An exploration of the conceptual relationship between design aesthetics and Aristotelian rhetoric in information visualisation.

by

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DECLARATION

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I hereby declare that *An exploration of the conceptual relationship between design aesthetics and Aristotelian rhetoric in information visualisation* is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

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Anneli Botha
31 August 2011

"New ideas are not so much discovered as uncovered by moving from what you already understand into the realm of what you would like to understand. Sometimes, simply by reorganising the information you possess, by using and comparing what you already know, you can uncover other information ... These connections differentiate raw data from meaningful information. I find this reassuring. I don't worry so much about discovering new information, but in connecting existing information in new ways. I think that all things are connected and that once you realise that, you will feel immediately justified to start your search at any place."

– Richard Saul Wurman (2001:271)

SUMMARY AND KEY TERMS

This study explores the conceptual relationship between design aesthetics and Aristotelian rhetoric in the context of information visualisation. Aesthetics and rhetorical theory are traditionally studied as separate discourses, but conceptual links between these fields are identified, specifically in terms of communicative goals and strategies. This study therefore compares selected theories on design aesthetics and Aristotelian rhetoric in information visualisation in order to ascertain whether a combined framework may be feasible.

Although information visualisation is traditionally practiced from software engineering disciplines, this study frames the practice within the broader field of information design. The democratisation of the field of information visualisation and the emerging practices that emphasise the aesthetic value of visualisations is explored. In order to understand what is meant by the term 'aesthetic', a variety of both classical and contemporary views on aesthetics theory is investigated. Even though the term 'aesthetic' is not defined, a broad understanding is created by identifying the main conceptual themes in discourse. A specific focus is placed on understanding aesthetics in a design context, since there are many misconceptions about 'aesthetics' in this context. The idea that aesthetics relates to the communication of artifacts is explored, which provides a point of departure in linking aesthetics and rhetorical theory. The communicative nature of information visualisations is thus explored in relation to visual rhetorical theory. Aristotle's three rhetorical appeals, namely *logos, pathos* and *ethos*, form the backbone of the visual rhetorical analysis of visualisation artifacts.

The aesthetic and rhetorical theories explored throughout the study are compared by applying them to Charles Joseph Minard's seminal information visualisation of Napoleon's march to Moscow. This comparative analysis considers the traditional divide between aesthetics and rhetorical theory but identifies sufficient conceptual links between the discourses to suggest that a combined aesthetic-rhetorical framework for information visualisation may indeed be practical. Lastly, the wider implications and potential value of such a combined framework is considered within a broader design context.

Key terms: Aesthetic visualisation, Aristotelian rhetoric, communication design, data visualisation, design aesthetics, experience design, information design, information visualisation, information aesthetics, visual communication, visual rhetoric.

ACKNOWLEDGEMENTS AND DEDICATION

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CHAPTER ONE

INTRODUCTION

1.1   Background

The amount of data people interact with has increased exponentially in the last few years owing to the use of the internet and specifically the rise of web 2.0 and social media. Anyone with an internet connection is now able to not only access, but also generate information. According to Ferdi van Heerden (2008:6), "as more and more aspects of our lives become connected in the webbed environments of urban landscapes, the information that we generate and consume collects into massive databases". This leads to what information architect Richard Wurman (2001:14) terms 'information anxiety', where people are overwhelmed because all the data simply does not inform. According to John Thackara (2005:162), we feel flooded by information because "we're getting information unfiltered, unsorted, and unframed".

In an attempt to make information more accessible and understandable, an increased focus is currently being placed on the designing of information that facilitates the generation, organisation, presentation, transferral and storage of information. Information visualisation[1] has emerged as one such practice, where large data sets are presented visually, in order to reveal patterns and connections and make data more easily understandable. Information visualisation is traditionally approached from disciplines such as human-computer interaction and software engineering, but the democratisation of this field, through the accessibility of data and easy-to-use software, has led to designers embracing the field as a valuable platform to create communicative and compelling visual artifacts. According to Andrew vande Moere (2008:473), information visualisation is moving away from its "traditional, expert and computer graphics background" and is becoming a broader social communication tool.

As a result of the democratisation of the field, an emerging sub-category of information visualisation called 'information aesthetics' (or 'info-aesthetics') has emerged, which applies visualisation techniques in more artistic and experimental ways, with a strong focus on visual appeal. However, this 'new wave'[2] of visualisation practice, has led to considerable debate within the visualisation community. An *Information visualisation manifesto* published online by Manual Lima (2009a) and the comments that resulted from it show that there are differing opinions regarding the aesthetics of information visualisation. Some argue that aesthetic information visualisation should be seen as separate from traditional visualisation, since 'flamboyant experiments' could potentially harm the reputation of the practice as an analytical tool:

> ... many people passionate about information visualisation ... share a sense of saturation
> over a growing number of frivolous projects. The criticism is slightly different from

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[1] Information is visualised in a variety of forms such as diagrams, graphs, charts, maps as well as other innovative methods, and is seen in various research fields and industries. For the purposes of this study, information visualisation is framed as a specialist area of visual communication practice within the broader field of information design.

[2] This refers to a comment by Moritz Stefaner (in Lima 2009a), where he describes himself as part of a second wave of information visualisation practice.

person to person, but it usually goes along these lines: 'It's just visualisation for the
sake of visualisation'; 'It's just eye-candy'; 'They all look the same' (Lima 2009a).

Aesthetics, from this perspective, is seen as surface decoration and as a distraction from analytical visualisation goals. However, other theorists and practitioners defend aesthetics as an important factor in effective visualisation practice. According to Andrea Lau and Vande Moere (2007:87), current information visualisation practice focuses predominantly on effectiveness and functional considerations, while often neglecting the positive influence of aesthetics on task-oriented measures. According to Lau and Vande Moere (2007:89), 'information aesthetics' can be analysed from either "an information visualisation perspective, in terms of functionality and effectiveness" or from "visualisation art, in terms of artistic influence and meaningfulness". These two purposes of visualisations are often placed in contrast with one another, with functionality valued higher than aesthetic quality or vice versa, depending on the approach. However, Lau and Vande Moere (2007:87) argue that aesthetics can potentially augment information value and task functionality. The influential information visualiser Ben Fry (2004:11) also contends that the aesthetic principles of visual design should no longer be treated as superficial or less important in information visualisation, but rather be embraced as a necessary aid for improving the understandability and accessibility of information communication.

This perceived separation and tension between aesthetics and functionality is not a new phenomenon in design practice. Robert Horn (1999:25) explains that there is a "considerable tension between (1) graphic designers – who learn in art school to worship the gods of style and fashion, novelty, impact and self-expression – and (2) technical communication people – who worship the gods of clarity, precision, legibility, comprehension and (often) simplicity". Furthermore, there is also a tension in terms of what is researched in the field. Horn (1999:26) writes:

> Researchers tend to avoid trying to measure style, novelty, and self-expression, partly
> because it is very difficult and partly because their research grants and contracts usually
> come from organisations whose major commercial priority is evaluating the clarity,
> legibility, and efficiency of communications.

These dichotomies are related to the conception that aesthetics is analogous to surface stylistic factors that do not add to clarity or comprehension. Anna-Lena Carlsson (2010:452) points out that even though aesthetics is seen as a significant aspect of information design, it is still perceived as separate from the meaning or message and usually as merely "decorative". Albert Borgmann (1995:15) attributes this superficial understanding of aesthetics in design to an overemphasis on user 'disburdenment', or in other words, an approach that enables people to perform tasks that make life easier in such a way that is not distracting:

> Engineering devises the ingenious underlying structures that disburden us from the
> demands of exertion and the exercise of skills and leave us with the opaque and
> glamorous commodities that we enjoy in consumption. Aesthetic design inevitably is
> confined to smoothing the interfaces and stylising the surfaces of technological devices.
> Aesthetic design becomes shallow, not because it is aesthetic, but because it has become
> superficial. It has been divorced from the powerful shaping of the material culture.

As part of 'disburdening' users, the medium is smoothed to become as invisible as possible. In other words, the medium should never draw attention to itself or distract users from the task at hand.

There are thus two misconceptions about aesthetics in a contemporary information design context. On the one hand, aesthetics is seen as an afterthought, the superficial visual appeal that should be considered after the 'real' design has been concluded. On the other hand, aesthetics is distrusted, with 'decoration' seen as a sign of subjective interference into otherwise objective or neutral information transfer.[3] This divide between aesthetics and functionality may, however, be a result of the particularly narrow understanding of the concept of aesthetics within design discourse. In order to challenge this narrow view of aesthetics as superficial and functionless, a greater focus needs to be placed on understanding the communicative value of aesthetic qualities.

In order to understand the communication process of information visualisations, a rhetorical perspective proves useful. Rhetoric, as the study of persuasive or eloquent communication is greatly concerned with the means through which practical communication goals may be reached. Rhetoric has thus been identified as a potentially valuable area of investigation within design discourse. Julian Jenkins (2009:193) explains how rhetorical approaches to communication might provide a solution to information overload and that it shifts the focus from information acquisition towards more meaningful interactions. Design theorist Richard Buchanan (1985:4, 22) argues that communication is the overarching idea found in all design studies and that the "skilful practice of design involves a skilful practice of rhetoric". According to Buchanan (2001:187), designers are the "agents of rhetorical thinking in the new productive sciences of our time" and that design employs rhetorical strategies in "shaping the products and environments that surround and persuasively influence our lives to an unprecedented degree". From this perspective, information visualisations can be seen as rhetorical arguments that are focussed on communicating complex information in an eloquent manner.

Aristotle, one of the earliest theorists on rhetoric, identifies three modes of persuasion: the appeal to logic or reason (*logos*), the appeal to the emotions (*pathos*), and the appeal linked to credibility or integrity (*ethos*). These three appeals often form the basis for a visual rhetorical analysis[4] of design products and is also utilised in this study to analyse information visualisations. Kevin LaGrandeur (2003:119-120) points out that even though available means have expanded drastically since Aristotle, the rhetorical theories of this classical philosopher are still important today. In an age when people are bombarded with media messages, a "fluency with images and their use has become crucial to controlling credibility and creating emotional appeal, and even, to some extent, logical appeal" (LaGrandeur 2003:119). It may be argued that information visualisation practice relates particularly closely to rhetoric in that the purpose is to 'prove' certain (often social, economic or political) states by means of seemingly objective data. Information

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[3] The notion of neutral information presentation is challenged throughout the study, since all data is sampled, filtered and manipulated into carefully constructed visualisations, aimed at conveying a certain message.

[4] Buchanan (1985, 2001), and Lupton and Ehses (1988) refer to Aristotle's three appeals quite extensively in their discussions on applying visual rhetoric in design contexts.

visualisations typically display a certain authority, and persuade viewers owing to their perceived neutrality and informational integrity.

Although both aesthetics and rhetorical theory have been identified as important areas of inquiry within a design context, they are generally considered separately. John Poulakos (2007) exposes the conceptual links between rhetoric and aesthetics, but this relationship has not yet been investigated from a visual design perspective. Preliminary research indicates that there are striking similarities between aesthetics and rhetorical theory, since both discourses pertain to the study of effective and engaging communication. It may be argued that the aesthetic 'function' of a visualisation is very closely linked to its rhetorical function, in that the aesthetic quality may influence the overall communicative value, or in other words how it is perceived and processed.

Jenkins (2009:196) explains how "the perceived value of information design has been largely limited to making objective data more accessible", and even though this is a step in the right direction, it is only part of the solution to the information overload people experience in contemporary society. According to Wurman (2001:16), a "quantity over quality shift in our culture" with regard to information has led to a search not only for greater understanding, but also for more meaningful experiences. Gianfranco Zaccai (1995:3) shares this view and explains that while it is difficult to define the "missing ingredients", a majority of design products are not "sufficiently satisfying to either our souls or our senses" (Zaccai 1995:4). There is arguably a lack of emotional connection between people and the products they interact with on a daily basis. Jenkins (2009:194) argues that a rhetorical approach may shift the focus of communication from merely acquiring more information towards meaning-making.

Sally McLaughlin (2009:303) explains that information designers often aim to present information as neutral, but by trying to remove human experience from the information presented, these artifacts become dehumanised.[5] McLaughlin (2009:303) uses an example of graphs representing "people being killed in conflicts, or dying of famine, subsequently showing up as mere statistics". These products often perpetuate an idea that information is objective and neutral, but this does not stimulate engagement and as a result the information is not internalised, remembered or reflected upon. Borgmann (1995:15) explains that an overemphasis on functionality and 'disburdenment' leads to artifacts that are less engaging and therefore less meaningful. Designers have an important part to play in the creation of more meaningful experiences and in order to do so they need to ask how they can "revitalise information" so that it matters to people (McLaughlin 2009:303).

By linking aesthetics and rhetorical theory a holistic approach to communication, where audiences are engaged in more meaningful interactions, may potentially be uncovered. With this assumption as a point of departure, this study investigates the conceptual links between design aesthetics and Aristotelian rhetoric in order to establish whether a combined conceptual framework may be developed.

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[5] McLaughlin (2009:311) argues that Western metaphysics prescribes that "feelings and moods are put aside so as to allow the world to show up for us 'objectively', without being coloured by emotion".

1.2   Aim and objectives

The aim of this study is to explore the conceptual relationship between design aesthetics and Aristotelian rhetoric in the context of information visualisation. Both aesthetics[6] and rhetoric[7] have been identified as significant potential fields of research to expand on discourse surrounding the fields of information design and visualisation. Traditionally, rhetoric and aesthetic discourse have been studied separately, but it is possible to argue that there are significant conceptual links between these fields in terms of their communicative goals and strategies. This study therefore compares selected theories on aesthetics and rhetoric and analyses the similarities, specifically from an information visualisation perspective.

The objectives of the study are to:

- explain key concepts such as information visualisation, information aesthetics, aesthetics and rhetoric in the context of this study,
- frame information visualisation within the broader field of information design,
- investigate and critically engage with relevant discourse surrounding aesthetics and apply this to design and information visualisation contexts,
- investigate and critically engage with selected discourse on rhetoric, with a specific focus on Aristotle's three rhetorical appeals, namely *logos, pathos* and *ethos*, and apply this to design and visualisation contexts,
- compare the above-mentioned aesthetic and rhetorical theories in order to propose whether the development of a combined theoretical framework is feasible,
- consider the potential value of a combined aesthetic-rhetorical framework, and
- illustrate all of the above by showing and interpreting relevant examples from the information visualisation field throughout the study.

1.3   Theoretical framework and methodology

The study is qualitative in nature and follows a hermeneutic approach based on a literature review and the theoretical frameworks discussed in the study. Owing to the complex and abstract nature of the concepts under investigation, broad overviews of concepts are provided by breaking concepts down into their constituent parts. According to Nieuwenhuis (2010:73), a thorough literature review becomes intrinsic to a study when concepts display a "variety of contending meanings on which the literature is almost infinite". This is most definitely the case regarding theories of aesthetics and rhetoric. After concepts have been explained, theories on aesthetics and rhetoric, as they relate to information visualisation, are compared in order to identify thematic commonalities. The relationship between selected aesthetic and rhetorical theories is thus explored in order to establish whether a new combined framework may be developed.

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[6] This study frames 'aesthetics' as the study of a complex experience that pertains to more than physical appeal or beauty, even though these are related common understandings of the term.
[7] Rhetoric is a field concerned with studying the art of speaking or argumentation. The field has its origins in ancient Greek oratory, but it has been shown to apply to visual contexts as well.

Relevant visualisation examples are shown throughout the study to illustrate the application of theory. Since information visualisation is a new and emerging practice often encountered in virtual environments, the study relies considerably on internet sources. Furthermore, the majority of images shown are international examples, since there is still a shortage of South African examples of information visualisation (accompanied by adequate reviews or aesthetic evaluations). Visualisations are chosen based on the availability of commentaries that substantiate their status as either aesthetic or persuasive (pertaining to rhetoric). One specific visualisation example, Minard's *Carte Figurative*, is analysed extensively in Chapter Five, since it is lauded as both eloquent/persuasive and aesthetic.

It is important to note that findings are based on my own subjective readings with regard to the analysis of concepts. Consequently, this study does not aim to provide definitive conclusions, but rather explores conceptual links, interpretations and new applications of theory in order to establish how these concepts relate specifically to the field of information visualisation. Owing to the vast amount of literature available on the topics of aesthetics and rhetoric and the limited scope of this mini-dissertation, a comprehensive analysis of aesthetics and rhetorical theory is not possible. A broad context is merely established to serve as a point of departure for theoretical comparisons. Specialised theories on aesthetics are selected based on their relevance to design discourse, as opposed to only fine art. In terms of rhetoric, the focus will remain on Aristotle's theories, as it can be applied directly to visual communication design contexts, while also relating to aesthetic theory.

1.4   Literature review

This study looks at a broad range of literature from a variety of fields, namely information visualisation, information design, information aesthetics, traditional aesthetics, design aesthetics, rhetoric and visual rhetoric. Literature that considers the conceptual links between these different fields is also consulted. Prominent authors in each specialist field are listed here in alphabetical order.

In order to gain an understanding of the field of information visualisation, the work of seminal authors such as Stuart Card, Jock Mackinlay and Ben Schneiderman (1999), Juan Dürsteler (2002; 2007), Ben Fry (2004; 2007), Jarke van Wijk (2005) and Colin Ware (2000) is investigated. Many of these authors, however, approach the subject from a how-to perspective and from disciplines such as human-computer interaction and software engineering. Information visualisation is currently studied predominantly from software engineering and information technology perspectives, with a strong focus on statistics and programming. This study, however, accepts a broader definition of 'information visualisation' that includes static and hand-drawn artifacts that present complex information through a visual medium.

As this study aims to frame information visualisation as a specialist sub-category of information design, theorists from the information design field, such as Robert Horn (1999), Gerlinde Schuller (2007), Nathan Shedroff (2001) and Richard Wurman (2001), are also consulted. Wurman suggests that the modern environment is utterly saturated with data and information, which explains why information

design and visualisation are needed in the first place. Shedroff provides valuable insight in terms of how data and information is processed and his ideas form a basis for understanding information design and visualisation. Horn and Schuller further explain what information design is, and what its purposes are.

Various theorists from the field of information visualisation have started to focus on the aesthetic nature of visualisation practice. According to Horn (1999:20), Edward Tufte[8] (1983; 1997; 2006) is a pioneer in "how communication can be both beautiful and useful". The influential new media theorist, Lev Manovich (2001; 2010), coined the term info-aesthetic in reference to contemporary information artifacts that exhibit aesthetic qualities. Manovich does not, however, offer comprehensive reasons for his aesthetic evaluations. Both Tufte and Manovich provide rich and extensive histories of the practice of visualisation with ample examples. An increasing number of contemporary publications and websites have also started to showcase examples of aesthetic information visualisations.[9] Lau and Vande Moere (2007) also venture further and try to uncover the aesthetic characteristics within visualisations. They do so, however, from a very pragmatic perspective and the aesthetic quality of visualisations has remained largely unexplored. Various authors and practitioners such as Peter Crnokrak (in Lima 2009a), Ben Fry (2004; 2007), Peter Hall (2008), Greg Judelman (2004), Moritz Stefaner (in Lima 2009a) and Viégas and Wattenberg (2007) support a greater awareness for aesthetics and have described the importance of aesthetics in visualisation practice. Many of these practitioners make their approaches to aesthetic visualisation known through responses to blog posts by Lima (2009a; 2009b), as mentioned previously. This exchange shows that there are many different opinions regarding the appropriateness and value of aesthetics in visualisation practice. Lau and Vande Moere also show an interest in the observed separation and tension between aesthetics and functionality, which points towards one of the central concerns in this study.

Even though it is not the intention of this study to devise a new definition of the term 'aesthetics', it is important to form a basic understanding of the concept for the purpose of this study. This study thus looks at a broad overview of both classical and contemporary theories on aesthetics in order to identify key conceptual themes that specifically relate to the contexts of information design and visualisation. Natural objects are often described as aesthetic, but for the purpose of this study, a particular focus is placed on human-made artifacts, both fine art and design artifacts, insofar as they are relevant to an information design and visualisation context. Some of the seminal philosophies and theories of aesthetics include those (in alphabetic order) of Alexander Baumgarten, John Dewey, Francis Hutcheson, Immanuel Kant, and Lord Shaftesbury.[10] These theories are explored in relation to contemporary authors such as Dennis Dutton (2005; 2009), Alan Goldman (2004; 2005), Gordon Graham (2005), Roger Scruton (2007) and Richard Shusterman (1997; 2006). This proves helpful in outlining a broad historical overview.

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[8] Tufte is "one of the great pioneers that studied the relationship between aesthetics and information design" with concepts such as 'data-to-ink ratio' and 'chart-junk' that stand as "signposts in the skilful and graceful use of visual language" (Horn 1999:20).
[9] Some of these sources include the books *Data Flow* (Klanten *et al* 2008), *Information is beautiful* (McCandless 2009) and *Beautiful visualisation* (Steele & Iliinsky 2010) as well as the websites *Visual complexity* (Lima) and *Infosthetics* (Vande Moere).
[10] Anthony Ashley Cooper, the third Earl of Shaftesbury is commonly referred to merely as 'Shaftesbury' (Gill 2011:[sp]).

Some of these traditional approaches include aesthetics as a manifestation of sensory perception, the presence of beauty, the manifestation of order or harmony, the assertion of authorship, the display of skill, and the engaging of emotional experience. Dewey's *Art as experience* (1934) is a seminal source on aesthetic experience and the work of Scott Stroud (2008) provides valuable commentary on how Dewey's ideas are applied to a communication context. Not all theories on aesthetics are considered in the scope of this mini-dissertation, and not all questions, especially regarding aesthetics beyond the realm of information visualisation, are answered. According to Graham (2005:2), this is unavoidable because typically "philosophy raises more questions than it answers".

Even though the above-mentioned authors provide an essential theoretical basis for understanding the concept of aesthetics, for the purpose of this study, aesthetic theory needs to be considered from a design perspective. There is a distinct shortage of literature on aesthetics specific to design, but the work of a few contemporary theorists is examined in this study. Anna-Lena Carlsson (2010), Alain Findeli (1994), Mads Folkmann (2010), Sven Hansson (2005) and Paul Hekkert (2006) provide valuable perspectives on how aesthetics is perceived in a design context. All of these authors call for a more in depth understanding of aesthetics, arguing that there is functional and communicative value in aesthetic experience. Folkmann (2010:40), for instance, explains how aesthetics is a vital aspect of design that has often been neglected in research and argues that a new approach which considers the more complex relationship between object and subject (user or viewer of the object) is needed. Findeli (1994) and Carlsson (2010) consider the traditional functional/aesthetic divide from different perspectives. Findeli (1994:66) particularly argues that aesthetics should be seen as closely aligned with the ethics of design products. Hansson (2005) and Hekkert (2006) focus on aesthetics as related to the functional use of products.

