense complex datasets into a recognisable form that viewers find less tedious to look at, thus improving their data comprehension. The purpose of *Chernoff faces* is to show trends in data by pointing out regularities and irregularities through mapping datapoints onto a single object. In this way, viewers process the variables in parallel. allowing them to make comparisons. Chernoff claimed that up to 18 datapoints could be mapped using this method (Morris, Ebert, & Rheingans, 1999).

Figure 37. Star glyphs.

Figure 39. Eugene Turner (1977). Life in Los Angeles, 1970.

Figure 38. Colin Ware (2000). Chernoff faces.

Chernoff faces are used primarily in analytical data visualisation, although a modified version was employed by cartographer Eugene Turner for depicting social data in his 1979 data map, *Life in Los Angeles, 1970*. In this map, shown in Figure 39, data variables concerning affluence, unemployment rate, urban stresses, and percentage of white population are mapped respectively to the face shape, mouth shape, eyebrow slope, and face colour (Zhou & Spinelli, 2004). While it was lauded for successfully communicating to the public the living conditions of Los

Figure 40. Otto Neurath (1939). Profile of family income in Columbia, South Carolina, 1933.

Angeles, Turner's map was also met with criticism, as he notes: "Probably one of the most interesting maps I've created because the expressions evoke an emotional association with the data. Some people don't like that" (Turner, n.d.). The accuracy of Turner's visualisation technique is not questioned, and it is uncertain whether or not he intended the data plot to make an underlying socio-political statement. But by marking out the *dark* faces as visibly unhappy and even surly compared with the relatively happy *white* faces, the display's apparent neutrality is dispelled by a complex and politically charged underlying message about race and lifestyles in 1970s Los Angeles.

By comparison, Neurath's 1939 chart *Modern Man in the Making* in Figure 40, which also deals with social data (mapping income to populations of *white* and *Negro*) deliberately sets out to eliminate any overt social judgment by the use of highly abstract symbols of Isotype. The symbols *appear* neutral, for it was Neurath's intention that the international picture language might be universal, objective, and purely denotative.

Kinross argues that even the most generic informational artifacts are in some sense, persuasive, thus blurring distinctions of what we qualify as "design for information" or "design for persuasion" (Kinross, 1989, p. 134). Since their inception in mid-Nineteeth Century Europe, train timetables, which were supposedly neutral, " ...performed 'a rhetorical maneuver, in the sense of a set of rules for

making information eloquent'—a means of persuading people of the ordered nature of railway travel; controlled, dependable, knowable in advance" (Esbester, 2009, p. 103). In this way, suggests Kinross, organisations that produce the train timetables are trying to say something about their service to convince transport users of the trains' efficiency. The reality of the timetables' rules was that they were (and in some cases continue to be) confusing and hard to follow. In Nineteeth Century Britain this generated a bias towards men as prime users of the information; males were logical and rational, so regardless of the timetables' design flaws, men would innately possess the ability to know how to read them. Far from being neutral presentations of transport information, it is possible that train timetables perpetuated gender stereotypes of the period (Esbester, 2009).

The cultural associations of efficiency, internationality, public or private, inclusion or exclusion— as evoked through the design of apparently *neutral* visual information—all stand as rhetoric in their own right. It is socially constructed neutrality; one overlain with implicit politics and power relationships, where everything is influenced by something and everything influences something. It can be seen as "the rhetoric of neutrality" (Kinross, 1989, p. 131) that cracks the transparent *crystal goblet*.

The following chapter elucidates in detail an approach which is more audience-centred and which rejects emphasis on uni-directional communication and the privileged position of the *expert*.

5.0

The dialogical approach

5.1

Rhetoric and communication design

A number of theorists have discussed and debated the relative merits of approaches to information design. They aim to construct a framework for relevant and responsive ways of designing; approaches that might underpin the design process, and that would be independent of the medium used for display, yet still sensitive to it, and to the needs of the information. This quest is the field's claim to "conceptualise information design so that it can be improved upon by future generations of practitioners" (Jacobson, 1999). Paramount to this formulation is that theory is not detached from practice. Therefore, as Kinross (2005) observes, any undergirding approach must see information design theory and practice drawn together into a meaningful whole:

> I remember alighting on the idea of rhetoric as a true theoretical practice, and a way out of what I still think of as the cul-de-sac of semiotics and semiotically-inspired theories—which may tell you how to read, but have no way of guiding action or production. As an idea, certainly, rhetoric is attractive: an art of making public statements, an art of reasoning, of conducting civilized discourse. (p. 213)

Rhetoric is an ancient Western theory of language, invented by the Greeks about 2500 years ago (Ehses & Lupton, 1988). It is "both the practice of persuasive communication and a formal art of studying such communication" (Buchanan, 1985, p. 6). Although it originated from the oral tradition of communication, the study and deployment of rhetoric is foundational in written discourse and more recently has expanded to include visual rhetoric. Here, it may be understood as both the byproduct of the deployment of visual artifacts or symbols to communicate (the image generating its own visual rhetoric), and also as a mode of inquiry; a way to critically understand the communicative effect of the visual artifact under study (Foss, 2004). In the past, rhetoric has been relegated to the status of ornament or pure aesthetic and contrasted with logical, rational thought and action, although academic interest was reinstated in the mid-Twentieth Century as discourse turned away from scientific objectivity (Nöth, 1990). Whether visual or verbal, rhetoric is not a fixed set of rules but is dynamic and open, and is directed though actual language use. Where grammatical theories place communication as a *transferral* or *transmission* process of ideas and information from the interlocutor

to their audience, those of a rhetorical nature develop arguments that identify with an audience and persuade them to accept a particular belief or take action (Buchanan, 1985). Thus, as Buchanan (1985) suggests, rhetoric is socially and communally motivated; it is "the art of shaping society" (p. 6), closely identifying with audience as "a social process of creating the world" (Pearce, 1995).

Tyler (1995) puts forward a compelling argument for the rhetorical approach in order to align design communication with users and audiences; one which is particularly suited to discussions of theory in information design. She outlines four distinct viewpoints regarding the way designers communicate visual messages. The first view positions the audience as spectator, standing outside the process and receiving the expressions of communication design impassively, where the subject and mode of communication has little connection with the audience. This decidedly parallels what is described in this study as a *formalist* approach. The second aligns with a grammatical approach, where the designer uses formal visual and linguistic tropes to construct messages for the audience to decode. Third, she offers a semiotic view, where the designer and audience share an understanding of common codes and the audience reads their interpretation of signs presented to them through the designed artifact. Last is the rhetorical view of communication. Here, the audience is a dynamic participant in the communication dialogue, and the designer creates visual arguments designed to accord with the audience's values and social beliefs.