In order to understand design's communicative value, theorists such as Gui Bonsiepe (1999) and Richard Buchanan (1985; 1995; 2001) have identified the potential value of studying design from a rhetorical perspective. Rhetoric, or in other words the art of speaking eloquently, shares similar goals to information design, in that it aims at communicating effectively and persuasively through the careful construction of a message, whether verbal or visual. The connection between rhetoric and visual language under the name 'visual rhetoric' is fairly established and further explored by theorists such as Sonja Foss (2004; 2005), Charles Hill (2004), Kevin LaGrandeur (2003), and Charles Kostelnick (2004). Design theorists such as Buchanan, Robin Kinross (1985), Ellen Lupton and Hanno Ehses (1988) and Katherine McCoy (2000) have pointed to the potential value of studying information design from a visual rhetorical perspective. Despite recommendations in discourse to study visual rhetoric in information design, focussed research in this area is still generally neglected. This study thus investigates the concept of visual rhetoric and assumes that the emerging area of information visualisation may also benefit from this visual rhetorical perspective. It could be argued that information visualisation as a genre or sub-area of visual communication practice, relates particularly closely to the study of rhetoric in that the purpose is to 'prove' certain (often social, economic or political) states by means of seemingly objective data.

Buchanan (1985; 1995; 2001) and Lupton and Ehses (1988) specifically focus on Aristotle's rhetorical theories as applied to design and visual communication contexts. As previously noted, this study thus looks at the work of Aristotle in greater depth, with specific reference to his three modes of persuasion. Various contemporary authors such as Christopher Carey (1994), Julian Jenkins (2009), Kevin LaGrandeur (2003) and Christof Rapp (2009) interpret the work of Aristotle, and place rhetoric in a contemporary context, arguing that his work is highly relevant in today's cluttered communication environment. Even though Buchanan, Lupton and Ehses provide valuable interpretations and applications of Aristotle's theories, the current study consults Aristotle's original work in an attempt to stay close to the original meanings of *logos, pathos* and *ethos.*

Visual rhetoric and aesthetics are generally considered as separate areas of enquiry and comparative theoretical approaches are uncommon. One such exploration by John Poulakos (2007) proves to be a valuable point of departure in comparing aesthetics and rhetorical theory. Poulakos exposes conceptual links between rhetoric and aesthetics, but this relationship is investigated from an abstract philosophical perspective and not in terms of visual design practice. The work of other theorists such as Glen Magee (2009) and Stroud (2008), while not explicitly linking aesthetics and rhetorical theory, prove helpful in identifying conceptual links between theories. Magee (2009) provides valuable insight in terms of links between aesthetic experience and ethics, which may be related to the *ethos* of an argument, while Stroud's (2008) ideas regarding artful communication provide insight regarding the role of the audience in the aesthetic experience. However, owing to the limited sources available on links between aesthetics and rhetorical theory, the majority of conceptual links are identified by the author as extracted from the theory as explored separately.

This study, starting with the assumption that aesthetics and rhetorical theory potentially have much in common, specifically in relation to communicative goals and strategies, investigates the above-mentioned areas of enquiry from an information visualisation perspective. A comparative analysis of aesthetics and rhetorical theory, as applied to visualisation examples, is thus used as an initial probe into whether a combined aesthetic-rhetorical framework may be developed.

1.5   Overview of chapters

Chapter Two is divided into three parts and provides an overview of basic concepts and areas of practice. Firstly, the terms 'data' and 'information' are investigated along with how information is processed and communicated. Secondly, information visualisation as an area of practice is investigated by considering both historical perspectives and new trends in the field. In order to prevent confusion in terminology, the field is demarcated, and differences from related fields such as scientific visualisation and information graphics are explained. For the purpose of this study, information visualisation is shown as situated as a specialist practice within the broader field of information design. Lastly, the emerging field of 'information aesthetics' is defined and explored in order to provide a point of departure for investigating

aesthetics in information visualisation. Visual examples are showed throughout this chapter in order to orientate the reader and clarify certain concepts.

Chapter Three consists of three sections. Firstly, traditional and contemporary theories on aesthetics are explored in order to expose the main recurring themes throughout. These themes include: aesthetics as sensory perception; as related to beauty; a manifestation of order or unity; skilled performance; and aesthetics as engaging experience. Secondly, specific attention is paid to aesthetics in a design context, exploring the relationship between aesthetics and functionality as approached from different perspectives. Lastly, aesthetics theories are applied to an information visualisation example in order to illustrate how the qualities identified add to a visualisation's aesthetic.

Chapter Four explores rhetorical theory with a specific focus on Aristotle's three rhetorical appeals (*logos*, *pathos* and *ethos*). Rhetoric is first defined in terms of its classical origins in Greek oratory, after which it is considered and applied to contemporary visual contexts. The possibility of considering information visualisations as rhetorical arguments is investigated. The last part of this chapter applies each of Aristotle's three modes of persuasion to information visualisation examples in order to identify qualities that add to visualisations' persuasiveness.

Chapter Five looks at the theory covered in Chapters Three and Four and considers the potential links between design aesthetics and Aristotelian rhetoric as applied to a seminal information visualisation example. The potential areas of divergence between aesthetics and rhetorical theory are explored first in an attempt to identify why theories are traditionally considered separately. This leads to certain conditions being established under which reasonable comparisons may be made between aesthetics and rhetorical theory. At the end of this chapter, an initial combined framework of aesthetics and rhetorical theory is proposed and the potential value of such a framework is considered.

Chapter Six provides a summary of the preceding chapters and outlines the overall contributions made by the study. Limitations of the study are identified and suggestions for further research are made. The study finishes with concluding remarks that point towards related contemporary issues in design discourse that may benefit from a more integrated approach to communication supported by this study.

CHAPTER TWO

INFORMATION VISUALISATION AND 'INFO-AESTHETICS'

In order to explore aesthetics and rhetoric in the context of information visualisation, it is first necessary to clarify what information visualisation is and how it fits into the broader information design field. Van Wijk (2005:79) explains that information visualisation is an ambiguous term that can refer to "the research discipline, to a technology, to a specific technique, or to the visual result". Furthermore, various practitioners from a variety of fields have presented data visually in different ways and for different purposes; therefore, the field of information visualisation is not easy to define or delineate.

The following discussion starts by defining the nature of information visualisation from a historical perspective. Because the scope of information visualisation practice is widely debated, information visualisation is explored alongside related practices and is ultimately framed in terms of the broader field of information design. The second part of the chapter explores new developments and trends in information visualisation, especially in terms of how the field has opened up to non-expert visualisation practitioners. The emerging field of information aesthetics or 'info-aesthetics' is then investigated. Various mixed reactions towards the aesthetics of visualisations are considered in order to further illustrate the importance of studying aesthetics in greater depth in relation to information visualisation (Chapter Three).

2.1   Information visualisation

Information visualisations are essentially external cognitive aids (Card, Mackinlay & Schneiderman 1999:1) that assist in the process of understanding, through visual presentation. Nathan Shedroff's model, *An overview of understanding* (Figure 1), illustrates this process of understanding and sheds light onto how information is processed and communicated. Shedroff's diagram explains the process of understanding as a "continuum from data to wisdom". Data is the most basic building block, and as Shedroff (2001:28) explains, exists without a context and has "nothing to teach us". According to Frieder Nake (2002:49), in computer processes and systems, one only finds data and nothing more, as it is only the human user who can create context and turn signals into signs and thus data into information and knowledge. It is thus the visualiser or designer who, through the process of organising and presenting data, changes or at least "shapes" its meaning and converts it into information (Shedroff 2001:28). In other words, information is mediated data or data put within a context (Dürsteler 2007:[sp]).
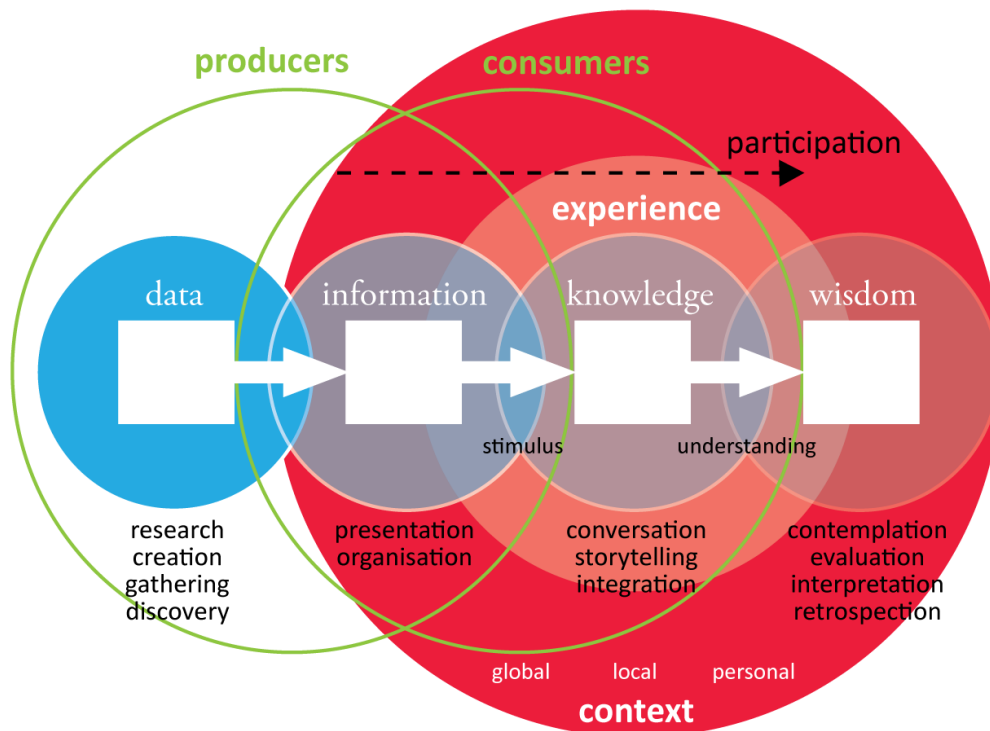
Figure 1: An overview of understanding.
(Shedroff 1994:15; 2001:27).

Further along Shedroff's continuum, information is converted into knowledge, which can be described as integrated information, where experience allows for seeing patterns and different perspectives. Knowledge is "more casual than information, and the experiences that create it are more personal" (Shedroff 2001:29). Shedroff (1994:5) identifies various types of experiences, from general to more personal. One therefore finds different levels of knowledge, with 'global knowledge' being more general, since it is shared, and 'personal knowledge' more unique to individuals. Shedroff (1994:4, 5) explains how "knowledge is communicated by building compelling interactions with others" and that "knowledge is a fundamentally participatory level of communication". As indicated by the first green circle (labelled 'producers'), designers or visualisers do not have complete control over the internal process of gaining knowledge (indicated by the second circle, 'consumers'). According to Carl DiSalvo (2002:69), "information is not knowledge" and that "this is something that, after our much-heralded launch into the 'Information Age' we are beginning to acutely realise".

Dürsteler (2007) interprets Shedroff's diagram and contends that only information that is interesting enough to elicit interaction will be converted into knowledge. Shedroff places an 'experience' circle around the process of gaining knowledge, which, according to Dürsteler (2007), outlines the importance of "experience design" in building knowledge in the most effective way. According to DiSalvo (2002:70), it is the "meaningful interaction with and action upon this information ... that transubstantiates it in to what we will call knowledge". Jane Suri (2004:13) explains that design practice is moving in a new direction of designing 'experiences' instead of merely products. Design practice is "asked to influence not

just the look and feel of individual things, but the quality of experience that people have as they live their lives through time and space, encountering the designed world" (Suri 2004:13).

Finally, according to Shedroff (2001:29), wisdom is the most advanced level of understanding where patterns and meta-patterns enable people to apply the knowledge they have gained in novel situations. Shedroff (2001:29) contends that that the sharing of wisdom is nearly impossible since it comes from within, after a "process of introspection, pattern-matching, contemplation, retrospection and interpretation". Wisdom is thus the most "vague and intimate level of understanding" (Shedroff 1994:5). Although information visualisations cannot directly lead to the gaining of knowledge and wisdom, it is possible to argue that certain engaging visualisations encourage the higher level processes by creating more interactive and meaningful experiences.[1]

Lev Manovich (2010:[sp]) defines information visualisation as the "mapping between discrete data and a visual representation". This broad definition leaves room for a wide range of visualisations and different approaches to the practice. There are many different types of information visualisations including graphs, diagrams, maps and an increasing amount of more integrated and innovative approaches. According to Manovich (2010:[sp]), there are two key principles in information visualisation, namely 'reduction' and 'space'. Arguably, for something to be classified as an information visualisation, it needs to reduce complex data into averages or simplified values.[2] These simplified bits of data are then presented as graphical primitives such as points, lines or shapes. The second principle is that this data is presented in terms of spatial variables, or in other words through position, shape, size and movement. Other visual variables such as colour and tonal value are also utilised, but spatial variables are typically privileged in information visualisation due to the nature of human visual perception[3] (Manovich 2010:[sp]). This relates to Van Wijk's (2005:79) view on visualisation as enabling viewers to obtain insight into data sets in an "efficient and effective way, thanks to the unique capabilities of the human visual system, which enables us to detect interesting features and patterns in a short time".

According to Ware (2000:2), there are a number of advantages that visualisation offers over textual information. Firstly, information visualisation has the ability to make huge amounts of data comprehensible and succinct. Secondly, visualisation "allows the perception of emergent properties that were not anticipated". Thirdly, on a more practical level, any problems with the data become immediately apparent the moment it is visualised, thus serving as a quality control measure. Another important advantage is the fact that visualisation creates understanding of both "large-scale and small-scale features" of data, or in other words context or overview as well as a more specific focus. Lastly, Ware (2000:2)

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[1] This study focuses particularly on the experiential nature of information visualisations in relation to aesthetics and rhetorical theory.

[2] Manovich (2010:[sp]) explains how a new method of 'direct visualisation' is emerging, where data does not need to be reduced or simplified but may be used directly. This is due to advancing technology and increased processing power of computers. For the purpose of this study however, the more traditional principles of 'reduction' and 'space' remains relevant.

[3] Spatial characteristics, such as distances to and between objects, and the shapes of objects, are crucial to daily existence and are as such also used as the primary carriers of meaning in visualisation artifacts.

states that, due to the above processes, visualisation assists in the formation of hypotheses. Even though these are important benefits, Ware does not go into detail about the communicative value of information visualisation.

According to Card *et al* (1999:1), the use of visualisation, as external cognitive aid, serves two basic purposes: to "create or discover the idea in itself" and to communicate an idea. Researchers may, for instance, make use of visualisation techniques in order to help them make sense of data, by identifying patterns and seeing relationships in the data. This serves to create or discover concepts that were previously unknown or only hypothesised. The other purpose is then to communicate these findings to others, in order to demonstrate the patterns and provide evidence of certain conclusions.[4] Visualisations can be particularly powerful communicative and persuasive tools. According to Hall (2008:123), some visualisations seem to "have a profound effect on society, changing the course of government policy, scientific research, funding and public opinion". It is the latter purpose of information visualisation – the communicative and persuasive intention – that is the major focus of this study.[5]

2.1.1   *Historical overview*

Ware (2000:1) observes that even though 'visualisation' originally refers to the construction of a mental picture, the common understanding of the term has become "a graphical representation of data or concepts". There are commonly two broad understandings of the term 'information visualisation'. Theorists such as Van Wijk (2005) and Card *et al* (1999) argue that information visualisation is a distinctly new field that has emerged over the last twenty years, with practice rooted in the use of computers. Card *et al* (1999:7) define information visualisation as "the use of computer-supported, interactive, visual representations of abstract data to amplify cognition". Other theorists such as Tufte, Dürsteler and Manovich explore information visualisation in terms of its broader application. According to Dürsteler (2002:[sp]), information has been visualised throughout the history of humanity, and that even though the transformation of data into information has been enormously facilitated by the computer, it does not require it. Thus, in broad terms 'information visualisation' could refer to any type of information that is represented in a graphic way instead of textually (Vande Moere 2005:32). This study accepts the broader definition of visualisation since regardless of whether visualisations are produced digitally or not, the purpose remains the same: to help make sense of large amounts of data and complex information.

Manovich (2010:[sp]) explains that even though we can visualise much larger data sets with the use of computers (as well as animate them or have them unfold interactively over time), the basic principles of visualisation have remained the same since the nineteenth century. He specifically refers to the rise of social statistics in the mid eighteenth century as having a direct link to the development of visualisation

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[4] It is possible to argue that there is a distinction between data visualisation as concerned with the analysis of 'raw' data and information visualisation as more concerned with the presentation of information, but in general data visualisation and information visualisation are used interchangeably.

[5] This is explored further in Chapter Four in terms of how rhetoric is used in visualisation.

practice (Manovich 2010:[sp]). Scholars such as Florence Nightingale, William Playfair, John Snow and Charles Joseph Minard were collecting numbers, calculating averages and representing statistical data from the early nineteenth century onwards, and are often cited by theorists such as Manovich (2010), Tufte (1983, 2006) and Pritchard (2010).

According to Horn (1999:17), Playfair established the use of various types of graphs and charts and "popularised their use through his writings on political and economic topics" such as his *Commercial and political atlas* (Figure 2) published in 1786 (Manovich 2010:[sp]). Another early example is Nightingale's *Diagram of the causes of mortality in the army in the East* (Figure 3) (1858) that shows further development in the use of charts. Nightingale is often "credited with inventing new types of statistical graphs and being one of the first to use information design in a public policy report" (Horn 1999:17).
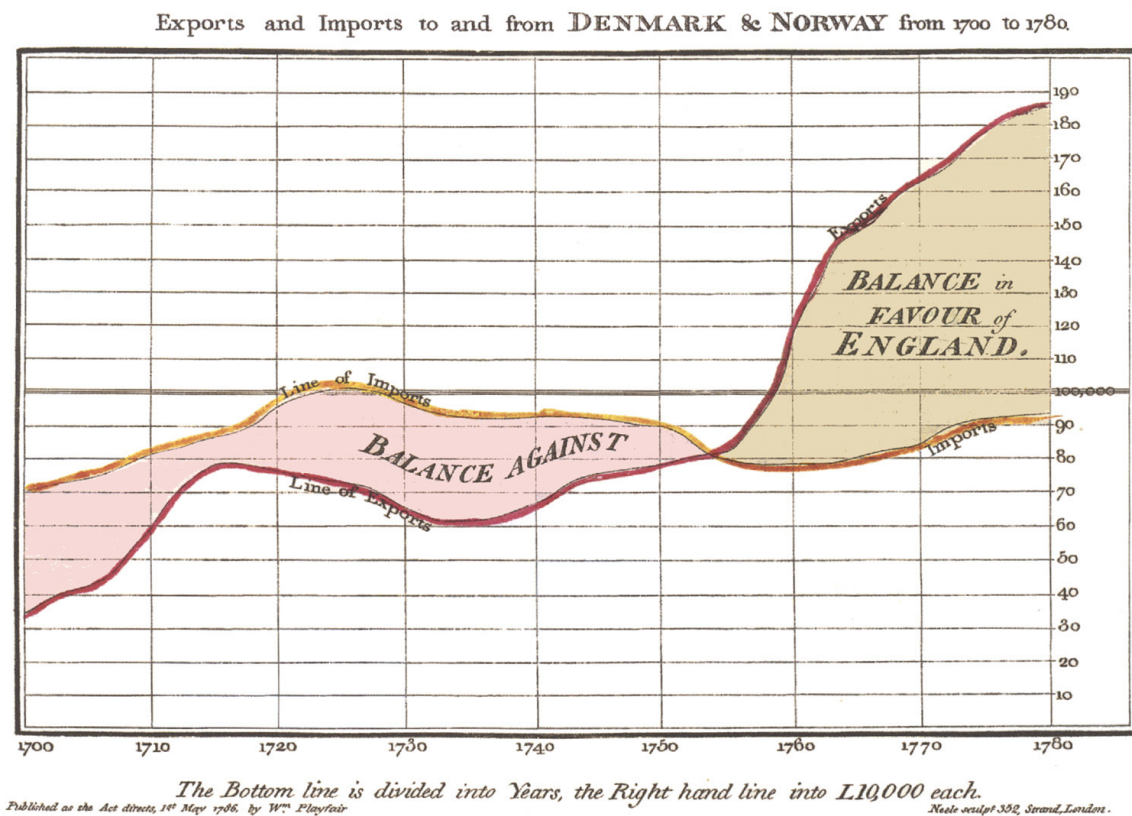
Figure 2: William Playfair, *Commercial and political atlas*, 1786.
(William Playfair 2011).
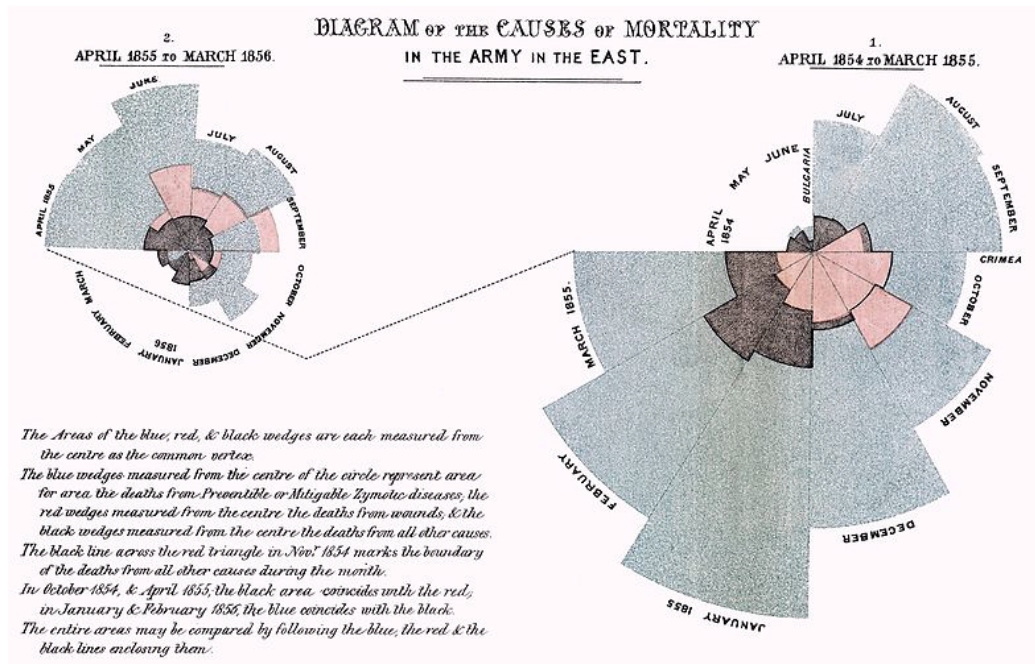
Figure 3: Florence Nightingale, *Diagram of the causes of mortality in the army in the East*, 1858.
(Florence Nightingale 2011).

Minard's map *Carte Figurative* (Figure 4) (1869) is cited by theorists such as Tufte and Manovich as a seminal and innovative early example of information visualisation. The map depicts Napoleon's march to Moscow in 1812 which was famous for its disastrous consequences. According to Tufte (2006:125), Minard's map combines "vivid historical content and brilliant design ... to make this one of the best statistical graphics ever". Napoleon's Russian invasion is presented according to a range of variables such as time, geographic location, number of soldiers, direction of movement and temperature. Tufte (1983:40) describes the chart as follows:

> Beginning at the left on the Polish-Russian border near the Niemen River, the thick band shows the size of the army (422 000 men) as it invaded Russia in June 1812. The width of the band indicates the size of the army at each place on the map. In September, the army reached Moscow, which was by then sacked and deserted, with 100 000 men. The path of Napoleon's retreat from Moscow is depicted by the darker, lower band, which is linked to a temperature scale and dates at the bottom of the chart. It was a bitterly cold winter, and many froze on the march out of Russia. As the graphic shows, the crossing of the Berezina River was a disaster, and the army finally struggled back into Poland with only 10 000 men remaining.

According to Tufte (1983:177), this graphic is an excellent example of aesthetics both in terms of sophisticated form and meaningful content. Since this is such a seminal visualisation example, it is used throughout the analysis of aesthetics and rhetorical theory in Chapter Five.
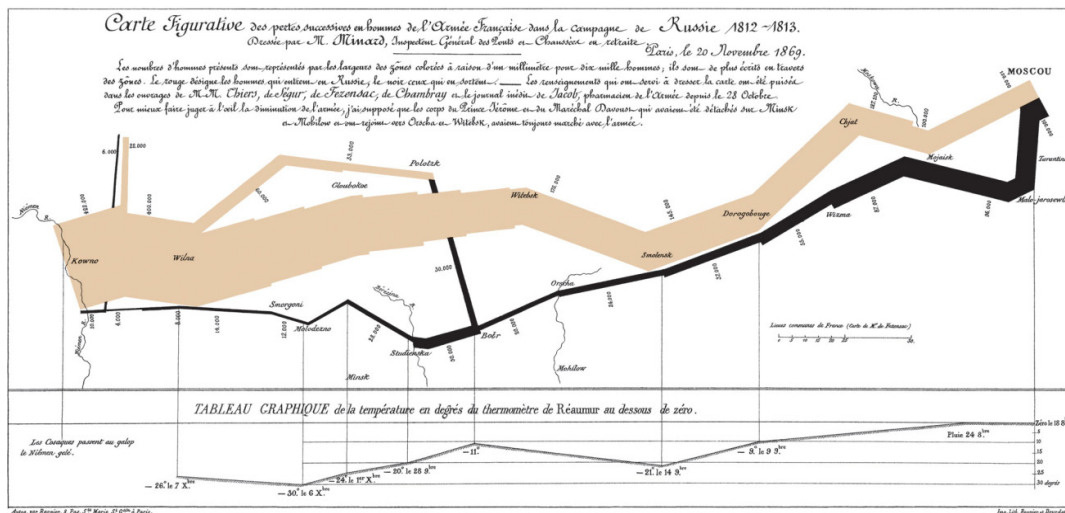
Figure 4: Charles Joseph Minard, *Carte Figurative*, 1869.
(Charles Joseph Minard 2011).

Towards the end of the nineteenth century, the United States statistical atlases[6] were published, utilising a variety of visualisation methods that are still in use today, such as pie charts and bar graphs. Charles Kostelnick (2004:216) explains that statistical atlases became very popular around 1870 in the United States and that they stand out as a "landmark in information design". These first statistical atlases played a "pivotal role in the development of conventional forms to represent data, forms that we now largely take for granted" (Kostelnick 2004:16). Kostelnick (2004:217) further explains how the statistical atlases to a large extent helped to shape attitudes concerning United States public policy around that time, completely transforming "the design and reception of census data, making them more compelling and comprehensible to the public". The example seen below (Figure 5) represents the distribution of 'idiots' (mentally challenged people) across the various states. Many of these data display types became conventional genres in visualisation practice (Kostelnick 2004:225).

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[6] The original series consisted of six statistical atlases visualising data gathered in the United States national censuses from 1870 – 1920 (Kostelnick 2004:217).
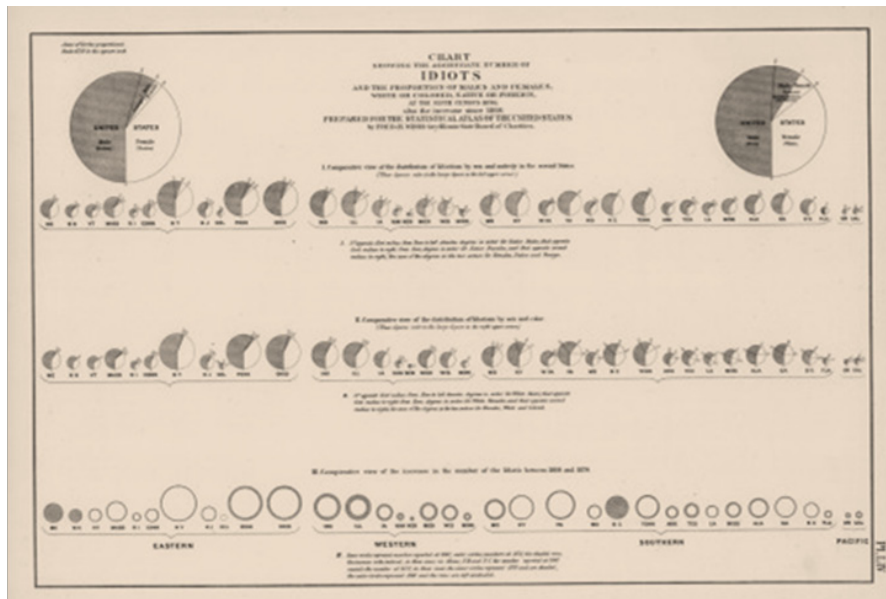
Figure 5: Francis A Walker, *Statistical atlas of the United States*, 1870.
(Flowing Data 2010).

With the advent of computers in the late twentieth century, computer scientists and software engineers became the most common practitioners of information visualisation. Today, however, with the development of new tools and technologies, information visualisation practice has become more accessible to designers not originally trained in the computer science fields. Once again, it is the rise of social statistics that has fuelled the development and popularisation of information visualisation practice, but currently in the form of online statistics, along with accessibility and the ease of use of visualisation software. Visualisations termed as 'casual', 'artistic' or 'information aesthetic' are emerging as sub-fields that aim at creating representations that are more pleasurable and encourage "insight discovery in an engaging and educational experience" for the average lay-person (Vande Moere 2008a:470). This move away from the scientific or specialist community towards a mass audience is where information design and visualisation start to overlap. According to Manovich (2010:[sp]), three hundred years after Playfair's recognition of the power of information visualisation, others are "finally getting it".

2.1.2   *Demarcating the field of information visualisation*

Various terms such as 'data visualisation', 'scientific visualisation', 'information architecture', 'information visualisation', 'information graphics' and 'information design' are used interchangeably and can potentially become confusing. While there are no clear boundaries, some general differences can be identified. In this section, scientific visualisation and information graphics are compared to information visualisation, after which the relationship between information visualisation and information design is explored.

Manovich (2010:[sp]) explains the main difference between scientific visualisation and information visualisation as a difference in the 'cultures' of science and design. While distinctions are not always clear, he explains that scientific visualisation developed alongside 3D computer graphics, while information

visualisation developed in tandem with 2D graphics software (Manovich 2010:[sp]). Vande Moere (2005:32) makes a similar distinction and explains that information visualisation is identified by its representation of abstract data as opposed to physical data. Abstract data is "characterised by its lack of a natural notion of position in space", and includes data sets such as "financial models, textual analysis, transaction data and network traffic" (Vande Moere 2005:32). Vande Moere states that information visualisation "clearly differs from (scientific) visualisation of physical data" which directly relates to spatial layout. Examples of physical data represented spatially may include "geographic layouts, architectural plans or medical imaging" (Vande Moere 2005:32). It is, however, possible and common to see both abstract and physical data combined in the same visualisation.

Similarly, there are also distinctions between information visualisation and information graphics. The term 'information graphic' generally refers to visual representations of already processed information that is more physical or spatial in nature and makes use of images, symbols or other representational graphics. Examples of information graphics would include instructional graphics, or explanatory layouts, where words, numbers and images are often used in combination to communicate a certain concept or process. *Left vs. right worlds* (Figure 6) by McCandless and Prosavec, is an example of an information graphic.[7]
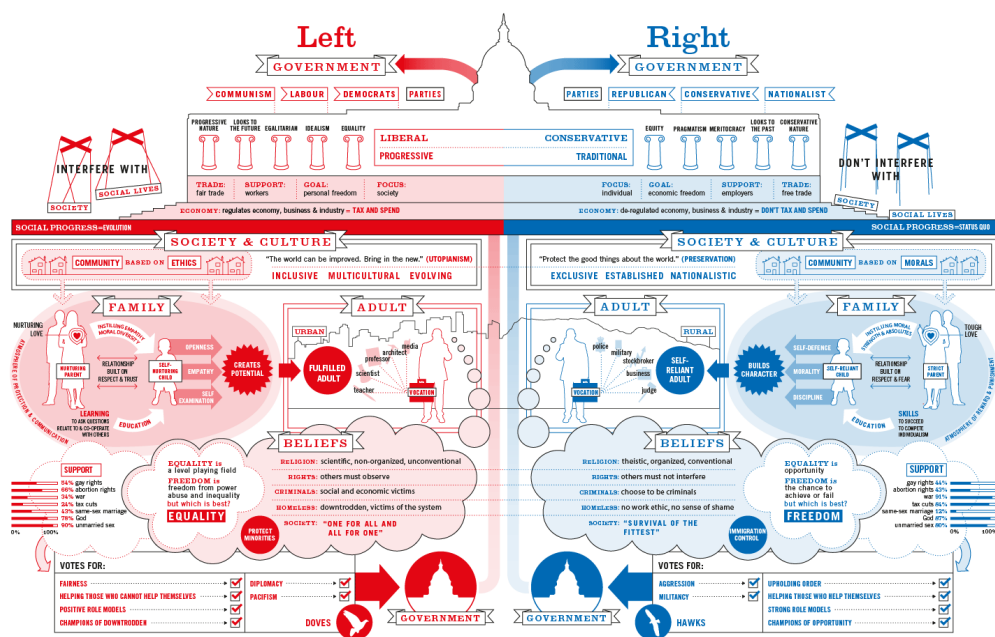
Figure 6: David McCandless & Stefanie Prosavec, *Left vs. right world*, 2010.
(McCandless 2010b).

Information visualisations are generally perceived to be representations of more abstract data. According to Lau and Vande Moere (2007:87), information visualisation "aims to amplify cognition by developing effective visual metaphors for mapping abstract data". The products of information visualisation, as can

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[7] McCandless' books *The Visual Miscellaneum* (2009) and *Information is Beautiful* (2010) shows a variety of examples that mostly fit the information graphic description.

be seen in *The shape of globalisation* (Figure 7) by Christina van Vleck, generally do not contain recognisable forms, symbols or images, but rather abstract elements such as dots, lines and shapes.
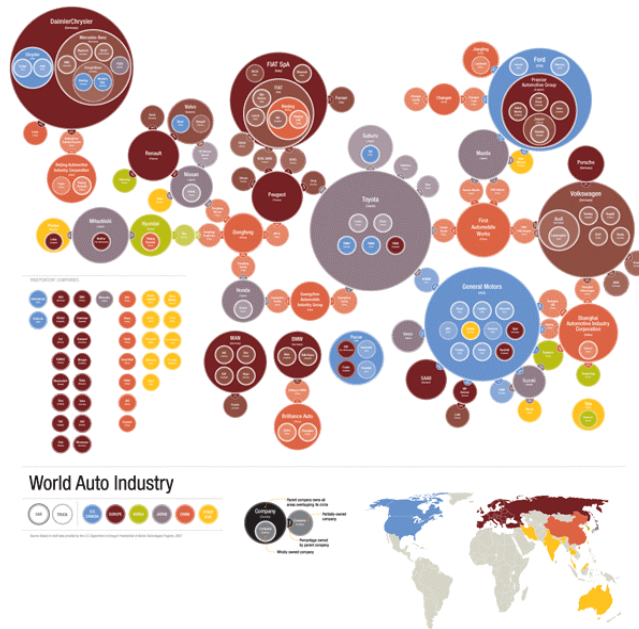
Figure 7: Christina van Vleck, *The shape of globalisation*, 2007.
(Van Vleck 2007).

The distinctions between scientific visualisation, information graphics and information visualisation provide a better understanding of the various sub-categories of visualisation. For the purpose of this study, information visualisations that focus specifically on the representation of abstract data are explored (in other words not scientific visualisations or information graphics). The reason for this specific focus lies in the way abstract data relies on creative metaphors in order to be represented spatially. Information visualisation assists in cases where data is neither accessible nor easily understandable due it its abstract nature, by revealing patterns and showing connections between different aspects of the data.

Information visualisation is thus challenged to creatively uncover the structure of abstract non-spatial data and to represent it within space (Vande Moere 2005:32). The abstract is often made more tangible through the use of visual metaphors, since they are powerful aids to human thinking (Van Heerden 2008:5). Vande Moere (2005:36) explains how metaphors in visualisations help users to understand systems in conceptual terms that they are already familiar with. This explains why "natural and cultural environments" are excellent sources of inspiration when finding metaphors for representing complex data (Judelman 2004:1). *Literary organism* by Stefanie Prosavec (Figure 8) is a visualisation of the classic novel *On the road* by Jack Kerouac, that presents the content of the book holistically through the use of a visual metaphor. The visualisation makes use of a tree metaphor: the main branches indicate various chapters; sub-branches show paragraphs, sentences, and ultimately breaks the book down to individual words. The visualisation aims at uncovering the structure and patterns within the book, with various themes indicated

in various colours. The viewer can thus get a quick overview of trends in the book regarding themes as well as length of various sections.
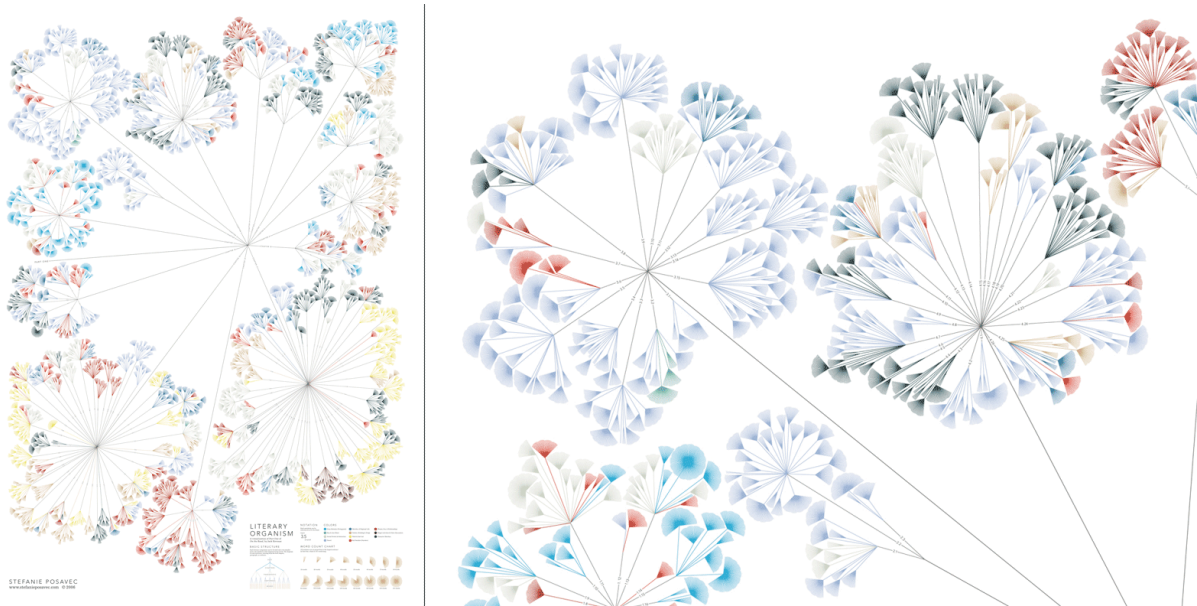
Figure 8: Stefanie Prosavec, *Literary Organism*, 2008.
(Notcot 2008).

Literary Organism is a particularly striking example and is often considered to be an 'aesthetic information visualisation'.[8] It presents information through abstract and creative metaphors which can be more appealing, engaging and encouraging in terms of new exploration (Vande Moere 2005:36). This emerging practice of information aesthetics is explored in more depth shortly.

2.1.3   *Framing information visualisation within the broader field of information design*

According to Manovich (2010:[sp]), information design starts with the data that already has a clear structure, whereas information visualisation aims to discover the underlying structure of raw data. In other words, he describes information design as dealing with information, and information visualisation as dealing with data (Manovich 2010). Even though Manovich acknowledges that not all examples would fit such distinctions, he maintains that the two fields are different in terms of their functions. It may thus be possible to argue that information visualisation is highly concerned with data analysis whereas information design and information graphics are more concerned with visual presentation. When considering the differences between data and information (as outlined by Shedroff) it is, however, possible to argue that a distinction should rather be made between data visualisation and information visualisation. Information visualisation, as concerned with the organisation and presentation of information, therefore falls within the domain of information designers.

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[8] Prosavec's *Literary Organism* has been showcased on the *Information is beautiful* and *Infosthetics* websites.

Vande Moere (2005) also investigates the links between visualisation and the design disciplines in his article *Form follows data*. According to Vande Moere (2005:33), designers often unconsciously use information visualisation throughout their work and process, which consists of "preparation, investigation and analysis" in order to reach design decisions. In other words, design is not only responsible for the presentation of information, but also for the preparation and organisation of the collected data into more meaningful information. Vande Moere (2005:33) explains that since the term 'information architecture' was used by Wurman in 1976, "many conceptual connections between architecture, design and information handling have emerged". There is a relationship between information architecture, information design and information visualisation in that all of these aim to make information more accessible and understandable through processes of organisation and presentation. Information architecture can be defined as the "structural organisation and effective presentation of data into valuable and meaningful information" (Vande Moere 2005:34). However, information architecture focuses largely on structural rather than presentation issues, and thus differs from information visualisation and information design in this regard (Vande Moere 2005:34). Even though information designers may be involved at the very early stages of data analysis, they are typically highly concerned with presentation and communication of information.

Shedroff (1994:1) states that information design "addresses the organisation and presentation of data: its transformation into valuable, meaningful information". Robert Horn (1999:16) expands on this definition and explains how information design has emerged as a profession because large amounts of information need to be managed and presented "to the right people at the right time, in the most effective and efficient form".[9] Practitioners from a variety of fields work in the broader field of information design, often resulting in a confusion of terminology and scope (Horn 1999:17). For instance, there is often confusion concerning the differences between information design and graphic design. Ware (2000:xviii) for instance identifies a link with graphic design by explaining that information visualisation can be approached in three main ways – in "the art-school tradition of graphic design", "within computer graphics as an area concerned with the algorithms needed to display data", or "as part of semiotics, the constructivist approach to symbol systems" (Ware 2000:xviii). Ware does not, however, refer to the discipline of information design, which can be seen as a broader discipline that combines a variety of these approaches. According to Schuller (2007:[sp]),

> Information design is the transfer of complex data to, for the most part, two-dimensional visual representations that aim at communicating, documenting and preserving knowledge. It deals with making entire sets of facts and their interrelations comprehensible, with the objective of creating transparency and eliminating uncertainty.

Romedi Passini (1999:85) provides an apt explanation of the differences between graphic design and information design. He believes that graphic design tends to emphasise appearance and the "expression

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[9] Perhaps it should be noted that the precise criteria used to determine what is most 'effective' or 'efficient' are subjective and therefore up for debate.

of contemporary aesthetic values" whereas information design focuses on both form and content with a particular emphasis on research as part of the design process (Passini 1999:85). Information design is characterised by its interdisciplinary approach to communication, drawing from a variety of disciplines such as "typography, graphic design, applied linguistics, applied psychology, applied ergonomics, computing and other fields" (Walker & Barratt 2009:[sp]). To some extent this relates to Vande Moere's (2005:32) description of information visualisation, as a "distinct academic field that is inspired by the fields of computer science, psychology, semiotics, graphic design, cartography and art".

From the above definitions one can gather that information design and information visualisation share very similar goals, but that information design seems to be a broader discipline. For the purpose of this study, information visualisation is thus situated as a specialist practice within the broader field of information design.[10] Once again, it is important to point out that some information visualisations aim to analyse data, while others are more focussed on presenting and communicating information to an audience. Even though information designers may be involved in analysis of data, this second function of communication is arguably where the information designer plays the biggest part. Information designers are trained in the art of communication (which incorporates aesthetics and rhetorical theory). Accordingly, examples that focus on the presentation of information for communication purposes are shown throughout the study.

2.2 The emerging field of info-aesthetics

Along with the previously mentioned example by Prosavec, *Literary organism*, a whole series of information visualisations have appeared under the label of 'information aesthetics' or 'info-aesthetics'. The following section investigates what this term means as well as the context surrounding the practice.

2.2.1 Defining 'information aesthetics'

The term 'info-aesthetic'[11] appeared in an online manifesto by Lev Manovich in 2001, entitled *Info-aesthetics*. This manifesto has inspired researchers from various fields to explore the concept of aesthetics within the realm of information visualisation. Manovich (2001:[sp]) argues that a "new aesthetics already exists in information interfaces and information tools that we use in everyday life" such as "simulation, visualisation and databases" and that these are the "new cultural forms of information society".

The last few years have seen an increased interest in the aesthetics of information visualisations. Innovative work is being done by institutions such as the MIT Aesthetics and computation group, under

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[10] Even though information graphics could also be situated within the broader practice of information design, it is not part of the particular focus of this study.