5.2

Visual rhetoric and information design

This social aspect and the explicit focus on audience highlights the usefulness of a rhetorical approach in formulating a guide to practice in information design. Rhetoric filters through all levels—conception, process, and reception of information. Fundamentally, all communication is the effect of, and itself affects, persuasive techniques. Persuasion is not, as is commonly thought, purely the domain of advertising and promotion:

> There is no such a thing as pure information; every communication, verbal or visual, is always tainted by an agenda. And as soon as this agenda helps to define the shape of the content, the rhetorical process leaks into the design... it suggests a degree of authorship, bearing responsibilities extending beyond its professional sphere. (de Almeida, 2009, p. 188)

For information design, this notion of authorship holds that the initial stages within the process of designing information—scoping, data collection and analysis, visualisation, and prototyping, for example can be considered rhetorical, in that each stage can be regarded as an "ill-formed argument" (Poggenpohl, 1998, as cited in de Almeida, 2009, p. 189) in the decision-making process. It is an inclusive and dialogical process as seen in Figure 41, and involves what Frascara (1988) describes as an approach that:

> ... shifts the designer's center of attention from the interrelation of visual components to that between the audience and the design, recognizing the receiver as active participant in the construction of the message. (p. 29)

SURVEY Questionnaires, interviews, semantic tests	DETERMINE USERS' PHYSICAL LIMITATIONS AND SPECIAL NEEDS			
BEHAVIOURAL Observe, record or film designs in use	RECORD USERS PERFORMING TASKS IN ENVIRONMENT	RECORD USERS PERFORMING TASKS WITH INITIAL DIRECTIONS	RECORD USERS PERFORMING TASKS WITH REFINED DIRECTIONS	RECORD USERS PERFORMING TASKS WITH FINAL INFORMATION
PARTICIPATORY Direct user input to design of communication		ALLOW USERS TO REORGANISE CONTENT AS NEEDED	SOLICIT USER VIEWS FOR REFINEMENT OF VISUAL ELEMENTS	

Figure 41. Paul Nini (2006). Task-oriented information design—user research plan.

Classical rhetoric is concerned with three means of persuasion: instructing or educating an audience, winning it over (changing beliefs and inciting action in the process) and moving it emotionally (Ehses, 1984). The audience—depending on the success of the information design artifact in capturing their attention and engaging with their communal beliefs—will be an active participant in meaning making. This approach is established in user-centred and participatory design, as suggested by Forlizzi & Lebbon (2002):

> User-centered methods allow communication designers to create the opportunity for a shared dialogue with their viewers, and more important, to create the opportunity for behavioral and social change. When designer and viewer are actively involved in a shared dialogue, both become active participants in the creation and interpretation of the visual message. (pp. 3–4)

Visual rhetoric is harnessed to enforce and extend the rhetoric of specific communities. One influence of the formalist approach is science, and it is through

science that the rhetoric of scientific graphics operates, synchronously reinforcing the values of the fields of science and scientific data displays. The scientific data display also upholds the mantel of exclusivity and expertise worn by scientists, as evidenced in an article from the science journal *Nature* entitled *Science in Culture: The Medium is the Message*. The author, Martin Kemp (2006) states:

> A graph is not only a crucial tool in plotting data within parameters that are taken as significant, but is also an integral part of the style of a presentation... It serves the rhetoric of irrefutable precision that operates whenever we aspire to proceed in a 'scientific' manner. (p. 140)

Here, the "we" is the scientific community, and the style he refers to is the lean and reductive, objectively neutral aesthetic that resides at the other end of the affective scale from the *friendly graphic*. Particularly compared with the graphics generated from quotidian presentation software, expertly designed data graphics uphold "the poetry of information" (Tufte, 1997, p. 103), possessing an elegant simplicity that is held as beautiful. Since, as the poet Keats reminds us in his 1820 poem *Ode on a Grecian Urn*: "Beauty is truth, truth beauty" (Keats, 1975), the "truthfulness" of the analytical hypotheses represented in the graphic is verified. In the context of a scientific display intended for an audience that has a vested interest in them, the Spartan and refined aesthetic is appropriate. The point here is that *scientificising* the display furthers the rhetoric of objective and rational science in a way that the *friendly* graphic could not. The assumed neutrality of analytical graphics gives way to the "rhetoric of irrefutable precision", a rhetoric that serves a dual purpose. Firstly, it boosts the credibility of science as a discipline of exactitude and integrity; secondly, it enhances the ethos of the graphic itself by its association with science (Kostelnick, 2008).

Brasseur (1998) praises Tufte's informative examination of John Snow's 1854 data map that depicts cholera transmission in an area of central London, but at the same time denounces Tufte's reductive weekly time-series chart tracking the deaths from cholera over the time of the epidemic (Figure 42) as "an approach to information design that has been praised for its beauty, but also criticised for its lack of context and its limited actual use" (Brasseur, 1998, p. 342). Tufte (1997) then redesigns Snow's cause-and-effect data to produce a graphic (shown in Figure 43) that Tufte (1997) terms "pop journalism... complete with celebrity factoids, over-compressed data, and the isotype styling of those little coffins" (p. 37). Of course, this "styling" would, in practice, be entirely suitable if this graphic was to actually appear in popular media. It would in then complement its real-world use

and audience. The arguments noted here suggest that the visual effect Tufte favours is no more correct than tho one used in the popular media chart. It fits the rhetoric of science, but this does not make it inherently more effective in all communication situations and with all audiences.

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Figure 42. Edward Tufte (1997). Weekly aggregation of deaths from cholera in August and September, 1854 from the cholera epidemic of London (Version 1).

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Figure 43. Edward Tufte (1997). Weekly aggregation of deaths from cholera in August and September, 1854 from the cholera epidemic of London (Version 2).