[11] The term 'information aesthetics' appeared during the 1950s in Max Bense's information theories (Lau & Vande Moere 2007:88), but as used then was more closely related to mathematical and computational aesthetics (Scha & Bod 1993[sp]). Manovich's definition of "information aesthetics" is thus explored in the context of this study, as it is more closely related to the field of information visualisation.

the leadership of John Maeda and Ben Fry.[12] The Aesthetics and computation group describes itself as working towards "the design of advanced system architectures and thought processes to enable the creation of (as yet) unimaginable forms and spaces" (Aesthetics + computation group: MIT media laboratory [sa]). The concern with aesthetics can also be seen in the increasing amount of so-called 'aesthetic visualisations' being showcased on websites such as *infosthetics.com* (Figure 9)*, visualcomplexity.org* (Figure 10) and *flowingdata.com,* and in books like *Beautiful evidence* (Tufte 2006), *Data flow* (Klanten *et al* 2008), *Information is beautiful* (McCandless 2010) and *Beautiful visualisation* (Steele & Iliinsky 2010). Another example is the annual SIGGRAPH[13] conference, which allocated an entire section of the exhibition to the field of 'information aesthetics' in 2009. SIGGRAPH aims at highlighting this field in "recognition of the increasingly prominent role that information visualization and data graphics are assuming in our digitally mediated culture" (Information aesthetics showcase 2009:[sp]).
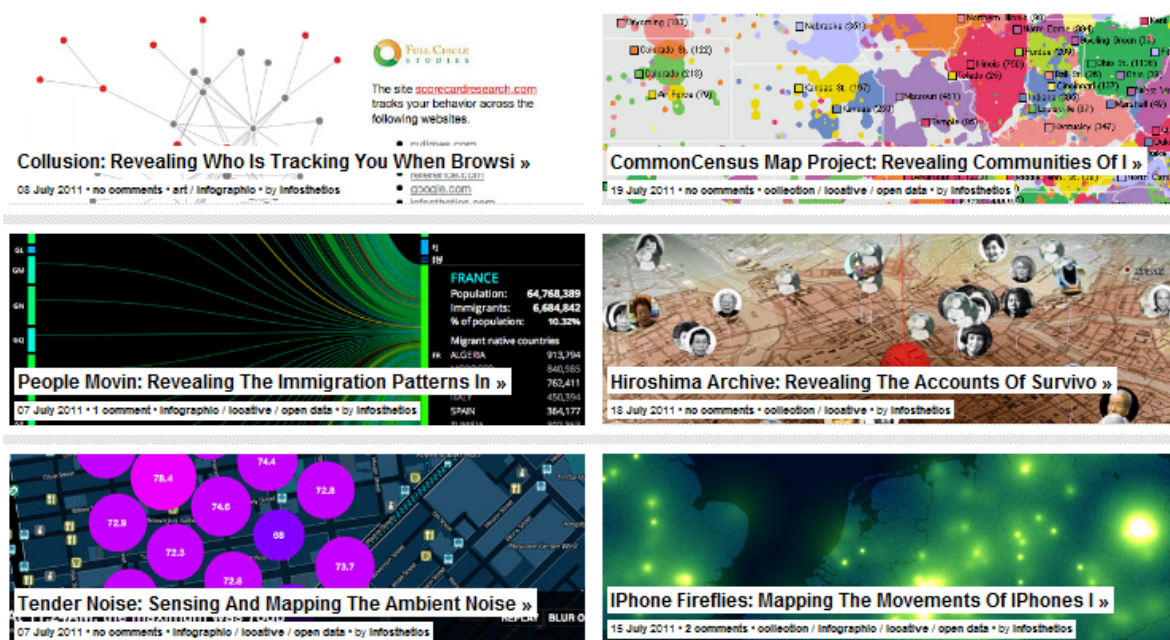
Figure 9: *Information aesthetics website screen shots,* 2011.
(Information aesthetics 2011).

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[12] Ben Fry is an influential figure within the visualisation community and created, along with Casey Reas, an open source software application, *Processing*, which has had a significant influence on the democratisation of visualisation practice (Processing overview [sa]).
[13] SIGGRAPH is a five-day interdisciplinary international exhibition on computer graphics and interactive techniques. SIGGRAPH 2009 was held in New Orleans, Louisiana.
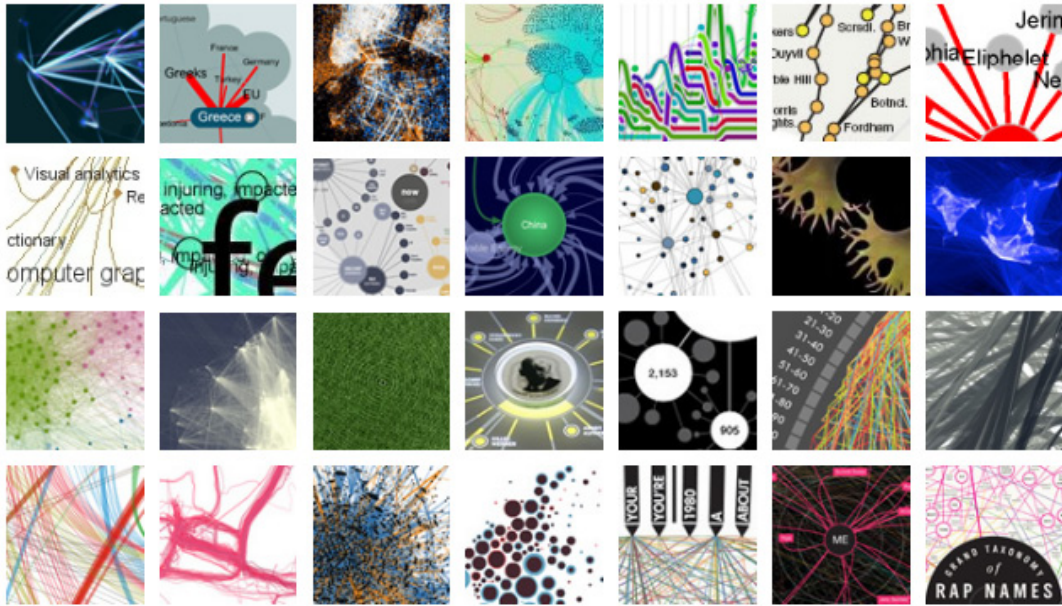
Figure 10: *Visual complexity website screen shot*, 2011.
(Visual complexity 2011).

In order to gain a better idea of information aesthetics, one can look at the popular examples of work by Moritz Stefaner and Boris Mueller, which were included at the 2009 SIGGRAPH conference. *Well-formed Eigenfactor* (Figure 11) by Stefaner explores the emerging patterns in scientific citation networks. Stefaner uses four visualisation methods to expose patterns about the content of research journals from a variety of fields. The result is a thought-provoking set of graphics that create insight into the patterns of research citations and the interrelatedness of various research fields.
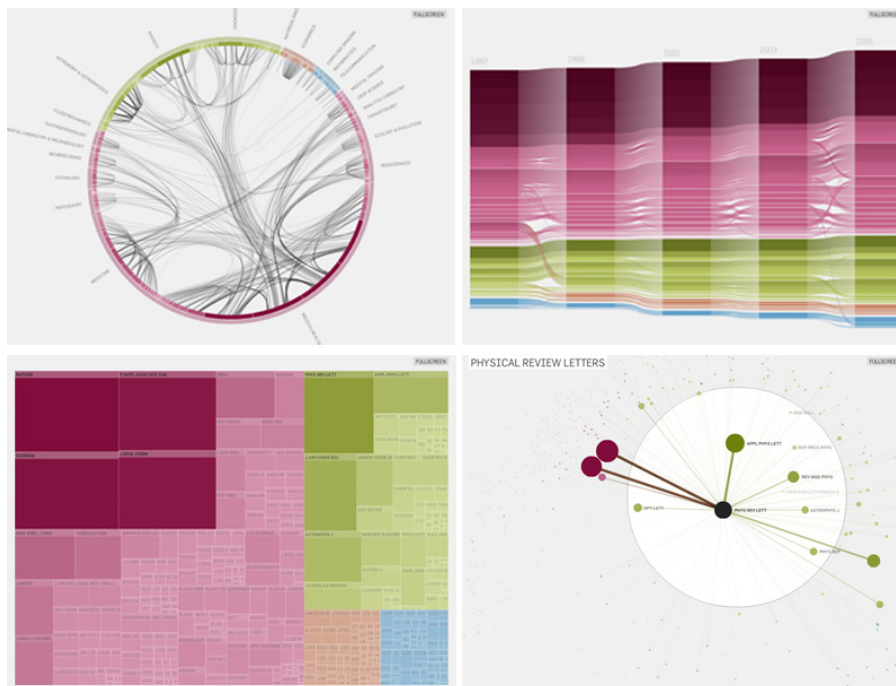
Figure 11: Moritz Stefaner, *Well-formed Eigenfactor*, 2009.
(Vande Moere 2009a:[sp]).

Poetry on the road by Mueller (Figure 12) is a generative design project for a poetry festival in Bremen, Germany. The visualisations represent poetry in a unique an interesting way that bridges the gap between design, computer science and literature (Information aesthetics showcase 2009). Different numbers are assigned to letters of the alphabet and each word is represented by adding these numbers. The numbers are mapped onto a circular graphic, with lines connecting the words as they flow in the poem. The result is a visual identity for the poetry festival that is not necessarily meant to be 'read' from a data perspective, but rather experienced for its aesthetic qualities.
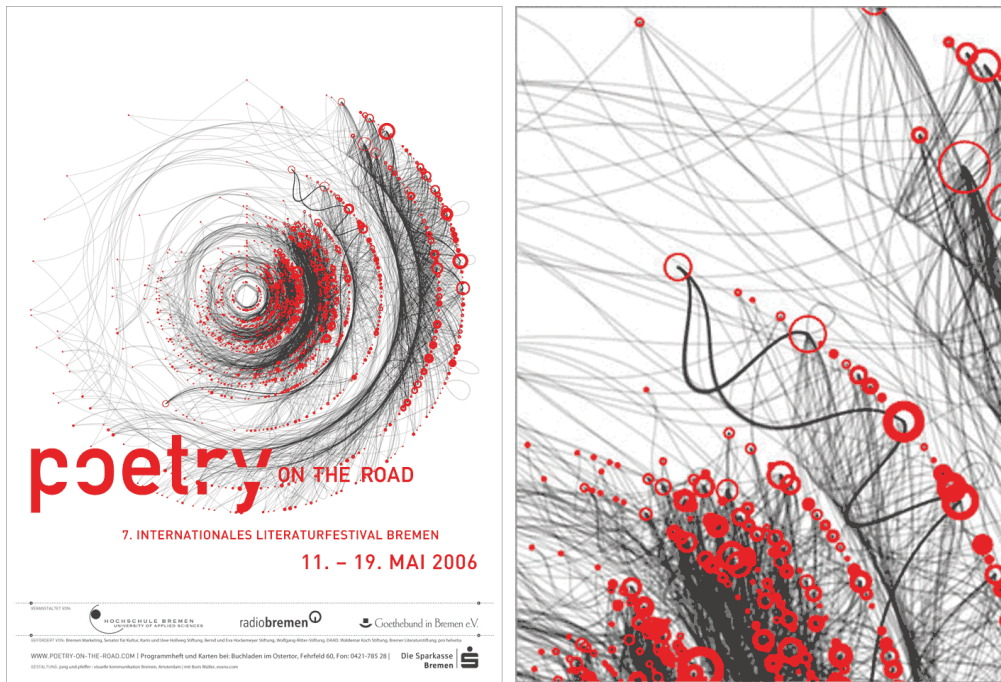
Figure 12: Borris Mueller, *Poetry on the road* poster, 2006.
(Information aesthetics showcase 2009).

Although these projects are labelled as aesthetic, the defining characteristics of 'aesthetic' visualisation remain elusive. In order to increase an understanding of the current interest in aesthetic visualisation, one can look at the development of information visualisation into a more accessible and informal practice, as well as the mutual influences that art and visualisation have had on each other.

2.2.2 *The democratisation of information visualisation practice*

As explained previously, the rise of social statistics along with the easily accessible data and tools, has led to the information visualisation discipline being "pushed in a process of democratisation and mass-media popularisation" (Vande Moere 2008a:470). Major advances in data storage capacity and new easy-to-use software, has lead to everything being chronicled and shared online (Antonelli 2008:21). Fernanda Viégas and Martin Wattenberg (2007:184) explain how new software tools such as *Adobe Flash* and *Processing* allow designers and artists to create visualisations without having been extensively trained in programming or

visual analytics. *Processing*,[14] being an open source application, has further placed visualisation tools in the hands of anyone willing to learn the basics of computer programming (Processing overview [sa]). Furthermore, a new phenomenon, which Robert Hassan (2008:2) calls the "network effect", is emerging, where people are compelled to become a part of information society. There is an urge to become connected in order to be efficient and productive, but also to express individuality (Hassan 2008:2). Paula Antonelli (2008:20) describes this expressive urge to "record and share personal, life-defining moments" as the "source of the proliferations of weblogs and other tagged and mapped meta-diaries".

An example of this need for personal expression can be seen in a poster by the UK design agency, Socket studios (Figure 13), that shows a circular chart of a specific day in the designer's life. The chart indicates time allocated to various activities, such as eating and working. It is a casual and playful expression of personal data, being shared in a creative way. There is no purpose to this graphic beyond sharing insight into the personal life of the designer (and perhaps showcasing design skills). This type of information visualisation is often referred to as 'casual visualisation'.
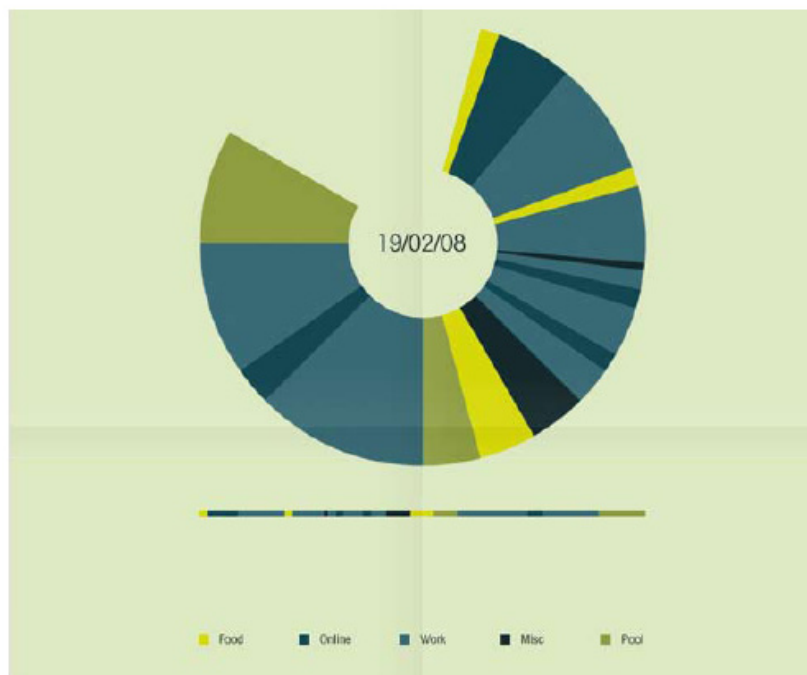
Figure 13: Socket Studios, *19-02-08*, 2008.
(Socket studios [sa]).

Zachary Pousman, John Stasko and Michael Mateas (2007:2) describe various cases of information visualisation that are on the periphery of the discipline, where visualisations are not typically designed for work situations or functional considerations, but rather to view and manage data that is more personally important to individuals. Pousman *et al* (2007) identify various kinds of casual information visualisation such as 'ambient', 'social', 'artistic' and 'personal' information visualisation. 'Ambient' visualisation aims at displaying data in an aesthetic way within an environment, thus creating a certain ambiance. These types

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[14] This is available for download at www.processing.org.

of displays are typically not interactive but mainly focus on creating an aesthetic experience. 'Social' information visualisation typically provides representations of online communities, social processes or situations. According to Pousman *et al* (2007:3), 'artistic' information visualisation (or data art) refers to objects of reflection that are mainly aimed at challenging preconceptions. These artistic visualisations often "evoke curiosity, puzzlement, or even frustration", although "many of them are beautiful" as well (Pousman *et al* 2007:3).

Pousman *et al* (2007:5) identify four main differences between traditional information visualisation and casual information visualisation. Firstly, in casual visualisations, there is an enlarged user population with a wide spectrum from "experts to novices". The creators of these visualisations do not need to be information analysts and are often not trained in fields of information visualisation, but rather in other design disciplines. Secondly, the patterns of use are different because it is separate from work situations. Casual visualisations are often contemplative in nature and may be created over long periods of time. Thirdly, the types of data explored in casual visualisations are usually more personally meaningful and often more subjective in approach. Lastly, Pousman *et al* (2007:5) also propose that "different kinds of insight" are supported by casual information visualisation such as "awareness insights, social insights and also reflective insights". They explain how casual information visualisation systems are often more ambiguous and equivocal in their depiction of data, leading to multiple interpretations of the underlying data (Pousman *et al* 2007:6). Furthermore, the insights gained from interpretation may be seen as useful in a broader sense, as opposed to the utilitarian function of more traditional information visualisation (Pousman *et al* 2007:7). In other words, casual information visualisation systems may be less "productivity focussed", but rather focussed on "visceral appeal (emotionally or aesthetically focussed)" or "reflective appeal (higher cognitive processes)" (Pousman *et al* 2007:7).

According to Eric Rodenbeck (in Manovich 2010:[sp]), information visualisation "is becoming more than a set of tools, technologies and techniques for large data sets. It is emerging as a medium in its own right, with a wide range of expressive potential". Many designers and new media artists are currently exploring the potential of visualisation within their own disciplines. The following South African example, a calendar for the company Research Surveys (Figure 14), utilises the medium's expressive potential. Even though it would not be considered a casual information visualisation, since it was produced for a commercial client, the purpose of the visualisation is not to be read or analysed in the traditional sense, but rather to be a functional and yet decorative calendar that expresses "dates in the language of research" (Derrick [sa]). The data represents DNA being replicated over time, but the main concept revolves around the significance of celebrating birthdays:

> Why look forward to birthdays so excitedly and preserve them as such special days on each of our individual calendars? The answer lies within our DNA and more specifically, the extraordinary way it replicates. Replication is an incredibly precise process with a mass of checks and balances. Because every component of an individual's genetic makeup does its job flawlessly, DNA can copy itself over and over again. That is the only way each of us can grow. So when our annual birthday

celebrations come around, we inherently know that they are the culmination of days upon weeks upon months of the most exact work imaginable (Research Surveys 2004).

The actual data presented is arguably not as important as the formal or stylistic qualities which mimic visualisations of DNA in such a way that it symbolises complexity and precision. The calendar visualisation is thus a symbolic presentation of the organisations' brand values, while also being a visually pleasing artifact suitable for display.
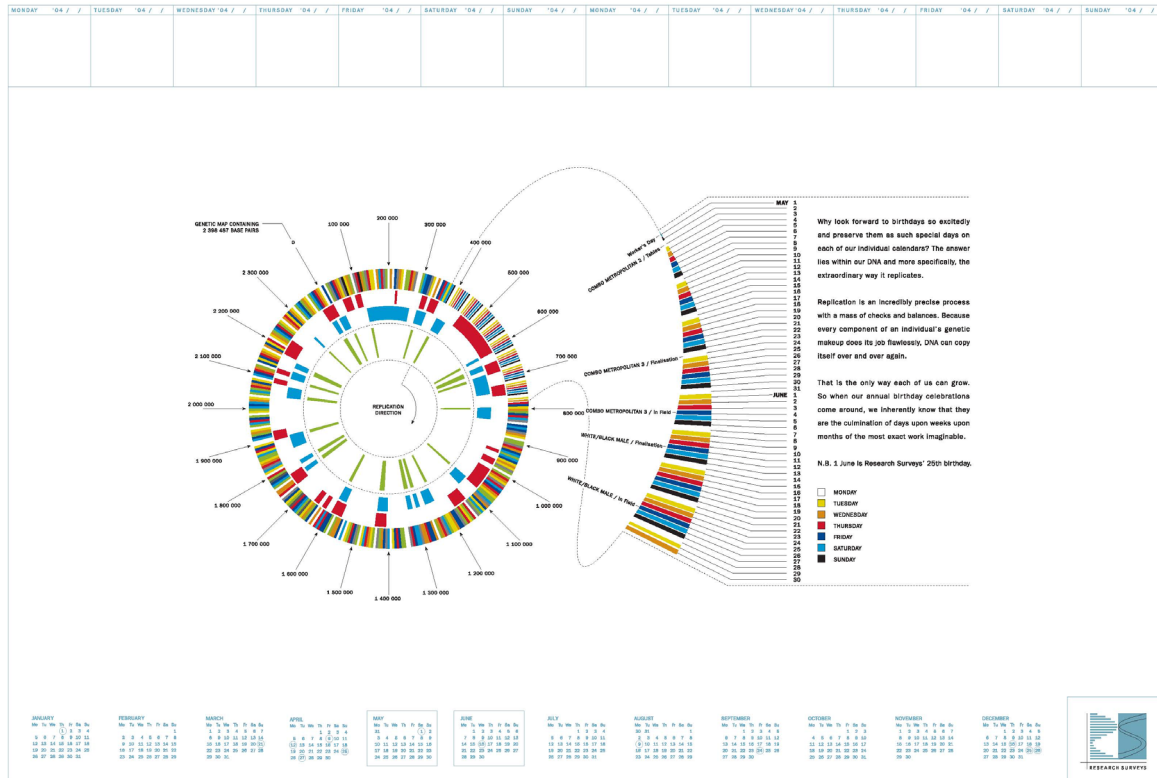
Figure 14: Mark Stead (creative director), King James RSVP (consultancy), *Research Surveys calendar,* 2004. (Research surveys).

The increased computer literacy of artists as well as the continuous drive to be original and to explore cross-disciplinary themes, new materials or technologies, have also led artists to embrace information visualisation as a creative platform (Vande Moere 2008a:470). New media art such as "algorithmic art" or "generative art" uses the computer as a medium, generating artworks that are "programmable" (Vande Moere 2005:37). Viégas and Wattenberg (2007:182) explain how "artists and designers have taken matters into their own hands and expanded the conceptual horizon of infovis as artistic practice".

Artists and designers create what Lau and Vande Moere (2007:87) refer to as "artistically motivated but data-driven forms". Since it is so difficult to define what is artistic and what is not, Viégas and Wattenberg (2007:183) settle on a definition of artistic visualisation as a visualisation done with the intent of making art. It thus does not only refer to 'beautiful' visualisations, but rather to any visualisation that follows an 'artistic intent'. These kinds of visualisations are generally self-motivated and make use of exaggeration or highlighting of specific data elements in order to communicate a subjective interpretation of a data set,

usually to a lay public, or art community (Vande Moere 2008a:470). According to Vande Moere (2008a:470), data art is often inclined to representations that include "ambiguity and subjectivity" in the mapping process. The aim of data art is typically to project an ambiguous message, open for interpretation (as is often the aim of contemporary art in general). The aim is thus quite different to traditional information visualisation, which aims at creating more direct or 'objective' representations of data in the most accurate way.

Data art is often presented in the form of interactive installations, where the viewer enters and participates in the environment. The generative artwork entitled *Grower* by Sabrina Raaf (Figure 15) is an excellent example of such an installation. The *Grower* is a machine that translates carbon dioxide (CO_2) data in the air into bar graphs that are drawn on the wall in a green marker. As CO_2 levels rise, the bars grow, thus depicting grass. This work is a commentary on how art needs people in order to thrive, just as grass needs CO_2. According to Raaf (2004:[sp]), her work

> ... focuses on making explicit the interdependent relationships of human to machine as vital entity to vital entity. *Grower* offers a model where both machines and humans effect each other by their involuntary cooperation. It is a model where human and machine behaviour interact in a mutually informative and dynamic manner.
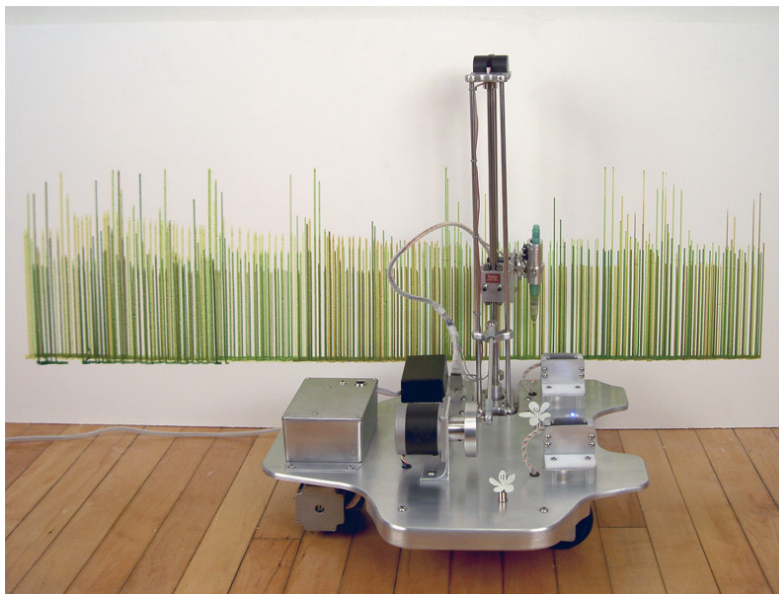
Figure 15: Sabrina Raaf, *Grower*, 2004.
(Raaf 2004).