On a contextual level, the substance and situation of the information design artifact can also be seen as rhetorical. Kinross (1989) observes that the viewer of the designed artifact has a *sense* of its circumstances (of use and social milieu). For example in Figure 44 on page 82 the colours, typography, and use of American mid-west visual vernacular acknowledges the subject's regional and historical origins, and well as the low-tech craft aspects of making a guitar by hand. This is an outcome of the rhetorical strategies employed in the design. Successfully situating the design depends on the shared understanding between designer and

audience—aptly termed by Kinross as "the data of cultural reference" (Kinross, 1989, p. 135), whereby modes of communication and their features are particularised within both the history of public communication employed in a society and the way it is used and valued in that society (Kress & van Leeuwen, 2006).

Figure 44. Meagan Bach (2010). Make a true folk guitar. Information design of instructions.

Consequently, because as Kinross asserts, "nothing can be free of rhetoric", the information designer is powerless to choose whether or not they reference meta-beliefs or meta-values. They may only choose *which of these* they reference—and in so doing, can alter or effect existing beliefs held by the audience (Tyler, 1995). This highlights the ethical importance of information designers' understanding the socio-cultural beliefs and values held by their audience; a matter discussed further in Chapter 6.

5.3
Dialogical approach: discussion of examples

Visual rhetoric is an intensely social process that entails convention building within discourse communities and a process of enculturation that fosters visual literacy among group members. Information design also embodies the shared cultural knowledge—values, ideologies and aesthetic tastes—of its designers and readers at a given historical moment. (Kostelnick, 2004, p. 239).

Rhetoric permeates all communication, and it is a force for "changing the course of individuals and communities and setting patterns for new action" (Buchanan, 1985, p. 6). This is an accretive activity—one that fails if the dialogue between designer and audience is fraught with assumptions and misunderstandings. Since visual rhetoric is socially mediated, it is seen to operate within specific discourse communities to:

a. inspire action for social change, and;
b. advance the conception and literacy of particular graphic conventions and enculturate them within a given group and historical circumstance.

This section details four examples of information design where visual rhetoric is not only a persuasive and advocacy strategy, but also can effect, or suggest formal developments in genres used to communicate information. The last two examples are contemporary, examining the development of a pictographic information system for use in hospitals. The first two examples of information graphics in the following discussion were developed in England during at least part of the "Golden Age of data graphics" (Friendly & Denis, 2009, p. 20), spanning the period 1850 to 1899.

In Europe, this "Golden Age" delivered some outstanding data graphics (Friendly, 2009), also known as "data maps" (Tufte, 1983/2001, p. 20). Kimball (Kimball, 2006) suggests that many examples of information graphics from

the period were not only graphically innovative, but were socially progressive forms of advocacy and public policy. Graphical innovation arose not only from the recording of scientific endeavours but also through the need to organise and communicate social data; with European government initiatives promoting wider use of statistical information for social planning, industry and public utilities like transport (Friendly & Denis, 2009). They reflect the mid-Seventeenth Century European interest in social data—"political arithmetic" (Friendly & Denis, 2009, p. 20), which drove innovations towards graphical ways to represent data. This point in time marked the start of a theory of statistics and although later proponents of graphical forms such as J.H. Lambert and William Playfair invented "modern graphical designs" (Tufte, 1983/2001, p. 32) and are thus seen as pioneers in the wider field of data visualisation, this chapter deals with the social and rhetorical aspects of information graphics' meaning making, so an historical taxonomy of information graphics is not of prime concern.

Particular information graphics of the era were instrumental in delivering narratives of social progress or reform. In the nature of their communication they were prescriptive and action-oriented, and the evidence-based stories they told were intended to appeal to specific audiences. John Snow's 1854 cholera maps of London and Charles Joseph Minard's 1861 figurative map of the ill-fated march of Napoleon's army in Russia 1812–1813 are some examples of graphical visualisations of "quantitative evidence" (Tufte, 1997, p. 27) from this period. These have been thoroughly documented; their content dissected and brought to the attention of the information design field through the work of Edward Tufte. The omission of these information graphics from this study is intentional. Although they both constitute visual stories of credible evidence, their purpose is not judged to be explicitly rhetorical and they were not designed to appeal to a resistant audience (Brasseur, 2005). The following examples have been chosen specifically for their use of discernable rhetorical devices as purposeful means of persuasion, and can be seen as reinforcing particular ideologies in a way that simultaneously mirrors and impacts upon the culture of the times.

5.3.1 Florence Nightingale's "rose" diagrams: Visualising for advocacy and social action

The Nineteenth Century British nurse, Florence Nightingale, known for her unflagging administrative and hospital care for soldiers on the front of the Crimean War was a campaigner for "the common soldier" (Brasseur, 2005). She challenged pervasive attitudes towards British soldiers as disreputable (Grint, 2000) and was an early advocate for the use of evidence-based statistics in visuals argument for

reform/policy change. Following her service as director of nurses on the Crimean War front Nightingale was commissioned to a write a report to the Royal Commission on the Health of the Army (Short, 2008). Her well-researched and compelling report described the alarmingly high mortality she witnessed in the Crimean War's field hospitals. The soldiers' fatal diseases were a direct result of neglect and unsanitary conditions while being treated for injuries in the military hospital and thus in her opinion, they were completely preventable. More soldiers were dying from typhus, cholera, and dysentery than from battle-related wounds (Short, 2008). Nightingale's written recommendations for implementing reforms were ignored and field hospital doctors contested the data. She then resolved to persuade the government of the data's accuracy by graphic means, where the key mortality figures from the original tables were translated into abstract, yet coherent diagrams that she perceived as being more meaningful and convincing to her diverse audience than tabular data. Her 1858 series of three statistical diagrams, now known variously as "rose", "coxcomb", or "polar area" diagrams were included in an annex to the written report (Brasseur, 2005).

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Figure 45. Florence Nightingale (1858). Diagram of the causes of mortality in the army in the east.

For each of the three diagrams, the data is plotted over twelve months in consistent 30-degree wedges (Short, 2008). Within a given month's wedge, blue represents death by preventable disease, red is deaths caused by injury and black stands for death from all other causes. Brasseur (2005) observed in the second diagram: "Nightingale arranged these colored areas so that the main cause of death (and the largest sections)—deaths by disease—would be at the end of the wedges and

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would be more easily noticed." (p. 172). This example of visual salience uses the rhetorical device of *visual weight* to place focal emphasis on that point of the diagram (Kress & van Leeuwen, 2006). It punctuates the argument by highlighting preventable disease as the major cause of deaths and legitimises concerns about the way the authorities cared for infirmed soldiers in warfront military hospitals. Brasseur (2005) argues that a pie or bar chart would not allow for this kind of persuasive tactic, nor could it display simultaneously the complex degree of multivariate data, including mortality over time and comparative data in narrative form.

In examining the provenance of Nightingale's rose diagrams Brasseur (2005) claims that previous chronicles of the rose diagrams focus on the first diagram only; and that by tracing the development of all three in the series Nightingale's explicitly rhetorical and narrative approach is revealed. The first diagram sets the stage of the argument, showing the extent of mortality in the Crimean War hospitals over 1855–56 and comparing this to data for mortality in the city of Manchester, known for its harsh living conditions, overall poverty and short life expectancy. This allowed graphic comparisons to be made between the number of hospital deaths in Crimea and Manchester's well-known high mortality rate. The second diagram reviews the cause of the deaths in the Crimean war hospitals by visually stating a clear breakdown of comparative causes of death while the third, comparing the mortality rates of military hospitals on the Crimean front with the rates of one in London once healthcare reforms were made, suggests a solution to the problems articulated in the first two diagrams. This "space-time-story graphic" (Tufte , 1983/2001, p. 43) is a *chapter* within the overall visual narrative where statistical information is linked to time, month by month over two years.

Nightingale's rose diagrams and accompanying explanatory texts are what Few (Few, 2009) terms "statistical narrative", a way of "telling the stories that reside within quantitative information" (p. 1). While it is not clear how stories "reside" in the data, given that raw data itself is not inherently meaningful until translated and given visual form, statistical narrative itself (the graphic) indeed has "a story to tell about the data'" (Tufte, 1997, p. 177). For the rose diagrams invented by Florence Nightingale, meaning making involved numerical comparisons that gave context and relevance to the information and enabled the audience to make conclusions and act upon them (Few, 2009). The rose diagrams' convincing story of causality lent considerable impact to Nightingale's written report—government agreed to instigate her recommended reforms to sanitation and care of soldiers in British military hospitals on the Crimea and elsewhere (Brasseur, 2005). Nightingale's rose diagrams are now known as polar area diagrams, and remain as one of the standard techniques in statistical graphing.

5.3.2 Charles Booth's London poverty maps (1889–1902): Social mapping raises the curtain

The rose diagrams designed by Florence Nightingale were intended to highlight the crisis of warfront hospital conditions and appeal for reforms by heightening the tone, intensity and drama through the diagrams' visual rhetoric. The story the data told was incontrovertibly powerful; the intended audience could *see* the unexpectedly high death toll, compelling them to act to ameliorate conditions that caused so many preventable deaths. Over thirty years later, Charles Booth's London "poverty maps" paradoxically downplayed the Victorian age's emotive visual rhetoric of poverty to "make poverty seem a problem that could be addressed, rather than an insurmountable crisis" (Kimball, 2006, p. 353).

Frustrated by what he saw as an inaccurate picture of the scale and demographic of London's poverty Charles Booth, an influential and wealthy businessman carried out an extensive "social survey" (Kimball, 2006, p. 356) of every street in London to collect ethnographic data relating to social class and comparative earnings.

The "Inquiry" findings, published between 1889 and 1902 in a multi-volume series, the first of which was entitled *Labour and Life of the People* aimed to quantify as accurately as possible how many people lived in poverty and to qualify, through observation and analysis to what degree the relative impoverishment affected them. Booth found that while 30.7% of London's population lived in poverty (a higher amount than previously estimated), only a small number (0.9%, denoted as "Class A"), were deemed beyond hope of reform. While the comprehensiveness of the report and its conclusions were hailed by the public as astonishing, Kimball (2006) claims that it was the report's accompanying hand-tinted maps depicting the study's findings that were pivotal in changing public perceptions of poverty, since they proposed that extreme poverty was not as entrenched as assumed, and that it was a problem that might be overcome. The levels of deprivation or wealth in London's surveyed population were rated from A – H and each class correspondingly colour-coded. Once these codes were inscribed onto city maps, the social and economic position of each household in every street could be located (Kimball, 2006). Like the diagrams in Nightingale's report annex, Booth's maps visually supported the textual report through *showing* rather than *telling*. Unlike the rose diagrams, the visual rhetoric employed in the poverty maps was more closely bound to expectations of the audience (since poverty was an affecting subject of great public concern) and to the contingencies of their meaning making, "the physical, perceptual, and historical context in which the display is read" (Kostelnick, 2008).

Figure 46. Charles Booth (1889). Map of London's poverty (detail).

To assert the ways in which Victorian-era visual culture impacted upon public reception of Booth's maps, Kimball (2006) connects his analysis of the maps to London's preoccupation with poverty as one of the key social ills of late Nineteenth Century England. Rhetoric of obfuscating darkness, the "depths of despair" and misery was perpetuated through literature and public-facing illustrations, feeding a "monster" of discourse that blamed the poor—expressly their indolence—as the cause of their situation. Kimball (2006) suggests that prior to Booth's report, people were not able to see the problem clearly; thus a social reality was obscured. Booth endeavored to overturn this narrative, "to portray poverty simply and clearly" (p. 361). The maps were meant to represent the findings frankly, a "straightforward snapshot" of the problem (Kimball, 2006, p. 362). This focus on *clarity*, with its rational and structured presentation suggests that Booth chose to employ a visual language that invoked the "rhetoric of science" (Kostelnick, 2008, p. 116). Such scientific authority helped to validate the data and deliberately counter the chaotic visual narrative of darkness and disorder prevailing in the public perception of poverty.

Booth's judicious use of maps not only emphasised his objective, scientific bias; crucially they employed an informational genre that the public was accus-

tomed to, aiding their reception of the information. The poverty maps are *data maps*, explanatory rather than purely navigational. Tufte (1983/2001) claims that data maps allow for bird's-eye-views and detailed examinations of information, with the viewer switching between *macro-readings*, the perceptual overview and *micro-readings* of detail where "the pace of visualization is condensed, slowed, and personalized" (Tufte, 1990) p. 38. It is the latter, personalised reading that advanced the poverty maps' rhetoric. Kimball (2006) suggests that Booth verbally encouraged viewers' use of a magnifier to see the detail of the tinted houses. By identifying the social and economic position, viewers could mentally enter the homes colour-coded on the map, so that the representation of London was more than surface geography; it became "a cutaway diagram of its inhabitants" (Kimball, 2006, p. 362), amplifying its statistical narrative.