It is thus clear that there is a lot more depth to the work than initially meets the eye, and, just as many artworks do, it invites multiple interpretations. There are no written labels visible on the graph; there are, for instance, no CO_2 readings to indicate the current state of the environment. The work functions on a more subtle level, creating an intuitive understanding of the data represented. The aim is therefore very different from traditional information visualisation practice where the details of the data are of greater importance. Whereas traditional visualisation is usually considered a tool for analytic reasoning, rooted in science, artistic data visualisation is more concerned with "aesthetics and emotional qualities" (Vande

Moere 2005:37). This new kind of artistic visualisation challenges traditional assumptions and does not pretend to create visualisations that are neutral or objective. It is possible to argue that the "value of the [visualisation] artworks rests on the fact that their creators recognise the power of visualisation to express a point of view" (Viégas & Wattenberg 2007:191).

As an increasing amount of data artworks are seen in gallery spaces, the boundaries between art, design and visualisation are becoming blurred. Hall (2008:122) explains how information is currently being aestheticised "to the point that it has become difficult to sort function from creative expression". Viégas and Wattenberg describe how their work sometimes "ends up being art, sometimes science, and sometimes design" and that they are not influenced by different "labels" (in Aldhous 2011:44). To Viégas and Wattenberg visualisation is simply a "broad and expressive medium" used to reveal interesting patterns in a variety of contexts (in Aldhous 2011:44). There are, however, others, who consider the democratisation and blurring boundaries of information visualisation as a threat to the discipline. Manuel Lima's *Information visualisation manifesto* (2009a, 2009b), started a debate regarding several of these contentious issues in visualisation practice.

2.2.3   *Reactions towards 'information aesthetics'*

As mentioned previously, Lima (2009a) raises concerns over an increasing amount of frivolous and flamboyant information visualisations that, in his opinion, should fit into a separate category, since they do not share the functional purposes of traditional information visualisation. Some principles highlighted in Lima's (2009a) manifesto include: "do not glorify aesthetics" and "avoid gratuitous visualisations". Lima's (2009b:[sp]) basic argument is thus that aesthetics is being emphasised at the expense of functionality, and that this could have detrimental consequences on the reputation of the information visualisation field. Lima (2009b) argues that "the fallacy of information visualisation being a conveyor of "pretty pictures" is drastically threatening the field, by undermining its goals and expectations".

Various oppositional responses followed, by theorists and practitioners such as Vande Moere, Stefaner and Crnokrak, arguing that Lima's attitude towards the aesthetic is deprecating. Stefaner (in Lima 2009a), who describes himself as part of a 'second wave' of information visualisation, argues that one of their "main contributions was exactly to introduce a sense of liveliness, artfulness and aesthetics". Stefaner proceeds to defend the work of certain visualisers such as Jonathan Harris, Ben Fry and Martin Wattenberg, who may be seen as 'glorifying' aesthetics, but argues that these works have added significant value to information visualisation practice. Lima (2009b), in his defence, recognises the value of data art and acknowledges the 'slippery' nature of the term 'aesthetic', but nevertheless argues that separating data art from information visualisation is a necessary step towards ensuring that a detrimental "multipurpose, all-encompassing practice" does not become the norm.

A common concern traditional information visualisation specialists have with artistic visualisation, is that it tends to distort data or 'cheat' in the process by forcing a certain outcome based on what the artist is

trying to communicate. There is thus a general assumption that information visualisation should be used as a neutral and unbiased tool that merely analyses reality. Viégas and Wattenberg (2007:191) believe that even traditional scientific visualisations are never truly neutral, and that it is unrealistic to attempt to achieve complete objectivity. According to Viégas and Wattenberg (2007:191), the distortions in aesthetic visualisations should not be seen as a mistake on the artists' part, but rather as a certain 'point of view' necessary to make a commentary on a specific issue. Lau and Vande Moere (2007:88), in comparing information visualisation and visualisation art, show how "techniques which are highly data-accurate often limit an artist's creative input, whilst those created with full artistic freedom are often less representative". They believe that instead of operating at either extreme, better results can be achieved visualisations convey both informative and aesthetic value (Lau & Vande Moere 2007:88).

Vande Moere (2005:35), who is a strong proponent for aesthetic visualisation, explains how design and art disciplines are currently influencing aspects of information visualisation and demonstrating how "engaging, aesthetic and meaningful data representations" can be created. Vande Moere (2008a:470) explains how user experience has often been neglected in the process of information visualisation, with traditional data mapping rules primarily concerned with functional aspects such as effectiveness, accuracy and efficiency. Designers and artists often follow a different approach when presenting information with "careful attention on visual design, aesthetical quality and user engagement, and the exploration of visual and interaction metaphors" (Vande Moere 2005:33). Vande Moere (2005:31) argues that visualisations could be enhanced through the principles of creative design and art, and that they can become more meaningful emotional experiences that engage users. Viégas and Wattenberg (2007:191) also suggest that principles learnt from artistic visualisations may help traditional visualisations to persuade as well as analyse. This persuasive power of artistic visualisations should potentially be embraced by researchers in order to achieve their particular goals. Viégas and Wattenberg (2007:192) suggest that the study of classical rhetoric may potentially assist in understanding the persuasive power of artistic visualisations.[15]

Instead of creating separate categories for different kinds of information visualisation, as Lima (2009) suggests, it may be worthwhile to consider various approaches to the practice instead. Van Wijk (2005:84) identifies three approaches to information visualisation: "to consider visualisation either as technology, art, or as science". Van Wijk (2005:79) therefore analyses the purpose and value of information visualisations based on the contexts in which they are used. As a technology, visualisation is analysed in terms of standard measures of effectivity and efficiency, and its value would be assessed in terms of whether or not a desired outcome is achieved by "using a minimal amount of resources" (Van Wijk 2005:79). Thus, visualisation as a technology creates solutions that are "useful in practice" (Van Wijk 2005:84). As a science,[16] visualisations could be analysed in terms of a "coherent set of theories, laws and models that describe a range of phenomena, have predictive power, are grounded in observations, and

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[15] It becomes clear from this line of reasoning that aesthetics and rhetorical aspects of visualisations are interconnected, which is explored in Chapter Five of the study.
[16] The work of Colin Ware (2000), which focuses on visualisation in terms of the science of perception, could potentially fit into this category.

that can be falsified" (Van Wijk 2005:85). Van Wijk's (2005:85) third approach, namely visualisation as art, claims that a visualisation may have "value in its own right and for its own purposes" and that some images have "clear aesthetic value". This approach is particularly relevant to this study as it investigates aesthetic qualities of visualisations. Unfortunately, this approach is given least credibility (Hall 2008:123), as Van Wijk (2005:85) does not believe aesthetics is a "line of defence that can help us to convince our prospective users and sponsors". According to Hall (2008:123), this is a diminutive account of art that has come to be expected from the sciences. Hall (2008:124), however, believes that "the art of visualisation can be seen as an important critical counterpoint to the technological and scientific views" and that aesthetics in visualisation might even "open up the field". Even though all of the above approaches are important, aesthetic value should not be underestimated when looking at the overall purpose of visualisations.

In response to Lima's *Information visualisation manifesto*, Peter Crnokrak (in Lima 2009a) points out that an undercurrent of much of the debate leads one to ask: "Why are so many people interested in the aesthetic qualities of data visualisation?" This may well be because 'aesthetics' is seen to be an important aspect of visualisation practice, but for reasons that are difficult to describe. By following the debate that ensued from Lima's manifesto, it is clear that there are different conceptions of the term 'aesthetic'. Throughout the debate there is no clear outline of the core characteristics of aesthetic information visualisation. One may argue that the concept of aesthetics is understood on an intuitive level, but an expanded framework may assist in the understanding of the functional role of aesthetics in information visualisation artifacts.

This chapter provided an introduction to the field of information visualisation as well as the emerging practice of 'information aesthetics'. It has shown how advances in technology, as well as the increasing availability of data, have led to a democratisation of visualisation practice. This chapter also showed how an increased focus on aesthetic appeal may be a result of the influence of designers and artists practicing within this previously specialised field. There are mixed reactions towards the democratisation of the visualisation discipline, and the 'aesthetic' presentation of information. The characteristics that contribute to the aesthetics of visualisations have, however, not yet been established. The following chapter therefore investigates both traditional and contemporary approaches to aesthetics theory in order to clarify what makes certain information visualisations 'aesthetic'.

CHAPTER THREE

AESTHETICS IN INFORMATION VISUALISATION

In order to develop a way of understanding aesthetics in information visualisation, the following section discusses the most common themes in broad aesthetic theory with a specific focus on how they are manifested in manmade artifacts. For centuries, various philosophers have written extensively about aesthetics, and to give a detailed overview of each theory is not feasible within the scope of this study. Although many of the main aesthetic themes originate from fine arts discourse, they are considered here if also relevant to design contexts. In the second part of the chapter, ideas around functional and communicative aspects of design artifacts are investigated in particular. The last section in this chapter explores aesthetics in information visualisation in relation to a visual example. The aim of this chapter is thus to provide an overview of aesthetic theory and to create an understanding of aesthetics from an information visualisation perspective. Following this, conceptual links between aesthetic and rhetorical theories are considered in Chapter Five of this study.

3.1 Common themes in aesthetics theory

'Aesthetics' is a concept traditionally explored within philosophy and the fine arts. Artworks (visual, literary or musical) typically receive aesthetic attention, but also natural objects such as scenery or the human body (Quinton 2000:12). 'Art' and 'beauty' are notions relevant to the study of 'aesthetics', but should not be seen as synonymous. According to Paul Guyer (2004:19), modern aesthetics started as an inquiry into the ideas of beauty and harmony, but today we know that it is quite possible for aesthetic objects not to be seen as beautiful. Contradicting ideas and changing values thus make it difficult to define aesthetics in absolute terms.

Five overarching aesthetic themes are briefly discussed here. Firstly, aesthetics is, at its most basic level, considered as a manifestation of sensory perception. Secondly, aesthetics as the study of beauty (and the sublime) is examined, along with the ideas on pleasure and aesthetic judgement. Thirdly, aesthetics as the manifestation of order and unity is explored, which also relates to ideas around the moral or ethical associations of aesthetics. Fourthly, aesthetics is explored in terms of how it relates to a skilled 'performance'. Lastly, aesthetics is described as an engaging and emotional experience. While these themes are by no means definitive or complete, they aim to provide a basic framework for the study of aesthetics that may be applied in the fields of information design and visualisation.

3.1.1 *Aesthetics as sensory perception*

The German philosopher Alexander Baumgarten first used the term 'aesthetics' in 1750 when referring to the Greek "*aesthesis*, meaning (depending on context) sensation, perception, or feeling" (Scruton 2007:233). It is linked to sensory perception, "not with the heart or with the 'sentiments', but with the

senses, the network of physical perceptions" (Barilli 1993:2). Renato Barilli (1993:3) explains how the common use of the word anaesthetic is derived from this same concept, a process where all sensory perceptions are dulled. This etymological investigation of the word thus does not "validate the domination of the idea of 'art' that has become the medium-high usage of the term" (Barilli 1993:3). It is useful to consider the original meaning of the term 'aesthetic', merely as sensory perception, insofar as it does not refer specifically to 'beauty' or 'art', even though these have been the common meanings for more than two hundred years (Mandoki 2007:45).

At its most basic level, aesthetics is thus related to what is perceived through the human senses, and requires the presence of an object to be perceived and a subject that does the perceiving. Under this definition, an aesthetic object could encompass anything that could be perceived in a sensorial way and thus provides a broad enough definition to include both natural objects and manmade artifacts. However, there needs to be a more specific characteristic to the aesthetic other than sensorial perception, as we know through experience that not all objects that we perceive can be described as aesthetic. Katya Mandoki (2007:48) believes that a distinction can be made between "good or bad aesthetic" in terms of how objects either "nourish" or block sensibility.

Contemporary theorists argue that aesthetic experiences surround us on a daily basis, and that there is an unmistakable aestheticisation of the *lebenswelt* (Grabes 1994:10). Sherri Irvin (2008:29) also explains that the "experiences of everyday life are replete with aesthetic character, though this fact has been largely neglected within contemporary aesthetics". The "aesthetic richness" of one's life need not depend on trips to the art gallery or natural wilderness, but can be found even in one's immediate urban environment (Irvin 2008:44).[1]

3.1.2 *Aesthetics as manifestation of beauty*

Even though 'aesthetics' and 'beauty' may not be synonymous, it remains important to consider aesthetics alongside ideas on beauty, since it has played a crucial role in the development of our understanding of the aesthetic. Today, in popular usage, the term 'aesthetics' refers almost exclusively to the beauty of objects. According to Roger Scruton (2007:236), eighteenth-century philosophers such as Francis Hutcheson, David Hume, Edmund Burke and Immanuel Kant focussed their concern on the 'beautiful', even though the objects of beauty – human beings, music or landscapes, for example – often have very little in common. According to Gordon Graham (2005:16), "everyone agrees that beauty attracts and ugliness repels", but it is more difficult to establish the exact reasons why.

Connected to the idea of beauty is the experience of pleasure in the aesthetic. According to Graham (2005:14), "it seems contradictory to describe something as beautiful and deny that we are in any way pleasurably affected by it". However, it is possible to argue that not all aesthetic artifacts are intended to

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[1] This is especially relevant to the current study which analyses design artifacts from an aesthetic perspective.

promote pleasure. Some are "expected and intended to perplex, unnerve and disturb" (Carrol 2002:149). According to Scruton (2007:236), many of the most impressive contemporary aesthetics works are "downright ugly and even offensive in their raw-nerve impact". It is, however, possible to argue that they evoke a different kind of pleasure, and it may be necessary to extend our definition of 'pleasure' before establishing whether it is indeed an integral part of aesthetic experience. Graham (2005:6) argues there is a tendency to "conflate 'pleasure' with 'happiness' as though they were synonymous, when they are not". He also believes that 'pleasure' and 'pain' should not be seen as opposites (Graham 2005:6). Richard Shusterman (2006:219) explains how even in 'unpleasant' or disturbing experiences and the overcoming of such feelings in an aesthetic encounter may "give rise, at a higher level, to a distinctive, perhaps more difficult, form of pleasure (traditionally associated with the experiences of the sublime)". There are those like Kant and Burke who make a distinction between the 'beautiful' and the 'sublime', explaining that different interests are evoked by each (Scruton 2007:236). Graham (2005:19) illustrates the difference between beauty and the sublime as the difference between a pretty flower and the Niagara Falls. The latter evokes feelings of awe, possibly even fear, and is related to expressions of power and grandeur. The concept of the 'sublime' cannot be fully explained in the scope of this study, but it is worth noting that there are different kinds and perhaps different levels of 'beautiful' experiences.

'Beauty' can be approached from two perspectives: either as a universal, objective quality, or as a subjective judgement. In other words, evaluating objects in terms of their beauty or ugliness, certain value judgements are made, which could be understood as either being universally objective or more personal and subjective. Kant specifically investigates this contrast between the subjectivist and objectivist interpretations of the aesthetic (Graham 2005:16). According to Graham (2005:17), Kant understands the aesthetic as a 'special' kind of pleasure because it transcends personal preference. Dennis Dutton (2005) also attempts to uncover 'aesthetic universals' or in other words the objective characteristics that make objects beautiful. Whether or not these universal characteristics exist, it is impossible to ignore the influence of subjective judgements and personal taste[2] when considering the aesthetic nature of objects.

John Dewey argues that 'beauty' is an "obstructive" term that serves no purpose in the classification of objects, since beauty is a subjective perception rather than an inherent quality of an object (in Mandoki 2007:8). This also relates to the common saying that 'beauty is in the eye of the beholder' (Dutton 2009:37). In this view, beauty is relative, and relates to the subjective response towards an object, and not the physical characteristics of the object itself" (Graham 2005:16). Furthermore, different cultures have different ideals of beauty (and the aesthetic) and these ideals may change over time (Graham 2005:15). It may thus be possible to argue that both objective (physical) properties and subjective responses are part of aesthetic perception. The fact that art critics, for instance, agree on the aesthetic value of certain artifacts indicates that there must be certain objective properties that make objects aesthetic. However,

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[2] Even though 'taste' does have an influence on aesthetic judgement, it is not in the scope of this study to explore issues of 'taste', but rather to explore more general factors that potentially influence aesthetic experience.

disagreement and difficulty in defining aesthetic properties shows that aesthetic responses are also subjective (Goldman 2005:258).

Regardless of the objectivity or subjectivity of the aesthetic perception, the word 'beauty' remains an evaluative term as opposed to a merely descriptive one (Graham 2005:14). The same is arguably true for the word 'aesthetic' which generally refers to positive judgements. According to Alan Goldman (2005:262), both 'aesthetic' and 'work of art' are "honorific or positively evaluative" terms. Furthermore, since aesthetic artifacts are "typically designed to provide rewarding experience, it makes sense at least in some contexts to reserve the term for objects that succeed in fulfilling this intention" (Goldman 2005:262). Throughout this study, the term 'aesthetic' thus refers to those artifacts that provide positive and rewarding experiences, related to concepts such as beauty, pleasure and meaningfulness.

There are definite links between the aesthetic and that which is considered beautiful, even bearing in mind that conceptions of the beautiful may vary. However, the question of what constitutes a 'beautiful' perception remains to be answered. One explanation found in aesthetics discourse relates to the beauty of order and unity.

3.1.3   *Aesthetics as manifestation of order or unity*

According to Dewey, aesthetic experience would not be possible in an "absolutely chaotic world, lacking any kind of order, rhythm or form" (in Mandoki 2007:61). He describes a particular kind of holistic experience: *an* experience that "carries with it its own individualising quality and self-sufficiency" (Dewey 1934:35). The idea of aesthetics as related to unity and order is not a new concept. Mihaly Csikszentmihalyi (1991:26) explains that the "idea that art exists because it brings order to human experience" has existed since the time of Aristotle. According to Remko Scha and Rens Bod (1993), formal theories on beauty tie in with "harmonious properties of the object that is being observed – with self-similarities, symmetries, and simple proportions in the appearance of that object". For instance, ancient Pythagoreans were of the opinion that mathematical proportions were 'beautiful' (Scha & Bod 1993).

The first attempt to formalise a theory for mathematic aesthetics was devised by American mathematician George Birkhoff, who introduced the formula for "aesthetic measure" (M). Aesthetic measure is described as the "ratio between order (O) and complexity (C): $M = O/C$". Complexity is described as the number of various elements in an image and order relates to the amount of regularities found in the image (Scha & Bod 1993). There are obvious problems with Birkhoff's rigid mathematical approach, since aesthetics is a more fluid and subjectively determined phenomenon. It may be argued that Birkhoff's theories provide a measure more accurate for "orderliness" than for beauty (Scha & Bod 1993). Nevertheless, the idea that aesthetics lies somewhere in the balance between order and complexity, is a concept that appears throughout aesthetics discourse.

Along with ideas on order, unity is also often described as an important aspect of aesthetics. This unity is described in terms of both 'coherence' and 'completeness'. According to Shusterman (2006:222), "the phases of experience fit agreeably together (coherence) and they give a satisfying sense of fulfilment (completeness)". Dutton (2009:52) also explains how

> … enjoyment of artistic beauty often derives from multilayered yet distinguishable pleasures that are experienced either simultaneously or in close proximity to each other. These layered experiences can be most effective when separable pleasures are coherently related to each other or interact with each other – as, roughly put, in the structural form, colours, and subject matter … This idea is familiar as the so-called organic unity of art works, their 'unity in diversity'.

It is, however, possible for an aesthetic experience to be disjointed and incomplete, but Shusterman (2006:222) explains that even if that is the case, it still displays "the integrity of standing out as a distinctly singular experience in contrast to the stream of ordinary experience". There is therefore still cohesiveness and recognisability as a distinct "unit of experience" (Shusterman 2006:222). Paul Hekkert (2006:169) also identifies the aesthetic principle of 'unity in variety' that relates to how humans perceive structure in objects or environments. A certain level of sensitivity is often required in identifying the hidden unity in variety, such as for instance in modern music that may seem chaotic to the untrained listener (Hekkert 2006:169).

Shusterman (2006:222) refers to the word 'integrity' in describing this aesthetic aspect of order and unity. This makes sense when we consider it as an 'integrated' and 'whole' experience. The word 'integrity' may, however, also potentially refer to moral or ethical aspects of aesthetics. That integrity in aesthetics is closely linked to ethics is not a new idea. Alain Findeli (1994:66) explains how both ethics and aesthetics deal with human values, which relate to "the apprehension of harmony, the sentiment of unity". Shaftesbury also links the response to beauty with the response to goodness, "which constitutes the moral sense", in that they share the same "sensitivity to the wonderful order of the universe" (Guyer 2004:20). For Shaftesbury, this sense of order relates to how we appreciate both art and nature as being designed as a whole or entire system in harmony or proportion (Guyer 2004:20).

Shaftesbury places emphasis on the "designer" of this orderly system and the appreciation of an aesthetic object as a mindful or intelligent act of creation (Guyer 2004:21). Consequently, the concept of authorship also becomes important when analysing aesthetics, since order implies a mind that orders things. While the subject of authorship cannot be explored in great depth in the scope of this study, one factor related to the author, namely the demonstration of mastery or exceptional skill, is worth exploring briefly.

3.1.4   Aesthetics as skilled 'performance'

According to Dutton (2009:i), "art-making requires rational choice, intuitive talent, and the highest levels of learned, not innate skills". Moreover, Dutton (2009:191) argues that there is aesthetic pleasure in

response to displays of great skill, talent or achievement. He explains how aesthetic objects tend to be demonstrations of skill and virtuosity (Dutton 2009:53). Dutton (2009:53) believes that the "demonstration of skill is one of the most deeply moving and pleasurable aspects" of art as well as other human performance such as sport and even the use of language. Dutton (2009:174) writes that

> ... human beings are continuously judging their fellows in terms of the cleverness or banality of their language use. Skilful employment of a large vocabulary, complicated grammatical constructions, wit, surprise, stylishness, coherence, and lucidity all have bearing on how we assess other human beings.