Although he presented a visualisation that was simple, organised and efficient, Booth was not relying solely on the scientific authority of cartographic displays. He rejected conventional monochromatic colour gradations predominant in data maps designed by his contemporaries in favour of colour scales that directly reflected the cheerful and vibrant palettes used in popular amateur watercolour paintings. Kimball (2006) asserts that Booth's extension of an existing visual culture is significant to the Victorian public's interpretation of the maps, convincing them of the veracity of the report. Colour itself is implicated in meaning making. In Kress and van Leeuwen (2006) colour as a semiotic resource provides two *affordances* (van Leeuwen, 2005) of meaning making potential: *distinctive features* such as value, tone, saturation, hue; and *association*, the source of the colour or "where we have seen it before" (Kress and van Leeuwen, 2006, p. 233). Thus, colour is tied to the socio-cultural values and experiences of the audience. Tufte (1983/2001) cautions against flamboyant use of colour, recommending the avoidance of colour use as a data key, since the viewer must figure out how the graphic works and mentally transpose verbal descriptors to make sense of it; for displays of complex information he suggests using greyscale shades. This concern for the perceptual aspect of graphics is valid and places high importance on viewer accessibility, but it also assumes unmediated, decontextualised interpretation by a universal viewer. Kimball (2006) believes that Booth's use of watercolour painting colour schemes to "invoke and extend an existing visual rhetoric in Victorian culture" (p. 366), lent as much to the credence of the maps as did the maps' scientific status and graphic novelty.

The intention behind Booth's design of the maps was to *raise the curtain* on the public's impression of a critical social issue, adding significant weight to his argument that London's poverty, although serious was not as grim as generally

thought. The ideology of Charles Booth's survey and maps is that of *transparency* and *truth*, although the "facts" presented in the poverty maps are filtered through Booth's own viewpoint and position in society and are therefore only *seemingly* transparent. While his main focus was on assessing social conditions, or as Tufte (1997) puts it, "to govern the cause so as to govern the effect" (p. 28), his suggested solutions for alleviating poverty (based around the supposition that Classes A and B were small enough to be gotten rid of) stimulated wide debate on the matter, eventually leading to the inception of Britain's welfare state (Fearon, 2009). It is the depth of Booth's visual argument and the extension of the existing visual narrative to convince a specific audience (Kimball, 2006) that is particularly notable.

5.3.3 Pictograms for communication in healthcare: Nursing support

The healthcare and pharmaceutical sector makes use of visual information for labeling and product information, treatment advice and public wayfinding. Information design for this sector is a specialist domain where user-centred and participatory design methods are key. One of the principle demands for this kind of information design is testing and compliance, along with the need to "provide evidence that the information is accessible and usable to an agreed high standard" (Sless, 2007a, para. 13).

The following discussion compares pictogram design used in two very different cultural contexts: a Japanese urban hospital, and Xhosa communities in rural South Africa. The responses to these issues rely on a user-centred design paradigm, emphasising people, their sociocultural practices and their environments; and participatory research and design methods (co-design); which "allow for a partnering with users to create communications that meet specific contexts" (Nini, 2006, p. 120). The following examples of rhetorical information design are marked out by their application of dialogical practices through connecting with social attitudes and key values.

The Ashikawa Red Cross Hospital in Hokkaido, Japan identified problems with miscommunication around patient care within wards. Lack of nursing staff meant that information relating to patient care and needs was not being accurately and efficiently related to staff working on the wards, and accidental mishandling of patients was increasingly common. To combat this, staff produced temporary pictograms that were placed by patients' beds and trialled. These were informally styled, resembling *clip art* computer-generated forms, but appeared to work as effective "cues on 'Dos' and 'Don'ts' and other optional characterisations of the patients' condition" (Schneider, 2009, p. 141). Following the success of this testing, in 2008 a system of pictograms was developed by a professional design body,

a system that would be tested and produced to ISO 9186 standards (Figure 47). Throughout the iterative development phases staff, patients, and patients' families were consulted; part of an inclusive, collaborative design process that sought input from all stakeholders so that the end result might better meet the needs of the people whom the design addresses (Nini, 2006).

Final implementation of the nursing support pictograms received positive feedback, instigating a programme of similar pictogram installations in hospitals throughout Japan (Schneider, 2009).

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Figure 47. Andreas Schneider (2009). A sample of the final medical nursing support pictograms: *Staff* and *Mobility*.

5.3.4 Pictograms for communication in healthcare: increasing comprehension of pharmaceutical information

This study was held in the Xhosa community of South Africa, where low-literacy levels meant that people were not able to read and understand written instructions on medicines, compromising health outcomes. Researchers were aware of the success of using pictograms to convey instructions on pharmaceutical medicines. The purpose of this study was to determine the effectiveness of locally-designed, culturally-specific pictograms to aid the comprehension and recall of the medication instructions (Dowse & Ehlers, 2001).

Forty-six pictograms were designed locally, which took into account regional and cultural influences within the Xhosa group. Tested respondents all had no more that seven years of formal education, meaning that they were functionally illiterate. The tested designs were based on pictograms designed by United States Pharmacopeia (USP) in 1991 for a low-literate population in that country.

The researchers resolved that the original USP symbols were more suitable for a group of a quite different cultural and socioeconomic situation than the indigenous people of South Africa, and that therefore, the pictograms would need to be customised (Dowse & Ehlers, 2001):

> Although graphic material is often considered to be part of a universal language which can easily be recognised by all and can convey meaning with little or no dependence on language or cultural background, cross-cultural testing has consistently found otherwise... This emphasises the importance of designing and evaluating pictograms in collaboration with the target population. (p. 88)

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Figure 48. Ros Dowse & Martina S. Ehlers (2001). Local and USP pictograms used in the study.

From the original USP pictogram set, revised pictograms (referred to as *Local*) were adapted to be culturally appropriate for the Xhosa (Figure 48). Once implemented, their practical purpose was to aid medicine administration, acting as visual accompaniments to verbal explanations of medicine use in the first instance, and then as cues to recall the information thereafter. To accommodate this, respondents were tested twice on their understanding and recall, with a three weeks' interlude between testing sessions.