Sometimes skills are innate, or in other words a talent, while at other times the skill may be something that is learned and mastered through practice. There is, however, often a greater fascination or admiration towards skills that are innate. Dutton (2009:226), for instance, explains how this has an impact on the aesthetics found in fine art as opposed to that of mere craft. Crafts are often understood as only requiring competence, whereas fine arts such as painting or poetry require special talent as well (Dutton 2009:227). The difference potentially lies in the way that crafts are usually purposefully directed or preconceived in a very specific manner towards a final product, whereas fine arts products are typically creative works in progress. In other words, crafts typically follow recipes, instructions or routines, whereas art making is more spontaneous and less predictable (Dutton 2009:228). This is possibly why a paint-by-numbers painting is usually not seen as aesthetic in the same sense as an original work (Dutton 2009:229).

As part of the artistic performance, expressing individuality is another important factor that Dutton (2009:56) identifies. When a productive activity, such as bookkeeping or dentistry, has a defined output, there is usually no demand for individual expression. On the other hand, open-ended activities, such as can be seen in the arts, often encourage personal expression (Dutton 2009:56). The viewer may then experience an aspect of the creative act in apprehending the art object, and it is this that to some extent establishes an aesthetic relationship with the work.

Related to originality, or expressing a unique concept, authenticity is another factor that adds to the aesthetic experience. According to Dutton (2009:186), the reason why authenticity is so important is because all works of art (not just the performing arts) incorporate an element of performance. Dutton (2009:187) explains how forgeries in the arts feign performance and therefore they cannot be seen as real achievements. It is the viewer's appreciation of the creator's exceptional achievement that becomes part of the pleasurable aesthetic experience. Authenticity and integrity are thus extremely important aspects of aesthetics. This does not only refer to the authenticity as the opposite of forgery, but also to the integrity of intent. Dutton (2009:175) describes an "ever-present voice whispering to us that one kind of truth always matters: the truth about sobriety, knowledge, intelligence, seriousness, or competence of the fact-teller or the fiction-maker".

3.1.5 *Aesthetics as engaging experience*

It has already been implied that the aesthetic is something that is experienced, whether merely sensorial, or whether through affective (i.e., an experience of the sublime) or cognitive processes (i.e., making a value judgement on the beauty of an object or the skill of an artist). Aesthetics has been coupled with 'experience' right from the start of aesthetic philosophical enquiry in the eighteenth century (Grabes 1994:8). According to Goldman (2005:260), a "focus on experience becomes natural, even inevitable, once it is recognised that beauty and other aesthetic qualities are not simply intrinsic properties of objects themselves, but essentially involve responses on the part of perceiving, cognising and feeling subjects". The aesthetic experience can thus be described as a certain engagement with the aesthetic object. According to Dewey (1934:219), it is a fundamental error to confuse the "physical product with the aesthetic object, which is that which is perceived". Dewey does not disregard the physical artifact, but sees it as only one aspect of the overall aesthetic experience.

Dewey's concept of aesthetic experience may be described as an experience that is "both integrated with and demarcated from surrounding experiences, has a unique individualising quality, and possesses a sort of meaningful unity among parts" (Stroud 2008:156). This clearly relates to ideas on order and unity discussed previously. Dewey furthermore argues that this kind of experience may be found in everyday situations, not only in the experience of art (Stroud 2008:157). Dewey uses the word 'art' throughout his work, but often uses it to refer to a process or activity of a high experiential quality (Stroud 2008:157). Dewey thus does not focus on 'art' as an object, but rather as a heightened experience that "denotes a certain quality surrounding those processes of creation (or execution) and reception" (Stroud 2008:157). Shusterman (1997:33) explains that for Dewey, the essential worth of aesthetic artifacts lie in the "dynamic and developing experiential activity through which they are created and perceived". In this sense Dewey recognised that activities such as sport or fine dining could elicit similar aesthetic experiences. This is valuable in terms of looking at aesthetics not purely from a high art perspective, but considering functional everyday artifacts as well. Shusterman (1997:33) explains:

> Dewey's prime use of aesthetic experience is aimed not at distinguishing art from the rest of life, but rather at "recovering the continuity of its aesthetic experience with the normal processes of living," so that both art and life will be improved by their greater integration. His goal was to break the stifling hold of what he called "the museum conception of art," which compartmentalises the aesthetic from real life …

Dewey's theory of 'art as experience' rests on the notion that aesthetic experience occurs when there is an interaction between the creator and object, as well as between audience and object (Stroud 2008:159). As part of this aesthetic interaction, there also needs to be a specific mindfulness of the medium, or "expression" (Stroud 2008:161). The focus needs to be on the expression, which can be considered a means to an end rather than only an end in itself (Stroud 2008:161). In other words, being attentive to the means of expression (the paint on a canvas or the words in a poem) and not only on the 'ends' (the scene depicted or message conveyed) is vital to having a heightened aesthetic experience. According to Stroud

(2008:171), the "key" to aesthetic experience is thus the "*orientation* of the individual toward the activity or process (including that of creating or receiving expressive objects) he or she is experiencing". Stroud (2008:167) calls this kind of attention or orientation towards an object or situation "Deweyan mindfulness".

Stroud (2008:173) explains that even though the subject's mindfulness or 'orientation' is key, it is not the sole contributing factor to aesthetic experience. Stroud (2008:173) explains that Dewey does not deny the importance of the "objective features" of a physical artifact or situation on the aesthetic experience[3]. Dewey's theories elicit criticism because of its strong focus on subjective experience, which to some theorists implies the trivialising of art (Shusterman 1997:37). But, even though Dewey sought to "radically enlarge and democratise the domain of art", it does not mean that every situation or activity should be seen as aesthetic (Shusterman 1997:33). Dewey outlines that the aesthetic experience stands out from ordinary experiences as *an* experience, which leads to feeling "'most alive' and fulfilled through the active, satisfying engagement of all our human faculties (sensual, emotive, and cognitive) that contribute to this integrated whole" (Shusterman 1997:33).

Graham (2005:31) explains how it is common to think that emotional impact, both on the part of the artist and on the audience, is the most important factor in art. Mandoki (2007:61) supports this 'expressivist' view by stating that, "just as knowledge is an effect of our capacity to know, the aesthetic is the effect of our ability to feel". In alignment with this, Shusterman (2006:223) suggests that "although aesthetic experience need not be emotional in the robust sense of the term, it is hard to see how it can be altogether devoid of feeling or affect". Shusterman argues that a cyborg looking at an artwork would not 'understand' the aesthetic in the same way as a human would, due to the fact that human affect is necessary for something to be aesthetic. Dutton (2009:56) holds that there is a certain "emotional saturation" prevalent in artistic practices or objects. He argues that the emotional response evoked by an artwork is incited by either the represented content or an alternative "distinct emotional flavour or tone that is different from emotions caused by represented content" (Dutton 2009:57). This second type of emotion is usually described as "unique to the work – the work's emotional contour, its emotional perspective" (Dutton 2009:57). The 'emotional contour' thus sets a tone that is potentially more subtle and complex than direct emotional responses such as joy or anger.

Even though affect is an important aspect of the aesthetic experience, cognitive and intellectual aspects of the aesthetic also need to be taken into consideration. Goldman (2004:101) explains how great works of art lead to a common response, which "engages us on every mental level simultaneously" and this is possibly true for other aesthetic objects as well. These levels include perceptual appreciation, the perceptual-cognitive and perhaps affective grasp of a 'formal structure', the cognitive understanding of themes, symbols or historical importance, the emotional reaction to expression and the imaginative

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[3] Stroud (2008:173) does however emphasise the difficulty in identifying the "objective features" of aesthetic experiences and argues that an aesthetic experience could take on almost any imaginable form. As such, reconceiving aesthetic experience as more closely related to a subject's orientation towards the object may prove useful.

expansion upon that which is presented, and perhaps even the sharing or pursuing of the aesthetic aims of artworks (Goldman 2004:101). Goldman (2004:102) also argues that knowledge external to the aesthetic object, in example historical context, creates a greater awareness and potentially increases appreciation of the work. Even seemingly simple works of art may provide aesthetic pleasure in terms of pointing to historical, contextual or interpretive dimensions (Dutton 2009:57).

Dutton (2009:57) describes how works of art tend to be "designed to utilise the combined variety of human perceptual and intellectual capacities to the full extent; indeed, the best works stretch them beyond ordinary limits" and that this may be a source of aesthetic enjoyment (Dutton 2009:57). According to Shusterman (2006:219), aesthetics requires an intentional object that is "about something" and that lends itself to "some dimension of meaning". He argues that even though a subliminal experience may add to the overall aesthetic experience, it cannot constitute an aesthetic experience in itself (Shusterman 2006:219). This is because aesthetics requires an "intentionality and direct appreciative awareness" (Shusterman 2006:219). Intentionality and awareness are arguably cognitive processes separate from our immediate emotional responses and relate to messages communicated by the creator and interpreted by the viewer.

Scruton (2007:244) shares Shusterman's views on meaning and explains how the aesthetic object becomes an object of intrinsic interest which rational beings aim to understand. This meaning is arguably represented and interpreted through an imaginative process. According to Shusterman (2006:220), both the artist and the audience are critical observers of the work and engage in a creative process of aesthetic experience. According to Dutton (2009:58), one of the most important contributing factors of defining artistic practice lies in the way in which artistic objects provide imaginative experiences for both the creators and the receiving audiences. The aesthetic experience is thus understood as an imaginative and creative act rather than a passive act of merely observing at a distance (Dutton 2009:59). This creative participation is a source of pleasure which may be seen as connected with greater meaning (Shusterman 1997:37). Active participation also extends beyond the interpretation of content, and aesthetic experience arguably also requires a level of self-aware reflection upon the experience. According to Shusterman (2006:223), an aesthetic experience goes beyond "passive submission to a stage of more active self-consciousness through which the work and its experience are submitted to criticism". The viewer is thus actively engaged in the aesthetic experience, in a process of self-reflection.

Engagement as a criterion for heightened aesthetic experience potentially provides another reason why originality is of such great importance, simply because we are "more readily challenged and engaged by works that are strikingly different from what came before" (Goldman 2004:103). According to Dutton (2009:54), "art is valued, and praised, for its novelty, creativity, originality, and capacity to surprise the audience". This is potentially also true for aesthetic experiences related to other areas of life other than just art, such as for instance the pleasurable experiences gained from travelling and seeing new places. A

combination of different factors therefore contributes to the overall aesthetic experience. The following statement by Dutton (2009:243) summarises the nature of aesthetic experience as follows:

> We remain like our ancestors in admiring high skill and virtuosity. We find stylish personal expression arresting, as well as the sheer wonder of seeing the creation of something new. Art's imaginary worlds are still vivid in the theatre of the mind, saturated with the most affecting emotions, the focus of rapt attention, offering intellectual challenges that give pleasure in being mastered. And over all this, we still share with our ancestors a feeling of recognition and communion with other human beings through the medium of art.

Shusterman (1997:38) argues that people retain a deep need for positive aesthetic encounters, but due to contemporary art becoming largely inaccessible or incomprehensible, attention is directed towards popular art. Shusterman (1997:38) argues that many contemporary works of art "fail to produce aesthetic experience – in the sense of satisfying heightened, absorbing, meaningful and affective experience". It is possible to suggest that design artifacts could fulfil this need. Design artifacts, like artworks, are perceived through the senses and are often described as beautiful, possibly through displaying order and unity. Design artifacts also often display great skill and craftsmanship, although not all design artifacts do. Furthermore, design artifacts also create engaging experiences. There are, however, ways in which design artifacts differ from artworks and the following section thus considers the unique aspects of design aesthetics.

3.2   Design aesthetics

Design objects are often situated in an uncertain space, not as 'aesthetic' or meaningful as artworks, and at the same time not as 'functional' as artifacts created by engineers or practitioners in the sciences. Richard Buchanan (1985:16) explains how design is traditionally seen as a "minor art concerned with decoration", and thus not in the same 'special' class as artworks. Consequently, aesthetics is not commonly explored with regard to design artifacts, but traditionally tends to concern fine arts contexts. However, as Mads Folkmann (2010:41) points out, it is important to study the aesthetics of design, since "designed objects contribute to the ongoing aestheticisation of everyday life".

On the other hand, designers are often seen by the public as only concerned with the 'aesthetic', which in this sense is interpreted as the superficial, decorative aspects of artifacts. From this perspective, aesthetics as decoration is often seen as a hindrance to efficiency and thus not desirable in good design. This may provide a reason why designers have in recent years placed an increased emphasis on their role in functional aspects of design. This has, in turn, led to aesthetics being largely neglected in design discourse. Aesthetics is, nonetheless, an integral aspect of design practice, and arguably more closely linked to 'functionality' than contemporary discourse suggests.

The view of functional objects as incapable of being aesthetic and aesthetic objects being less functional is philosophically problematic. Aesthetics and functionality are concepts that cannot be divorced completely. It may be argued that the aesthetic experience found in the context of functional artifacts

such as information visualisations, is different to fine art experiences and it is thus important to consider design-specific aesthetics in more depth.

3.2.1   Design aesthetics as separate from functionality

Design, as opposed to the fine arts, is situated in a consumer context. Beyond considering the needs and wants of the consumer, a designer also considers the interests of the client and manufacturer (Folkmann 2010:41). Design is thus rarely concerned with self-expression. It is situated around the "complex negotiation between 'problem formulation' and 'solution generation'", and is often directly linked to patterns of consumption (Folkmann 2010:41).

On the other hand, Dutton (2009:55) explains how artistic artifacts tend to be removed from ordinary life and made a "separate and dramatic focus of experience". An artistic object is often "valued as a source of immediate experiential pleasure in itself, and not essentially for its utility in producing something else that is either useful or pleasurable" (Dutton 2009:52). Dutton (2009:52) explains how aesthetic enjoyment is said to be "for its own sake", or in other words, as separate from practical concerns. Anna-Lena Carlsson (2010:452) points out that seeing the aesthetic as separate from functional concerns has its roots in Kant's theories on aesthetic experience as 'disinterested'. Kant's concept of 'disinterestedness' refers to a "lack of interest in the practical uses of the aesthetic object" (Goldman 2005:263). Goldman (2005:263) further explains that to be 'disinterested' means to "attend to the object as an object of contemplation only, to its phenomenal properties simply for the sake of perceiving them". There is thus a certain detachment from subjective needs and interests which relates to the common notion that "art should be valued for itself, not for external purposes" (Carlsson 2010:451). Carlsson (2010:452) explains how this concept of 'disinterest' has largely led to aesthetics being restricted to formal qualities or "embellishment" that if it removed, would leave the underlying message intact.[4]

It is clear to see that various theorists have adopted this view, such as Anthony Quinton (2000:12), who defines aesthetics as a philosophical study of "a style of perception concerned neither with the factual information to be gained from the things perceived, nor with their practical uses, but rather with the immediate qualities of the contemplative experience itself". A common perception of aesthetic artifacts is therefore that they do not "refer us to any utilitarian or functional goal, but they are rational for all that" (Scruton 2007:240). Early writers such as Shaftesbury and Hutcheson also argue that the pleasure in something beautiful is independent of practical aspects of use or functionality of the object (Guyer 2004:19). Aesthetic artifacts are thus understood as valuable in terms of the pleasure they provide, due to the fact that they "challenge our capacities, expanding and exercising them to their fullest extent" while also removing us from "the real world of our practical affairs" (Goldman 2004:102).

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[4] Even though Kant's theories have had an influence on the perception of aesthetics in design, it cannot be explored in great depth due to the scope of this mini-dissertation.

An example of the aesthetic as being unconnected to 'practical affairs' can be seen when Nelson Goodman refers to different interpretations of the same line: the one functioning as a profits chart and the other symbolising a mountain (in Shusterman 2006:220). Goodman describes the mountain drawing as aesthetic, while referring to the other as a mere chart even when he is writing about the very same image. It is thus clear that charts are not typically seen as aesthetic objects in the same way as line drawings of mountains. From this perspective utilitarian objects cannot be aesthetic because they are focussed on functionality.

However, certain artefacts incorporate both utilitarian and aesthetic purposes. There are many examples of buildings for instance, that are both useful and aesthetic. According to Graham (2005:165), architecture is generally situated amongst the arts, with great architects throughout history celebrated in much the same way as great artists. Identifying aesthetic characteristics in buildings such as the Taj Mahal would for instance be widely accepted. According to Graham (2005:165), architecture is different to the other arts in that it is useful. One might say that there is an 'aesthetic' function in art, and that music and painting can also serve practical purposes, but, according to Graham (2005:165), the function is 'contingent' and not 'intrinsic'. Architecture and other designed objects are seen as intrinsically and essentially functional. Graham (2005:165) suggests that these objects cease to be valuable if removed from their context of use, unlike art which may be seen as valuable in its own right. 'Aesthetics' in this sense thus refers to that which makes an artifact valuable 'in its own right'.

From an engineering or technical design perspective, as mentioned earlier, 'aesthetics' takes on a different definition and usually refers to surface qualities of artifacts. Using the example of architecture, 'aesthetics' in this sense might refer to 'styling' unrelated to the function of the building. Scruton (2007:240) defines the aesthetic as the "choices remaining when utility is satisfied", with these choices relating mostly to the surface appearance of the object. This is a common understanding of the aesthetics of designed objects as referring to what is added at the end when all utilitarian decisions have been made; or, in other words, as the superficial outer appearance of an object. However, this is a very narrow view of aesthetics in design. Just as the relationship between form and function are more interconnected in architecture, it may be argued that the same applies to other designed objects.

Graham (2005:170) highlights the issue of form versus function[5] and explains that in architecture the form cannot easily be separated from its function. He explains how both functional considerations, such as structure and purpose, and formal (appearance) considerations are important in the value of a building (Graham 2005:170). He goes even further to say that the functional and formal aspects may be related or 'fused' and that this intimate relationship is what separates a mere building from architecture (and in other words what makes it aesthetic) (Graham 2005:170). According to Graham (2005:175), it is not entirely possible for form to simply follow function, as many formal considerations such as colour would still

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[5] The common phrase "form follows function" coined by American architect Louis Sullivan, promoted the idea that a building should be constructed according to its use and that unnecessary decoration should be avoided (Graham 2005:174).

remain undecided in the process. Graham (2005:178) states that it is "logically impossible to determine every formal feature of a building by appeal to function alone". Here ideas on expression come into play. For Graham (2005:179) ideas such as grandeur and elegance are often expressed through the formal aspects of architecture. These 'aesthetic' expressions should, however, not be seen as separate from the building's function, but rather as intrinsically linked to it. Graham (2005:181) thus contends that the sustained rivalry between functionalism and formalism in architecture is to a large extent built upon a "false dichotomy". Even though Graham provides valuable insight into how aesthetics and functionality might be more closely linked, he singles architecture out as a form of art and "not simply design or engineering", thus implying that design is not in the same "aesthetic class" (Graham 2005:180). This perception of design is problematic since design is highly concerned with a marriage of form and function, and the aesthetic qualities thereof.

Seeing aesthetics as separate from functionality is a dominant view that developed in the eighteenth and nineteenth centuries and is based on two perceived qualities of the aesthetic, summarised by Carlsson (2010:451): "aesthetic qualities are located in the *form* (in a separation of form and content/function), which makes the aesthetic experience *disinterested*, i.e. detached from subjective interests or desires". However, both of these qualities can be contested. Aesthetics is not only related to an artifact's form and it does not require a disinterested experience. Aesthetics in a design context will necessarily be linked more closely to content, practical concerns and outcomes.

3.2.2   *Design aesthetics as interconnected with functionality*

Alex Coles (2005:18) explains how a "sharp distinction between the world of the arts and that of technology" has persisted since the mid nineteenth century. On the one hand there is the "scientific, quantifiable and 'hard'" and on the other "aesthetic, evaluative and 'soft'" (Coles 2005:18). This traditional distinction has lead to certain productive roles in society as well as the design discipline struggling to find its place.

Alain Findeli (1994:52) explains how artifacts are traditionally perceived from the user's perspective, between two different "poles" (Figure 16: left diagram). On the one side objects are instrumental or utilitarian and on the other end objects are used for their "symbolic, ritual or sumptuary qualities" (Findeli 1994:52). Findeli explains how most design objects we interact with on a daily basis would be situated closer to the 'instrumental' pole, while art objects are closer to the 'symbolic' pole. However, Findeli (1994:53) explains that it is "practically difficult, if not impossible" to clearly separate these two functions of artifacts. Findeli (1994:62) argues that the "functionalist bias arising from rationalism" should be re-examined in order to extend the usefulness of objects, which includes their symbolic value.
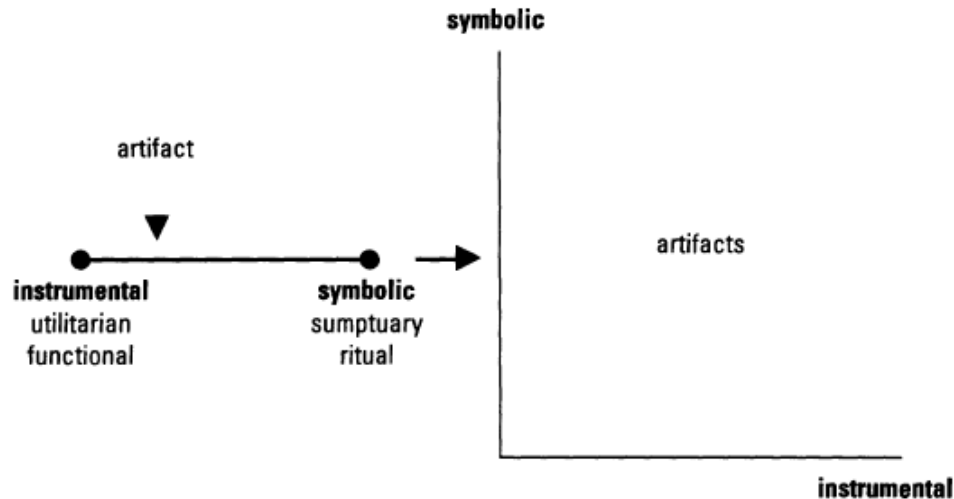
Figure 16: Findeli's model of artifacts, 1994, showing the "instrumental/symbolic polarity: from an excluding opposition (left) toward the space of artifacts (right)". (Findeli 1994:53).

Findeli (1994:52) thus proposes a new model of artifacts, where instrumental and symbolic qualities are mapped out in a space where both qualities may be present in varying degrees, as can be seen in the diagram on the right. Findeli's (1994:52) second diagram shows that artifacts can be both instrumental and symbolic simultaneously.