Dowse and Ehlers (2001) reported that the majority of tested respondents preferred the Local set of pictograms to those designed in the United States:

> The USP version contains abstract symbolism and graphic conventions depicting heat which were not apparent to our respondents. Most did not even attempt an explanation, and admitted to being totally confused... In the Local version we used familiar sources of heat such as the sun and a fire. Even then, the sun was sometimes mistaken for a watch face and the fire was not recognised. However, the majority of respondents preferred this version. (p. 91)

Procuring a sense of the respondents' preferences was important to increase the chance of their learning and recalling the symbols' meaning. Pictograms are metaphorical graphics and are more likely to be retained in long-term memory than arbitrary ones, such as pie charts and graphs (Horn, 1998), however the meanings suggested by the metaphors need to be relevant to the specific audience it addresses. This identification with the symbols is critical in a rhetorical approach. More than information transfer, it is a means of embodying and promoting shared ideologies (Forlizzi & Lebbon, 2002). All respondents were extremely positive about the pictogram use, and recognised the benefits of pictographic cues to help them remember how to use their medicines (Dowse & Ehlers, 2001).

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The pictograms we know today are the offspring of pictorial statistics developed in the mid-Twentieth Century, such as Isotype; and reflect the apotheosis of Modernist design values in their apparently neutral, highly abstract and stylistically consistent features. The language of the male and female signs in Figure 49 on page 95 is *public information*, their cultural affiliations are *international*, *public*, and *neutral* (Lupton & Miller, 1996d). Like written communication forms, graphics are conventional and must be learned—they are not natural or innate—and as pictorial symbols, they have strong cultural associations (Lupton & Miller, 1996d).

Western acclimatisation to the now ubiquitous public information signs means that from our vantage point, symbol signs appear universally comprehensible, so that designers assume that they will be universally valid in every situation.

Since the use of pictograms is, to some degree, an effort to summarise and unify discrete ideas pictorially, the design of pictograms involves a number of contextual factors. These include:

a. Situation of viewing or use

b. Complexity of amount of information to be communicated

c. Cultural background and practices of intended audience

d. Literacy and graphicacy level (general / specialised) of intended audience

e. Ethics of use

The communication problems in the two cases above involved great variances in these five parameters. Therefore, it is not surprising that, given that both projects employed rigorous testing through their iterative conceptual and prototyping phases to determine the most suitable graphics, the final outcomes are aesthetically divergent.

Notable in the *Local* pictograms from South Africa is the level of detail, character and realism in the pictograms compared with those designed for Japanese hospitals. They do not aim to conform to a predetermined ideal—a pictographic style—but are visually rich and detailed. These pictograms are tailored to address the complexity of information, close and personal reading and cultural specificity required. By contrast, the nursing support pictograms from the Ashikawa Red Cross Hospital are much more abstract and simplified. Perceptually, the pictograms' form allows for effective readability, and conforms to the ISO 9186 standard for design and testing (Schneider, 2009). In this, a balance was struck between simplicity for efficient reading and response by attending staff, and the level of advisory information required to gain a snapshot of the individual patients' condition. Schneider (2009) observes that future testing of prototypes may reveal that if "the proposed type of Nursing Support Pictograms should result in a false sense of security or further reduce opportunities for face-to-face communication with the patient, gains in efficiency could not justify application" (p. 145). But what exactly should be tested to justify failure or success in this instance? One would need to test whether it is the existence of the devices as a whole which caused this unwanted reaction, or whether it is *the generic, depersonalised quality of the pictograms* which lead to staff making assumptions about the condition of patients, thereby reducing the chance for them to carry out duties in a face-to-face manner. Since tested outcomes have not been published to date, this was not made clear.

Figure 49. AIGA & U.S. Department of Transportation (2010). Symbol signs (clockwise from top left): Escalator up; Toilets – Women; Restaurant; No dogs.

The design decision to deploy generic symbol sign pictograms might be explained by (i) the adherence to ISO standards; (ii) the evocation of the rhetoric of science (Kostelnick, 2008) (efficient, pure, modern), and (iii) the high level of graphicacy possessed by the intended audience of the nursing support pictogram. What is not clear is why pictograms which embrace a *public amenity* persona were deemed suitable when (i) their use and arrangement is individually tailored to patients' needs and (ii) they are located by the patient's bed? This situation of viewing does not suggest *public*, and therefore calls into question the ethical use of symbols that rhetorically associate the communicated information with a public arena for display.

Thus, what is not tested (or even questioned) is the formal suitability of the pictograms themselves (what Brasseur categorizes as the *genre*) deployed in this context. Brasseur (2003) contends that genres used in information design (for example, charts, tables, graphs) are so firmly established that should the visual display fail to communicate, blame will be placed on the designers' rhetorical misuse of the genre or the inability of the audience to interpret it. That the genre itself might not be valid is rarely, if ever, considered.

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This chapter aims to extend the suggestion that rhetoric is operative in all levels of visual communication by articulating the effects and use of rhetoric in information graphics. It asserts that visual or verbal rhetoric can be deliberately deployed to reinforce existing beliefs, and when used in information displays can promote audience reception and comprehension, as well as effecting action. The examples discussed propose that graphical conventions are socially mediated, and demonstrate that they reflect cultural values of a given discourse community, and at the same time can influence these values. Awareness of the power of rhetoric in design is critical in order to use information displays ethically and well, and entails that information designers are cognisant of the effects of their activity. This in turn introduces issues of ethics and social responsibility, which will be discussed in the next chapter.

6.0
Genre, power, and social responsibility

The previous chapter suggested that "all information graphics are visually-inscribed rhetorics" (Kimball, 2006, p. 379), and that visual rhetoric has power to influence, changing courses of action, and shaping culture (Buchanan, 1985). In this sense, all visual communication is imbued with particular "social, moral and political dimensions" (Ehses, 1988, p. 6), where information designers and their audiences share beliefs in the ritual process of communication.