Traditional roles of production are mapped out with artists situated closer to the 'symbolic' end, and engineers closer to the 'instrumental' end. Findeli (1994:52) explains how designers have to a large extent tried to reconcile these "two poles that the Western mind stubbornly continues to oppose to one another". The designer's role is arguably situated between that of the artist and the engineer, taking into consideration both art and technology (Findeli 1994:54). According to Findeli (1994:53), it is a designer's job to "confer a symbolic and/or instrumental value upon an object, to avoid the trap of banality or uselessness, to make the object safe and aesthetic". It is possible to argue that, unlike art objects, design artifacts need to be functional in order to be considered aesthetic. In other words, they cannot be considered aesthetic design products if they are poorly designed in an instrumental sense.[6] Findeli (1994:53) explains how in order for a design product to be meaningful "the product of its utilitarian value and symbolic value must be greater than a certain limit, the 'threshold of significance'". The following interpretation (Figure 17), based on another diagram by Findeli (1994:54), illustrates the relationship between the different productive arts and shows how aesthetic value in a design context may be dependent on functionality factors.

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[6] Design products with no immediate instrumental value that remain aesthetic for symbolic reasons are likely to be found in art galleries and thus blur the boundaries between design and art.
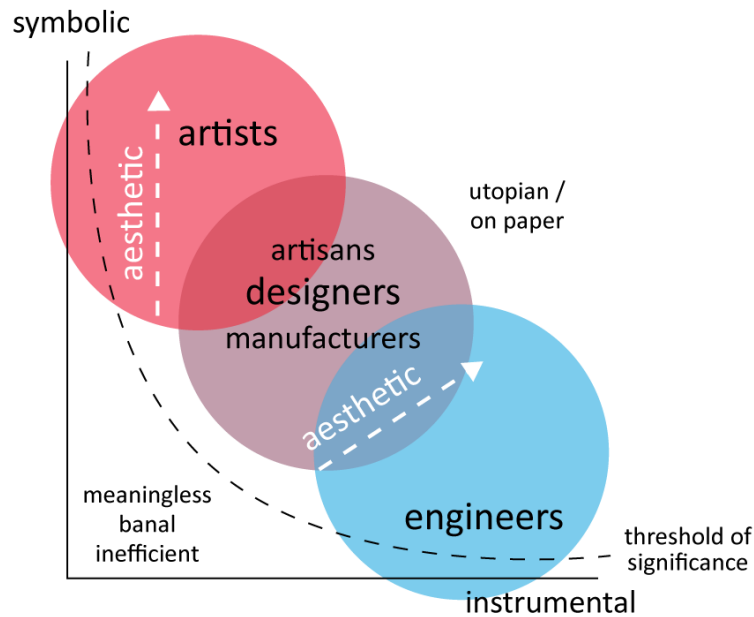
Figure 17: Adaptation of Findeli's *Space of artifacts*.
(Findeli 1994:54).

Findeli (1994:62) makes a valuable contribution to understanding design when arguing that we need to "reach beyond the materialistic and mechanistic definition of 'function' and of 'functionalism' to extend it to the symbolic realm". In other words, something may be useful for reasons beyond being instrumental or utilitarian. It is possible to build on Findeli's model in order to understand aesthetics in a design context. In the traditional sense, 'aesthetics' is understood as closer to the 'symbolic' side of the map. It may, however, be possible to argue that aesthetics in design is related to both 'symbolic' and 'instrumental' values. Contemporary theorists such as Folkmann and Sven Hansson provide more inclusive insights on the interconnectedness of aesthetic quality and functionality in design.

According to Folkmann (2010:40), the majority of aesthetics research focuses on the non-functional or emotional appeal of objects and not on the functionality and communication value of design as contributing factors to an aesthetic experience. Neither does current research focus much on how aesthetically pleasing artifacts may enhance functionality. Folkmann (2010:40) explains how "aesthetics touches upon one of the most vital matters of how design functions as a means of communication". Furthermore, Buchanan (1985:4) explains that the concept of communication is central to all design practice. According to Folkmann (2010:43), the "main concern of aesthetics is how ambience[7] works and constitutes a specific relation between subject and object". This 'ambience' or atmosphere between subject and object may potentially lead to an enhanced perception of the design artifact (Folkmann 2010:52). The creation of 'ambience' may initially seem like an insignificant aim, but in the area of communication design, where the relationship between subject and object is of major consequence, one

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[7] This idea of 'ambience' is based on Gernot Böhme's theory that "deconstructs the dichotomy of subject and object" (Folkmann 2010:43)

can see the influence this might have on communicative function. Consequently, the communication process inherent in interactions with design objects may be understood in terms of aesthetic experience.

Design theorist Victor Margolin (2002:42) refers to the aesthetic interaction with design products in terms of two dimensions: "operative", referring to how the object is used and "reflective", referring to how one feels about an object and about what it means. This may be compared to Findeli's theories regarding 'symbolic' and 'instrumental' values. Margolin (2002:44) explains that an "engagement with a product will have different degrees of fullness, depending on how an individual's interaction with it resonates with his or her own sensibilities and past experience". Margolin (2002:50) argues that Dewey's theories open up a new space for reflection about the significance of design products. According to Dewey (1934:40), the "enemies of the aesthetic are neither the practical nor the intellectual". Instead, thoughtless or insensitive practice or procedures (below Findeli's 'threshold of significance') are the real 'enemies':

> They are the humdrum; slackness of loose ends; submission to convention in practice
> and intellectual procedure. Rigid abstinence, coerced submission, tightness on one side
> and dissipation, incoherence and aimless indulgence on the other, are deviations in
> opposite directions from the unity of an experience (Dewey 1934:40).

Stroud (2008) investigates "Deweyan mindfulness" specifically in a communication context in order to ask how communication can be aesthetic. He suggests that being aware and appreciative of the means of communication, and not only on the external goal or message, may result in an aesthetic experience (Stroud 2008:166). Stroud (2008:166) uses an example of a conversation at a supermarket register, arguing that it could be either "habitual and mechanical" or "more akin to an integrated, consummatory situation in which each part has value". Something as mundane as a conversation in a supermarket could thus potentially be profoundly aesthetic, depending on the subject's orientation towards the situation. According to Goldman (2005:263), there is a longstanding debate over whether a special attitude is required in experiencing something as aesthetic, as was also seen in Kant's theory on 'disinterestedness'. Stroud (2008:167) explains that:

> If one's way of attending to the communicative utterances of others is at a mechanical,
> goal-driven (and hence external) level, one's experience will not reach the level of the
> aesthetic. If one cultivates a way of attending to and valuing the present
> communicative moves, then that process and activity can be rendered aesthetic, and
> the produced utterances of self and others will possess a true expressiveness (and not
> merely an externalised value as pointers to future coordination of action and ends).

From this perspective, Kant's theory on 'disinterestedness' as an attitude that leads to aesthetic experience becomes valuable. There is, in other words, a certain aesthetic awareness, removed from practical goals or concerns. However, it is arguably only one part of the aesthetic experience. According to Goldman (2005:263), to be disinterested means to "savour the perceptual properties for its own sake, instead of seeking to put it to further use in our practical affairs". To "savour the perceptual properties" is arguably an important attitude that forms part of aesthetic experience, but it need not necessarily be removed from practical affairs. It is possible to argue that both immediate perceptual attention and an awareness of functional goals are important in aesthetic situations. Dewey's theory shows that it is "the attitude of a

subject that can render something aesthetic (with a connection of means/ends) or can render it nonaesthetic" (Stroud 2008:166).

Stroud (2008:167) thus explains how, in order for communication to achieve the status of aesthetic experience, the subject's attention should be on the materials and means as well as the ends. Stroud (2008:168) emphasises that aesthetic communication is "*both* a means to future states of affairs *and* an immediately valuable, felt instantiation of harmony and coordination with others". This follows Dewey's (1934:199) argument that "sensitivity to a medium as a medium is the very heart of all artistic creation and aesthetic perception". He provides the following example:

> When, for example, paintings are looked at as illustrations of historical scenes, of literature, of familiar scenes, they are not perceived in terms of their media. Or when they are looked at simply with reference to the technic employed in making them what they are, they are not aesthetically perceived. For here, too, means are separated from ends (Dewey 1934:199).

Goldman (2005:265) also explains how 'disinterestedness' does not take into account the heightened aesthetic experiences that are often gained from aesthetic artifacts that also perform an instrumental function, such as, for instance, attending a service in a cathedral. Aesthetic experience thus needs to take into account both the functional outcome as well as the 'medium' through which the outcome is achieved. This relates to Sven Hansson's (2005:[sp]) notion of "aesthetic duality", where design objects can be aesthetically appraised both for their functional quality as well as other non-functional qualities. Hansson explains that functional objects "can be aesthetically appraised both under descriptions that refer to these practical functions and under descriptions not doing so". A chair may thus for instance be appraised as aesthetic because of what it looks like, but also potentially for how comfortable it is to sit on. Hansson (2005) thus argues that an aesthetic experience based on function is possible when an artifact functions satisfactorily. He also uses an example of a mathematician who might find a proof 'beautiful', but if discovered that the proof was incorrect or flawed might reconsider his aesthetic sentiments (Hansson 2005). If a certain artifact does not fulfil its intended function properly, one might say that the experience of using it immediately becomes less aesthetic (Hansson 2005). Aesthetic judgements related to practical function are typically directly linked to satisfaction of use (Hansson 2005).

Hansson (2005) explains how aesthetics and function cannot easily be separated, since some objects serve an "aesthetic function". The relationship between aesthetics and functionality thus becomes more complex. Hansson (2005) argues that, even though aesthetics can be based on satisfaction of function, "aesthetic value is neither fully reducible to practical function nor completely independent of it". Furthermore, Hansson (2005) defends a "contributory thesis" which states that "satisfaction of functional requirements in most cases contributes positively to aesthetic value". Hansson (2005) explains how two objects that appear very similar (similar in terms of their visual aesthetic), may perform functions with different levels of efficiency. Arguably, the object that performs its function in a more satisfying manner

would be considered more aesthetic. It is thus possible to argue that satisfaction in terms of performance may increase the aesthetic value of artifacts.

According to Patrick Jordan (2002:9), people are wired to seek pleasure, and design artifacts are a major source of pleasure in people's lives. He explains that humans have created both decorative and functional artifacts throughout history in order to increase their quality of life and to bring them pleasure (Jordan 2002:9).[8] Jordan (2002:13) identifies that once basic functionality is fulfilled, users develop the additional need for pleasure.[9] Users potentially find pleasure in objects that are not merely tools, but also meaningful objects that they can relate to (Jordan 2002:14). Jordan (2002:14) further identifies various types of pleasure that people experience in their interactions with design products: 'physio-pleasure' (related to physical interaction such as touch), 'socio-pleasure' (derived from the social significance of objects), 'psycho-pleasure' (such as the pleasure in accomplishing a difficult task) and 'ideo-pleasure' (derived from more complex and abstract reflection).

In terms of communication design and visualisation, psycho-pleasure and ideo-pleasure are of particular interest. An example of psycho-pleasure can be found in the satisfaction of functional performance. Paul Hekkert (2006) investigates how design aesthetics relates to the pleasurable use of objects and identifies what he believes are universal principles for creating appealing design. Hekkert (2006:169) argues that "maximum effect for minimal means" is an overarching aesthetic principle based on evolutionary theory. Accordingly a "theory, a chess move, building, or any other solution or design is considered beautiful or pleasing when a great effect is attained with only a minimum of means" (Hekkert 2006:169). Hekkert thus explains how humans are wired to experience pleasure when a task is performed in an efficient way. This is an important source of pleasure that people gain from interactions with design products. Functionality and usability should therefore not be neglected.

On an even higher level, people also search for ideo-pleasure. Jordan (2002:15) explains that ideo-pleasure specifically relates to the aesthetics of a product and the values that it embodies. Even though he does not see functionality as an aspect of aesthetic experience, his views shed light on deeper and more symbolic aspects of pleasure. He states that design objects that provide ideo-pleasure often take on the characteristics of "artforms" and that they adorn and create meaning in environments (Jordan 2002:15). Jordan (2002:15) also uses the example of recycled products, where pleasure is obtained from the product's alignment with personal values of care for the environment. Stuart Walker (1995:15) investigates this connection between aesthetics and ethics specifically from an environmental sustainability perspective. He also notes that 'aesthetics' in design has to a large extent referred to the superficial appearance or styling of a product, but that it is instead a combination of both "sensory response" to form, and "contemplative experience" of content (Walker 1995:19):

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[8] This philosophy was strongly supported by the Arts and crafts movement of the mid nineteenth century, where design reform was centered on the production of beautiful things (Crawford 1997:15).

[9] This is in reference to Maslow's 'hierarchy of needs' which argues that humans strive to fulfil 'higher needs' such as educational or spiritual growth once 'lower' needs such as food and shelter have been fulfilled.

> ... our aesthetic experience and judgement of an object are linked to both its form and content. The content of the object evokes associations which are based on our knowledge and understanding of our world.

Walker (1995:19) argues that the appreciation of sensory beauty might be negatively affected by the "contemplative experience" of something distasteful or unethical. Walker (1995:22) thus argues that aesthetic judgements or "ideas on what is 'beautiful' and 'tasteful'" are related to an "environmentally responsible frame of reference". Even though Walker speaks from an industrial design and environmental perspective, the idea that ethics is connected to aesthetics is also relevant to a communication design context.

In examining the aesthetic qualities of design objects, it thus becomes important to not only consider the formal visual (surface) qualities of the artifact, but also the way in which it functions. Functionality should be seen in the broadest sense, in terms of both 'symbolic' and 'instrumental' value. It is also important to consider the different kinds of pleasure that people gain from interactions with products, and how this relates to aesthetic experiences. Not only is it important for design objects to perform functions satisfactorily, but they also need to cater to deeper needs for psycho-pleasure and ideo-pleasure. Furthermore, it is possible to argue that a 'Deweyan mindfulness' or heightened awareness of the immediate value of design interaction or communication process may lead to more engaging and memorable experiences, which in turn may positively impact the functional communication goal. Margolin (2002:41) supports the concept of 'Deweyan mindfulness' arguing that the unity of '*an* experience' gives an encounter a "discrete identity" which contributes to the experience's meaning.

In the context of information visualisation, all of the above qualities of design aesthetics need to be taken into consideration. According to Gianfranco Zaccai (1995:9), aesthetics in design should be seen as "related to our ability to see a congruence among our intellectual expectations of an object's functional characteristics, our emotional need to feel that ethical and social values are met, and finally, our physical need for sensory stimulation". The immediate sensory perception, the awareness and appreciation of the medium, the interpretation of data, and the broader understanding of contextual values all potentially contribute to the aesthetic experience. The following section shows how aesthetics in information visualisation may be analysed, and also how the aesthetic characteristics relate to the various themes identified in broad aesthetic theory.

3.3 Aesthetics in information visualisation

Aesthetics in design artefacts is traditionally analysed in terms of form and content, and many of the themes uncovered in the previous section relate to either formal or content-related aspects of artefacts. Other aesthetic factors may be related to another dimension, being that of artistic intent.[10] The aesthetic

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[10] Lau and Vande Moere (2007:87) focus on aesthetics in information visualisation as the manifestation of 'artistic intent' and describe their concept of aesthetics as "the artistic influence on the technical implementation and intended purpose of a visualisation technique, rather than subjective aesthetic judgements on the visualisation outcome". This approach is particularly helpful when considering that aesthetic judgements are to a large extent opinions based on subjective experience.

concepts explored previously are illustrated here as applied to the highly acclaimed aesthetic information visualisation by Peter Crnokrak, *A_B_ peace & terror etc. The computational aesthetics of love & hate* (2008).[11]

A_B_ peace & terror etc. (Figure 18) is a poster that visualises a "geopolitical survey of the 192 member states of the United Nations with regard to the quantitative degree to which each contributes to peace and terror in the world". According to the AIGA Design Archives, *A_B_ peace & terror etc.* "blends world politics with the aesthetics of computational data to create a powerful, pertinent and spellbinding view of the modern world". The visualisation is in the form of a semi-translucent, double-sided poster with intricate graphs on each side. The graphs are separated into three rings indicating separate quantitative indexes of measuring peace and war. The quantitative values are indicated by a variation in line thickness; thin lines indicating a low value and thick lines a high value.

At the most basic level, information visualisations can be considered aesthetic if they provide a pleasing sensory experience through formal qualities. We know, however, that there is more to aesthetic experience than pure sensorial perception, such as the manifestation of beauty in order and unity. In terms of form the visual is striking, displaying visual elements in a unified and balanced manner. It displays intelligent design and craftsmanship which also adds to the aesthetics of the work. The intricacy of the graphs potentially invites closer inspection of the content, which leads to stimulation and engagement on a variety of levels, both cognitive and affective. In terms of content the "the poster reveals complex and socially relevant data derived from researchers working in the field of geopolitics" (AIGA Design Archives). The poster shows the highest ranked countries for contributions to peace as Vanuatu, Costa Rica, Dominica, Bhutan and Switzerland. The highest ranked countries for their contributions to terror include Israel, the Russian Federation, the Republic of Korea and the United States of America (The luxury of protest 2011a:[sp]). Even though it is not immediately apparent, the nature of the content is emotionally charged, potentially inviting deeper engagement and reflection.

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[11] *A_B_ peace & terror etc* by Crnokrak was showcased on a variety of occasions, including SIGGRAPH 2009 and the AIGA 365 exhibition in 2009.
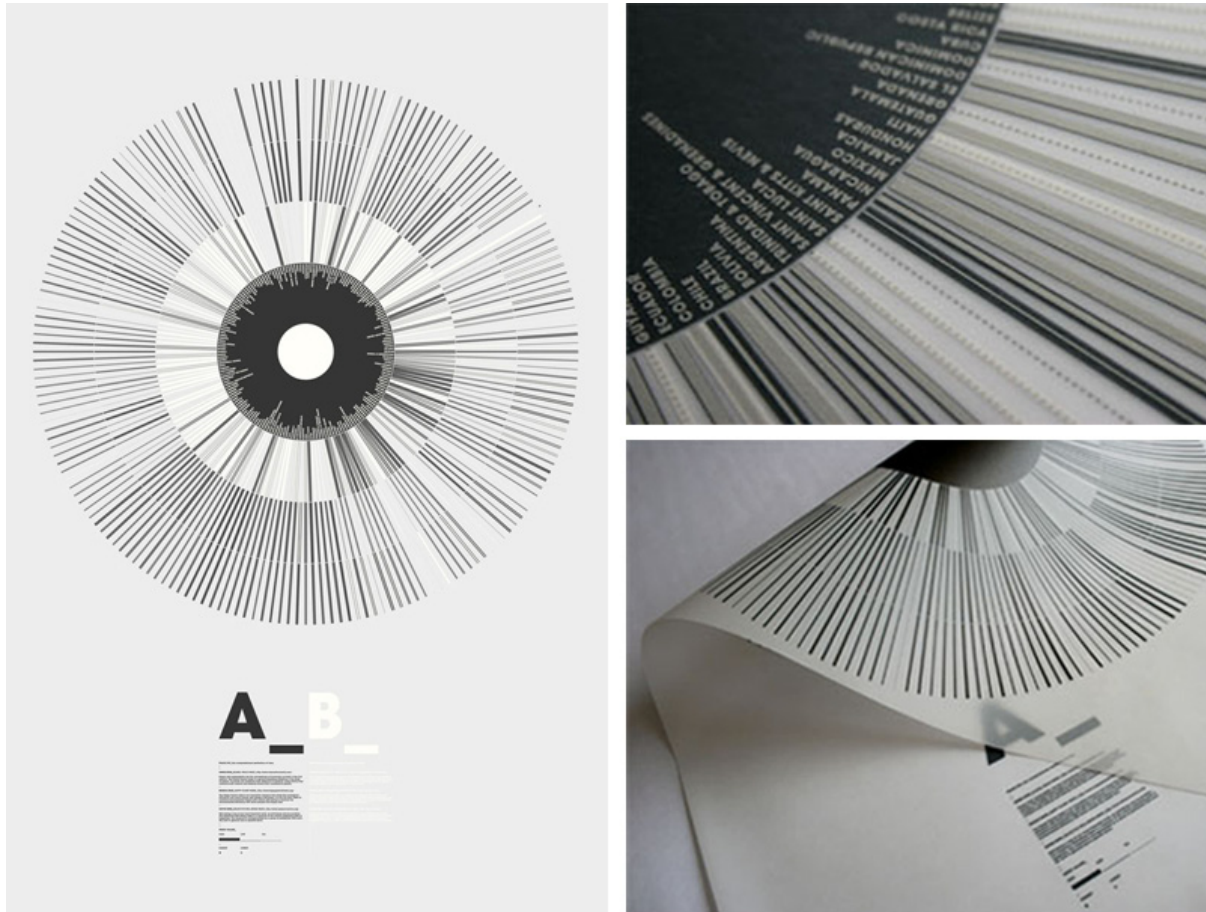
Figure 18: Peter Crnokrak, 2008, *A_B_ peace & terror etc. The computational aesthetics of love & hate.*
(The luxury of protest 2011a).

As explained previously, part of the aesthetic experience lies in the appreciation of novel means of presentation. Novelty in visualisation sparks excitement and potentially leads to new levels of understanding (Iliinsky 2010:1). Traditional genres of visualisation such as pie charts and bar graphs tend to be easily understood, but do not surprise the viewer or encourage deeper engagement (Iliinsky 2010:1). The rather unusual format (double-sided and semi-translucent) provides an engaging experience where the viewer looks through the poster to compare the measurements of peace (side A) and terror (side B) of a particular nation.

Beyond the aesthetics of physical form and content, the aesthetics of the communicative intentions of the designer/creator should also be considered. Even though form and content are still the 'carriers' of meaning, the focus here lies on the communication purpose and process more than on the artifact itself. Anna-Lena Carlsson (2010:451) explains how form and content cannot be separated in practice, as content always needs a form in order to be understood. According to Carlsson (2010:453), aesthetics in information design should not be seen as the "perception of beautiful form", but rather as the "integration of form and content, in a poietic activity involving both the one whose intention it is to inform and the recipient". The designer of this kind of information visualisation clearly has an agenda, as can be seen in Crnokrak's graphs. The function of the poster "becomes poignantly relevant when one

makes detailed comparisons across nations for the various measures – many of the results are quite surprising and stand in contrast to prevailing norms of collective national perception" (The luxury of protest 2011a:[sp]). Crnokrak therefore challenges the preconceived ideas that people might have about nations.

One may argue that there are more efficient ways of displaying the information, but pure information transfer is not the only goal of the work. By presenting the information in a novel and creative way, it potentially invites deeper engagement typical of works of art. According to Van Heerden (2008:6) the visualisation designer "shapes an experience, or view, of the data with a particular aim in mind". This intent, even though it is similarly expressed through form and content, is arguably different in aesthetic visualisations than in everyday visualisations. The intent influences the manner in which the designer goes about presenting the information, and may for instance include intentions "to clarify, confuse, inspire, redress, and connect" (Van Heerden 2008:6). Works like *A_B_ peace & terror etc.* hence achieve specific aesthetic goals through alternative strategies. Vande Moere (2005:37) argues that even though users might need more time to fully grasp the information in such visualisations, it may be an enjoyable process where they "learn complex insights by playing, retain information longer or like to use the application repeatedly". Crnokrak explains how his work is not understood instantaneously, and describes *A_B_ peace & terror etc.* as follows:

> The choice of a double-sided print was to graphically express the concept of 'two sides to every story'. The translucent quality of the paper not only allows the two data sets to be compared with visual ease, but also creates the thinnest possible barrier between peace and terror measures – symbolising the concept that one man's terrorist is another man's freedom fighter. This very simple design choice of recto/verso printing imbues the poster with an overt challenge to prevailing beliefs that peace is peace and terror is terror. In reality the two are not so simply distinguished. This is the artistic choice as a designer that I make for every visualisation project – to question collective norms of belief and bring new perspective (The luxury of protest 2011b).