In this shared communication process, various visual genres of information are established. Genre here refers to the expression of information within standardised visual forms. For information graphics, this expression is predominantly of a technical, scientific or business nature, and the visual forms include charts and diagrams, tables, technical illustrations, infovis, and graphs (Brasseur, 2003). Swales (1990) asserts that genre has particular constituent qualities: 1) a communicative purpose; 2) form; 3) structure; and 4) audience expectations (as cited in Brasseur, 2003). The aspect of audience expectation is particularly important. In information design, this arena of exchange is one of social action, and the genres used in the expression of information are social entities; they are "cultural artifacts" (Brasseur, 2003, p. 8). In addition, they are dynamic and discursive, and only exist in relation to conventional practices at a particular time. All design genres emerge from practice, and evolve with use, economic developments, and technological advances (de Almeida, 2009). If they fail to be taken up by the discourse community by not meeting and projecting audience expectations, they wither away. The nature of this dialogue and the roles within it are also constantly shifting as interactive media allows the audience to actively participate in what, and how much, information is displayed (Kostelnick, 2008). Thus, in this dialogical process, it is not solely designers who establish conventions. As Kostelnick (2004) states: "information design is socialized by discourse communities that construct, adapt, and refine conventional practices and that enculturate users in those practices" (p. 225).

In this regard, designers in the field of visual information design are innovators of the cultural artifacts that become genre, and through use, these forms become acculturated and naturalised. With this comes a degree of control and social responsibility. Howard (2001) suggests that for designers, "the first step is to ask who controls the work and whose ends does it serve" (p. 7). This involves more than aiming to construct perceptually accurate graphics. The ethical role of designers in using and transforming existing genres means they must, at very

least be aware of their complicity and of the personal power they hold, which "can be seen in the methodology that leads to the collection of data or to the choice of visual display, as well as the decision to include some data and not others, or determine how it should be visually designed, titled, and labeled" (Brasseur, 2003, p. 2). Genres, claim Brasseur (2003) are inherently unethical because they place information into a context-free space, which, through their overt rationality, starkness and precision, belie the complex levels of emotion, experience and story that underpinned the actual event that the data describes. The translation process designers undertake means abstracting and clarifying shapes, flattening perspective. Like the drawings of young children, in which the world is drawn as they know it, rather than in the way they see it (Kress & van Leeuwen, 2006) designers can be seen to work with information from a privileged view. The perspective of the viewer is undermined, as Kress and van Leeuwen (2006) state: "scientific and technical pictures, such as diagrams, maps and charts, usually encode an objective attitude. This tends to be done in one of two ways: by a direct frontal or perpendicular top-down angle. Such angles do suggest viewer positions, but special and privileged ones, which neutralize perspective itself" (pp. 143–144).

This is not necessarily a choice on the designer's part, it is the convention of the genre, but it does mean that the designer can—if they choose—hide, misrepresent, and reframe the information in a way that can harm. Power is operative in aspects of inclusion and exclusion of information, as well as how audiences adapt to information displays, as Kostelnick (2008) asserts:

> ... power can be measured in part by whose interest those displays serve, how designers control what information they include or exclude in a display, and the 'naturalizing' effect displays create when readers interpret them uncritically rather than as artificial constructs. In these ways, readers collectively delegate power to data displays that may serve their own self-interests (e.g., by perpetuating the status quo), or they might unwittingly cede their own power by acquiescing to forms that they lack the pragmatic, intellectual, or cultural authority to resist. (p. 122)

This can be seen in the proliferation of "junk charts" embedded in computer applications such as Microsoft Word, Excel and PowerPoint. Users of these programmes employ the default charts uncritically, simply because they are conventional, accessible and are easy to use (Allen, 1996). Habitual use of the standard technical and business graphing software not only gives non-experts flexibility to manipulate data and proliferate *bad,* or *lying* graphics, it naturalises the use of these genres so that they become standard ways of presenting data. It wrongly assumes

that genres are universally comprehendable. For example, by using standard technical and business graphing software to inform communities about important social policy as shown in Figure 50, authorities are inadvertently disempowering audiences who lack the cultural or educational background needed to interpret these specialised graphic forms. It undermines the abilities of that particular audience (Pacific people living in New Zealand) to understand, adopt and use that information to benefit their own communities. Thus it can be seen be seen that those who use default graphical software indiscriminately are relinquishing their power to use graphical communication ethically.

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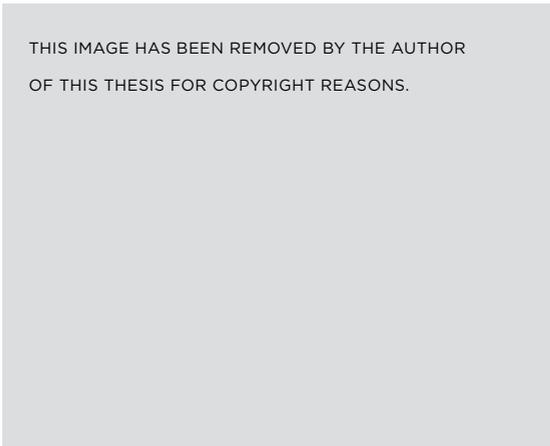
Figure 50. New Zealand Ministry of Education (2009). Compass for Pasifika success.

Even communication "design for good", which aims to raise awareness of the underprivileged and their needs is, claims Kimball (2006) an incursion of implicit power, where "any attempt to include details of the 'other' or the human is itself an ideological statement" (p. 379). Kimball (2006) also asserts that information graphics "inherently privilege the viewpoints of the powerful; they are used from a position of strength, representing corporations, agencies, classes, and institutions who are trying to forward agendas, prove points, and solve problems" (p. 379). That the information design field itself has emerged from that particular "form of economic organization we refer to as capitalism" (Howard, 2001, p. 4) is echoed by Stiff (2005), who rejects histories that position information design as a social-ist entity, suggesting instead that public information thrives in prosperous econo-mies, and that advances in the field proliferate in times of vast research budgets and limitless commissioning. Social dynamics such as these foster their own brand of power relationships.

Power and responsibility in the hands of information designers in this sense can be negative, obfuscating, and distorting. But power to visualise information can also be a positive force, allowing us to understand concepts and themes which are inaccessible to most in their numerical or text-based data form (Brasseur, 2003). Florence Nightingale's rose diagrams in Chapter 5.3.1 and Clarkson's slave trade ship schematic in Figure 51 are strong examples of design for social change and advocacy. Additionally, striving for the best methods to convey information to resistant audience drives conceptual and formal innovation and promotes new genres, which can become part of "an iterative, interactive process of radical audience adaptation…" (Schriver, 1997, p. 444). What matters is the degree of insight and awareness that designers have of their impact on visual communication, coupled with a desire to "behave in a responsible manner with regard to the needs of the target users and society as a whole" (IIID, 2000, para. 16).

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Figure 51. Thomas Clarkson (1786). Schematic of a slave ship. From his *Essay on the Slavery and Commerce of Human Species*, which was pivotal in influencing policy to abolish the British slave trade.

7.0
Conclusion

Visual information design is a relatively immature discipline, arising from a confluence of interdisciplinary influences. As a result, its philosophical and communication approaches are often contradictory; this is exacerbated in part by a lack of accepted clarification of its identity, and what its practice includes and excludes. This thesis does not purport to draw clear demarcation lines or to formulate discrete definitions of the discipline or its practitioners, however it mandates two important characteristics. First, that visual information design involves planning, structuring, shaping and organising content. Second is the information designer's explicit involvement with the needs of people—their desire to help other people to achieve their own goals (Schriver, 1997; Irwin, 2002), and the deployment of strategic design tools and user-based practices in the process.

This study contends that flawed premises regarding the purpose and practice of contemporary information design compromise the intrinsic relationship of information design to people. The thesis considers ways in which certain precepts that impact information design arose from the social, political and ideological landscape of Twentieth Century Modernism, and it attempts to suggest how aspects of these perspectives continue to pervade many contemporary approaches to information design. The traditionalist views that emerged from Modernism regard design as either a means of free 'self-expression' guided by the success of past heroes in the field; or alternatively but not exclusively, a self-conscious approach guided by fixed rules and evaluated by subjective criteria (Nini, 2006; McCoy, 2003) where content is a neutral fixture, devoid of subjectivity or context. Furthermore, traditional perspectives disregard the implications of power held by those who manage and control the way information is translated and presented.

In the design of visual information, this attitude is expressed through an adherence to the *formalist approach*. Excellence in information graphic design from the formalist perspective is a matter of achieving clarity, efficiency and accuracy in the display. Data is shaped, translated and presented in such a way that the intended message is assumed to be obvious and not obscured. In the formalist approach the pathway to an effective design outcome is guided by understanding data content, and facilitated by the designer's intuition, experience, and knowledge of general principles for good practice; predicated on a linear transmission process between sender and receiver. It has been promulgated and maintained in visual communication despite the shifting landscape of use, form, and technologies, which have

evolved through interactive digital communication. This thesis suggests that this misleading perspective arises partly from an acceptance of graphical conventions by those who design and commission information displays, and partly from the legacy of Bauhaus and Basel influenced design education, leading to a professional design practice that privileges a context- and responsibility-free approach to communication. Kimball (2006) sums up this situation in relation to information graphics: "But despite what seems a general scholarly agreement that information graphics are rhetorical, socially constructed, and ideologically biased, in practice most still use, teach, and approach graphics as transparent" (p. 354).

Where the formalist perspective persists today due to complacency and lack of knowledge, a solution lies in establishing an information design practice whereby people and their communities are placed at the centre of the process. When the designer assumes that they know what is best for their audience, they place themselves at the centre. This designer-centric formalist approach not only disrespects the audience, it is presumptuous—as designer Donald Norman (Heller, 2003) suggests: "Design for people as they are, not as you would have them be" (p. 131). Instead of designers regarding themselves as *guardians at the gateway to information dissemination*, they can empower audiences by initiating and establishing a more inclusive and participatory platform for practice, one that involves the audience, the context and the content in mutual alliance. Those who prepare information, especially for non-expert audiences have a responsibility to understand who will use the information and how they might use it.

Formal design education can play a decisive part in changing entrenched attitudes that permeate into professsional design practice. Therefore a rhetorical approach might be at the forefront of communication design and information design teaching, in much the same way that typography is fundamental to graphic design curricular. Design education could address this lack by inculcating in student designers a particular *attitude* towards the design of visual information. Conrad Taylor (Albers, 2003) rejects the notion of information design as a professional discipline, instead seeing "it more as a stance that one takes, like a political or moral stance" (p. 3). He further suggests that this attitude affects a designer's conception of their own role and responsibility in ensuring improved communication and betterment of lives (Albers, 2003). This is synonymous with the designer's individual worldview; which as discussed in Chapter 3.2, page 12, cannot be cast aside in the design process.

Such a stance might be developed through specific initiatives in teaching approach and delivery. Firstly, the subject of information design briefs should be considered carefully, so that students are working with content that is meaningful;

that which has some personal connection, or that in some way imparts a relevant message. In this way information is less likely to be regarded as something abstract and context-free. Such an approach can be integrated into even the most formulaic design briefs. For example, in choosing text for exercises in typography, Terry Irwin (2008) suggests eschewing traditional 'placeholder' text such as *lorem ipsum*, or maxims from Modernist heroes of typography in favour of textual content which itself deals with the social impacts of conscientious, or socially aware designing. She asserts that this approach forces students to engage with the underpinning philosophies of socially responsible design, albeit as a by-product of a formal exercise. Secondly, information design projects should be developed with the user, or reader in mind in order that students can encounter information (and its potential for inaccessibility) from the user perspective. By setting briefs where students are engaged themselves as users of the information rather than as expert designers of something entirely external to their experience, a simultaneously sympathetic and critical approach is promoted. What this can lead to is ethical reasoning and decision making relating to personal, as well as shared values; and these values are likely to inform professional practice. Decision making is active in every stage of designing information (see Chapter 4.7.2, page 70); thus a well-developed criticality is a crucial attribute of an information designer, one that can result in designers questioning the appropriateness of standard genres and visual forms (as elaborated in Chapter 6.0) rather than using them indiscriminately.

Many of the ideas and suggestions in this thesis, particularly around human-centred design practices are not new. Discovering how real people think, feel, and most importantly act must be a process of information gathering and content analysis at the start of an information design project. Depending on scope of the project, this might includes the development of user profiles, or personas—characterised versions of an audience type, constructed by finding out the personal attributes of the main audience types and used as reference points to match against design criteria—and scenarios, which locate the information user in a projected situation or narrative, and like storytelling, can suggest particular audience behaviours, and are thus useful to make certain design decisions (Baer, 2008). These methods, which fall under the rubric of human-centred design, are well established in technical communication, but have yet to be taken up widely in communication design practice and education. The notion that communication is a social act; an exchange of beliefs and ideas is less widely promoted and it is one that has the potential to create new possibilities for information design practice; one that might extend and innovate aesthetic, technological and cultural developments in its fields.

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