Linking with this, Folkmann (2010:46) believes that there is a level of aesthetics that relates to how the 'idea' is manifested in the design, or, in other words, how the idea is communicated. According to Folkmann (2010:49) "aesthetics in design is a matter of how design relates to meaning". The focus here is on the interaction between object and meaning, and not so much on the physical content itself. The manifestation or communication is moreover often a complex process of simultaneously containing and concealing (Folkmann 2010:47). Aesthetic objects are often perceived in this manner because there is a level of concealment present in the work, meaning that it communicates in a more subtle and ambiguous manner that requires a higher level of engagement on the part of the viewer. Aesthetics in design is "expressed as an ongoing dialogue of outer appearance, constantly hiding and revealing its meaning content" (Folkmann 2010:52). The viewer becomes more aware of the 'means' as a subjective expression and becomes absorbed in the 'ambience' of the work. A degree of decoding or uncovering remains central to the aesthetic experience.

Sally McLaughlin (2009:314) also believes that ambiguity in artifacts might be a significant contributor to encouraging reflection. Aesthetic visualisations may thus employ ambiguity as a strategic tool in encouraging engagement and soliciting reflection. It is under these circumstances that the information, being an 'event' rather than an 'entity', may influence perceptions through meaningful engagement. McLaughlin (2009:314) explains that art can "tune us into the world in such a way that we gain perspective, allowing us to reflect on the broader context of our existence". McLaughlin (2009:314) thus argues that information designers should understand this "mood" or "attunement" in order to produce artifacts that encourage reflection in order to become more meaningful. Although intentions to encourage deeper reflection through strategies such as 'concealment' or 'ambiguity' may not traditionally be associated with information visualisation practice, it has been shown to contribute to the aesthetics of information visualisation.

Beyond the communication of an 'ambience' with a particular aim in mind, there is also the intent to create something aesthetic, similar to the intent in making art. Most visualisations aim to communicate certain concepts, but only some of them do so with conscious regard to this added aim. Folkmann (2010:47) introduces the concept of an 'added quality' in aesthetic objects, which relates to how aesthetic objects contain something 'more'. For Folkmann (2010:48) "surplus of meaning" is inherent in aesthetic objects, which means they contain a self-reflective "aesthetic function".

The aesthetic design thus not only contains an idea, but also "demands or even commands a specific order of alignment or mode of understanding" that is reflective in nature (Folkmann 2010:47). This also relates to the awareness and appreciation of the 'means' as intrinsically valuable. Therefore, the aesthetic understanding of an artifact relies on the viewer's understanding of the 'aesthetic category' in which the artifact is situated. This is very similar to the way in which art is identified as such, because of the context in which it is placed (a gallery for instance). There is a certain 'mode of understanding' that accepts that the object is 'special', regardless of its form and content. There is, in other words, a particular "communicative construction" that points in an aesthetic direction (Folkmann 2010:47). It may also be seen as a specific awareness or intent on the viewer's part to frame the artifact as aesthetic and thus a different 'orientation' towards the work is adopted.

Crnokrak's example shows that there is an aesthetic intention in expressing a certain meaning, as well as an intention in making something aesthetic. The intention in the creation of this work is arguably twofold: firstly to analyse and visualise the geopolitical patterns and to communicate the significance of the outcomes to others and secondly to also create a 'special' aesthetic object that may be displayed or experienced in much the same way as an artwork. The aesthetics of this visualisation may thus potentially be understood in terms of the 'artistic' aims of its creator. The communicative 'ambience' arguably puts the viewer in an 'aesthetic' frame of mind, leading to a greater mindfulness of the experience and therefore a deeper reflection on the work. Crnokrak (in Lima 2009) explains that aesthetics is of vital importance to the overall communication value of visualisations:

> [G]ood looking – beautiful aesthetics – is likely an underlying function of
> communicative value – but one that runs so deep within our cognition that we do not
> have the vocabulary/understanding as of yet to objectively characterise. A well-trained,
> intuitively aware, designer knows how to engineer desire – that combination of visual
> elements that lead the viewer into a sequential experience of emotive graphic value ...
> an effective "purely aesthetic" experience is one that the majority of people can agree
> imparts some emotional value that draws their attention.

Chapter Three has shown that 'aesthetics' is a multi-faceted concept, related to various experiences of sensual/formal qualities, content and meaning and also the intentions behind the creation of certain artifacts. Aesthetics at its most basic level requires the sensual perception of an artifact or situation, but a narrower definition is required since not all experiences can be labelled aesthetic. Defining aesthetics in terms of 'beauty' remains problematic since it is influenced by subjective opinion and taste. Understanding aesthetics as related to manifestations of order and unity has potential to shed light on why certain artifacts are perceived as aesthetic while others are not. Aesthetic principles of order and unity have also shed light on the connection between aesthetics and ethics, as both relate to ideas on harmony and integrity. Furthermore, aesthetics was shown to be influenced by the perception of skill or mastery of a medium or process. Lastly, aesthetics was shown to relate to engaging experience, on both affective and cognitive levels. The audience is actively involved in creating '*an* experience', which implies a 'special' mindful orientation towards the aesthetic situation.

In a design context, an understanding of aesthetics was at first shown to relate to formal 'superficial' qualities of artifacts. However, it has become necessary to extend the definition of aesthetics beyond the surface. It was also shown that aesthetics in design is more closely linked to functionality, especially when a broader definition of functionality is adopted. Furthermore, the aesthetics of design artifacts is arguably enhanced when products are perceived as highly functional or usable, as well as pleasurable on a variety of levels, including psycho- and ideo-pleasure. This indicates that there is a depth to design meaning which is often overlooked in discussions around product functionality. Aesthetics in a design context was shown to influence the 'ambience' of interactions with artifacts, potentially leading to a deeper engagement. This engaging experience is of particular importance in communication design artifacts such as information visualisations, where contemplation and reflection can possibly enhance communication outcomes. This links to a response to Lima's *Information visualisation manifesto* by Richard Hare (in Lima 2009a):

> All sensory inputs have an aesthetic dimension – in that they make us feel one way or
> another. Understanding this rhetorical dimension is fundamental to effective
> communication. It is obvious that we must be adept at using the tools of
> representation conscious of their potential to engender feelings in our readers...
> ignoring aesthetics and kidding ourselves that we are thereby being objective is simply
> perverse. There is no neutral option in representation only an aesthetically ignorant
> and/or lazy option.

In order to understand the communicative function of aesthetic visualisation in more depth, the following chapter considers the communication process of design artifacts from another perspective, namely that of rhetoric.

CHAPTER FOUR

RHETORIC IN INFORMATION VISUALISATION

Aristotle (2010:8) defines rhetoric as "the faculty of observing in any given case the available means of persuasion". In a contemporary context, rhetoric is defined as the study of eloquent or persuasive speaking and writing, especially as practised in public oratory (Crystal 2000:757). Carol Thomas and Edward Webb (1994:6) explain that rhetoric was established as a discipline "when Plato and Aristotle combined the study of manner with that of matter". Aristotle's work *Rhetoric,* written approximately 350 BC, is one of the key texts in the field, and is still widely used today.

4.1 Aristotelian rhetoric and visual rhetoric

Aristotle (2010:5) explains that rhetoric is the study of modes of persuasion, and that persuasion is "clearly a sort of demonstration" (or proof). He argues that people are most convinced of something when they think it has been proven (in Rapp 2009:580). Even though Aristotle's rhetoric is written in reference to the persuasiveness of public speeches[1] in particular, it is possible to extend the usage of rhetorical practice to inform our views on persuasiveness in general (Rapp 2009:579). Rhetorical theory may therefore apply to a wide range of contemporary communication platforms, and seems particularly useful to information design and visualisation contexts. This chapter thus explores Aristotle's theories on rhetoric, with a specific focus on his three modes of persuasion, and shows how it can be applied in visual contexts. The latter part of this chapter applies these theories in the rhetorical analysis of information visualisation examples.

4.1.1   Aristotle's three rhetorical appeals

Aristotle identifies three means of persuasion or proof (*pistis*) (Carey 1994:26). Carey (1994:26) explains how the word *pistis*, is often translated as 'proof' but may be interpreted more broadly to include concepts of "trust, trustworthiness, credence and credibility". Aristotle (2010:8) describes the three modes of persuasion in the following way:

> Of the modes of persuasion furnished by the spoken word there are three kinds. The
> first kind depends on personal character of the speaker; the second putting the
> audience into a certain frame of mind; the third on the proof, or apparent proof,
> provided by the words of the speech itself.

These modes are interpreted by Carey (1994:26) in reverse order (as they are usually explained) as the argument itself (*logos*), the "disposition created in the hearer" (*pathos*), and the character of the speaker (*ethos*). The *logos, pathos, ethos* tri-partition has, according to Rapp (2009:582), been preserved in practically all modernised versions of Aristotle's rhetorical theory. Another way to describe these means is as

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[1] Aristotle saw rhetoric as mainly pertaining to three kinds of oratory namely, judicial (forensic), deliberative (political) and epideictic (ceremonial). In ancient Greece, these three kinds of oratory were the main reasons for public debate on which major societal decisions were based (Thomas & Webb 1994:18).

'appeals': *logos,* the appeal to reason; *pathos,* the appeal to the emotions; and *ethos,* the appeal implicit in the speaker's character and credibility (LaGrandeur 2003:120).

Logos is often described as the most basic element of persuasive arguments. According to Aristotle (2010:9), "persuasion is effected through the speech itself when we have proved a truth or an apparent truth by means of the persuasive arguments suitable to the case in question". It is thus important to note that *logos* is not related to the inherent 'truth' of an argument, but rather to the constructed content that may or may not be 'true'. The *logos* may be considered a special 'knack' on the orator's part for constructing an argument in such a logical and convincing way that there is no doubt in the audience that the facts are indeed true (Gagarin 1994:48). According to Aristotle, *logos* is related to dialectics since it relies on 'deductions, inductions and deduction-like inferences" in order to construct an argument (Rapp 2009:583). *Logos* thus relates to the structure, conclusiveness or coherence of an argument.

According to Rapp (2009:584), arguments are further supported by the remaining two appeals, *pathos* and *ethos*, which are more closely related to moral psychology. For Carey (1994:26), the latter two appeals (*pathos* and *ethos*) are indirect 'proofs', but still have a major influence on the audience and thus on the process of persuasion. LaGrandeur (2003:119) also explains how Aristotelian rhetoric "stipulates that the speaker's ability to arouse emotion in his audience and his ability to cultivate an impression of credibility with them are, in addition to evidence and logic, extremely important persuasive elements".

Pathos is related to the emotional appeal of an argument that creates a certain disposition in the audience (Carey 1994:26). *Pathos* is in other words more concerned with the manner in which something is said. Aristotle (2010:9) explains how "persuasion may come through the hearers, when the speech stirs their emotions. Our judgements when we are pleased and friendly are not the same as when we are pained and hostile". According to Carey (1994:26), Aristotle cements the idea of *pathos* in his writings and regards *pathos* as particularly useful in forensic arguments. Emotions that are often evoked by the rhetor in judicial settings, for example, could include sympathy (towards a perpetrator), anger (to make the audience feel like they have been wronged personally), or fear (of the potential negative consequences of a certain judgement)(Carey 1994:29). These are common tactics that one might witness in courtrooms even today. However, Carey (1994:33) also explains that the appeal to the emotions has relevance beyond forensic debating, and that it has value in other areas such as political oratory.

The third appeal, namely *ethos*, is related to the character of the orator, and is regarded as particularly important within political (deliberative) oratory:

> Persuasion is achieved by the speaker's personal character when the speech is so
> spoken as to make us think him credible. We believe good men more fully and more
> readily than others: this is true generally whatever the question is, and absolutely true
> where exact certainty is impossible and opinions are divided... his character may almost
> be called the most effective means of persuasion he possesses (Aristotle 2010:8).

According to Carey (1994:35), this emphasis makes sense in the Athenian context, where the projection of a reliable and honourable character was essential in competing for greater public influence. To a large extent we also understand the importance of the appearance of 'good character' within the political context of modern society. Aristotle identifies wisdom, virtue and goodwill towards the audience as important characteristics of the orator in establishing trust (Carey 1994:35). Other characteristics of a rhetor's *ethos* could also include participation in public service, patriotism, honesty, perceived inexperience in oratory (or naiveté), piety, restraint and adherence to etiquette.

Carey (1994:39) explains that there are often overlaps between *pathos* and *ethos*, since the one affects the other. Aristotle separates the various concepts in order to emphasise and clarify the desired effects of oratory, but in reality arguments are more fluid and not necessarily so neatly structured (Carey 1994:43). Aristotle provides a valuable framework for identifying the various elements of a persuasive argument. Aristotle (2010:9) thus identifies that in order to communicate persuasively, one must be able:

> ...(1) to reason logically, (2) to understand human character and goodness in their
> various forms, and (3) to understand the emotions – that is, to name them and
> describe them, to know their causes and the way in which they are excited.

According to Ian Worthington (1994:viii), it is important to recognise the conceptual relevance of Greek rhetoric in modern society, specifically in the realm of communication. According to Sonja Foss (2005:141), the term 'rhetoric' may in contemporary society be interpreted simply as 'communication'. Although this is possibly an oversimplification, it shows that rhetorical theory may provide a valuable perspective in the analysis of communication media. As we live in an era of visual communication, it thus makes sense to investigate visual messages by means of visual rhetorical theory.

4.1.2   *Visual rhetoric*

In an age where people are bombarded with media messages, a "fluency with images and their use has become crucial to controlling credibility and creating emotional appeal, and even, to some extent, logical appeal" (LaGrandeur 2003:119). Even though it seems natural to extend rhetoric beyond the spoken word, applying it to visual contexts is a fairly new development. According to Foss (2005:141), it was only in the 1970s that visual images became widely accepted as relevant to the study of rhetoric. Today the study of visual images from a rhetorical perspective is a flourishing practice, and, according to Foss (2005:142), is due to the fact that images are so pervasive in contemporary culture. Foss (2005:142) explains how images in the form of "advertisements, television, film, architecture and interior design and dress constitute a major part of the rhetorical environment" since these media have a similar "significance for contemporary culture than speeches once did". Foss (2005:143) also points out that the study of visual rhetoric is important because certain aspects of human experience are exclusively communicated through the visual (such as spatially oriented concepts).

Kostelnick (2004:215) explains how "visual rhetoric always begins with a designer shaping visual language for a specific audience and purpose and culminates with a reader interpreting that language in a specific situation". The concept of rhetoric thus always relates to both an orator (or in this case a visualiser) and an audience, and thus studies the purposeful, communicative interaction. According to Foss (2005:144), rhetoric is not employed simply for self-expression, but rather in communicating with an audience. This suggests strong links with the field of communication design.

Gui Bonsiepe was one of the first theorists to consider the relevance of rhetoric theory to design practice, as early as 1965. Bonsiepe (1999:167) also defines rhetoric as "the art of persuasion, or the study of the means of persuasion", which can be applied to visual contexts. Bonsiepe (1999:170) specifically refers to posters, advertisements, films and television spots as pertaining to the study of visual rhetoric. He focuses particularly on advertising, as it has an inherent persuasive purpose (Bonsiepe 1999:168; De Almeida 2009:188). According to Bonsiepe (1999:167), the aim of rhetoric is "primarily to shape opinions, to determine the attitude of other people, or to influence their actions". He argues that "the only examples of simple, dehydrated information, innocent of all taint of rhetoric, that come readily to hand are such things as logarithm tables, timetables, and telephone books" (Bonsiepe 1999:170).

Subsequent theorists such as Richard Buchanan (1985) and Robin Kinross (1985) suggest that the study of visual rhetoric also applies to other communication or information design products, even if they may initially seem 'innocent' of rhetoric. Buchanan (1985:4) argues that communication is the overarching idea found in all design studies, and that it is directly related to rhetoric. Buchanan (1985:6), in agreement with Bonsiepe, outlines the purpose of rhetoric as being to "provide the audience with the reasons for adopting a new attitude or taking a new course of action". Buchanan's theories on visual rhetoric, particularly the way in which Aristotle's three appeals may apply to communication design contexts, are explored in more depth later in this chapter.

Also expanding on Bonsiepe's theories, Kinross (1985:21) explains how seemingly 'objective' artifacts such as train timetables are rhetorical in nature because they are "designed to say something persuasive about the nature of the organisation that publishes them". Even though Bonsiepe does not include this kind of 'objective' artifact in his study of visual rhetoric, he shows an awareness of the fact that designed information can never be neutral. Bonsiepe (1999:170) explains how

> 'pure' information exists for the designer only in arid abstraction. As soon as he begins
> to give it concrete shape, the process of rhetorical infiltration begins. It would seem
> that many designers – blinded by their effort to impart objective information (whatever
> that may mean) – simply will not face this fact.

Hanno Ehses and Ellen Lupton (1988) also expand on the work of Bonsiepe, and show in more depth how rhetorical theory could be applied to graphic design contexts. Lupton (1988:7) defines rhetoric as the earliest discourse of language in the Western world, and that it is always directed towards practice, in much the same way as theories on design. Ehses (1988:3) goes so far as to claim that classical Greek

rhetoric can be seen as a holistic approach to communication, and that it should be taught in design schools. He further explains that "for rhetoric, language is never simply a form of expression: it is a functional tool that is manipulated to achieve desired ends" (Ehses 1988:3).

It is easy to see why rhetorical practice is often associated with 'manipulation'. Ehses (1988:3) explains how there is a "common prejudice and misunderstanding" of rhetoric being "bombastic and hollow, with fraud and seduction, with deceit and sheer ornamentation". According to Ehses (1988:4), rhetoric is often perceived as the "garb of thought" or in other words the mere outer appearance of something, and is also often seen as manipulative or 'untruthful'. Ehses (1988:4) explains how the contemporary distinction between 'information' and 'persuasion' reflects these historical concerns. Even though many designers may be under the impression that their information is presented without the use of 'modes of persuasion', the fact remains that all communication, "no matter how spare and simple, has meaningful stylistic qualities which exceed the stated 'content' of a message" (Ehses 1988:5). All communication design is thus "infiltrated rhetorically", whether the designer is aware of it or not (Ehses 1988:5).

Ann Tyler (1992:21) explains how the purpose of persuasion in communication design is to accomplish one of three goals, namely "to induce the audience to take some action; to educate the audience (persuade them to accept information or data); or to provide the audience with an experience of the display or exhibition of a value for approval or disapproval". The first aim is related to areas such as advertising and is the most common application of rhetoric in visual communication contexts. The other two goals, educating and providing an experience, are more directly relevant to the field of information design and visualisation. Kinross (1985:18) agrees that rhetoric may specifically relate to information design since it is concerned with the needs of users rather than mere expressive possibilities. Victoria Gallagher, Kelly Martin and Magdy Ma (2011:27) also claim that a particularly strong argument "can be made for the interrelatedness of rhetoric and the visual arts, particularly in the field of design". Even though rhetoric and visual design have developed separately, Gallagher *et al* (2011:27) suggest that they are intricately related in their "assumptions, goals and functions". According to Gallagher *et al* (2011:28), both rhetoric and design encompass ideas of 'invention' and work toward "human advancement in both functional and moral senses" (Gallagher *et al* 2011: 28).

Buchanan (2001:191) also explores the connection between design and rhetoric and explains that design is "the human power of conceiving, planning, and making products that serve human beings in the accomplishment of any individual or collective purpose". Buchanan (2001:191) further argues that the definition of design is so close to that of rhetoric, up to the point where "we may begin to ask whether design is a modern form of rhetoric – or whether rhetoric is an ancient form of design". Buchanan (2001:191) explains that if "rhetoric provides systematic forethought in all of the distinct forms of making in words" it may also be seen as "an art of design".

According to Buchanan (2001:192), designers are "deeply concerned with persuasion and negotiation in all of the matters that they seek to advance with clients and the general public". Buchanan (2001:194) believes that products have a strong influence on human behaviour and that the common notion of design as mere product styling is a serious misconception. He further states that considering design merely as the styling of outer appearance is "comparable to the popular view of rhetoric as the mere styling of verbal expression. For both arts, the deeper work lies in the invention and disposition of form and content" (Buchanan 2001:194).

The persuasiveness (or communicative value) of design objects becomes easier to understand when considered from a rhetorical perspective (Buchanan 1985:4). Information visualisations, as communication design artifacts, may therefore also become more intelligible when considered from a rhetorical perspective.

4.2   Information visualisation as rhetorical argument

Buchanan (1985:18) suggests that "our understanding of rhetoric has been limited to the rhetoric of words, but that the vast output of human-made objects in the present represents another, unrecognised mode of communication, a rhetoric of things". Katherine McCoy (2000:82) states that virtually any communications design product relies upon persuasion. It may thus be possible to analyse information visualisations as rhetorical arguments. J Anthony Blair (2004:59) points out that "[a]rguments in the traditional sense consists of supplying grounds for beliefs, attitudes or actions" and images can "equally be the medium for such communication".

Buchanan (2001:194) explains how, when approaching design from a rhetorical perspective all products, whether tangible or intangible, should be considered "vivid arguments about how we should lead our lives". To Buchanan (2001:194), these design 'arguments' could potentially have both short and long term implications, because of the way in which they embody a wide range of cultural values and knowledge. Design arguments may have an influence not only on how we use products, but also in terms of how we perceive the world. It may be suggested that information visualisation as a specialist design practice provides particularly influential perspectives of the world as we know it through statistical data and the representation of other complex patterns.

Kostelnick (2004:226) explores the possibility of analysing statistical graphs and charts from a rhetorical perspective, concluding that data visualisations can be seen as 'visual arguments'. In any given situation

> ... a designer can employ visual language to foreground or embed information, help readers organise it, speak with a certain tone, foster credibility, and perform other functions that influence readers' interpretations. Even when various forms of visual language – typefaces, illustrations, icons, screen designs – are deployed to represent the most mundane information, they can embody elements that direct attention, persuade, and shape attitudes (Kostelnick 2004:226).

The ability of information visualisations to achieve these aims is now further investigated in relation to Aristotle's three appeals as applied to visual examples.

4.3 Aristotle's three rhetorical appeals in information visualisation

Aristotle's three modes of persuasion can be said to be present to varying degrees in all visual communication artifacts, including information visualisations. Lupton and Ehses, and Buchanan analyse each of Aristotle's three appeals (*logos*, *pathos* and *ethos*) quite extensively. These authors provide different interpretations of the appeals, and show that they may be applied in various ways. Buchanan (1985:9) proposes that Aristotle's three rhetorical appeals:

> ... involve interrelated qualities of technological reasoning [*logos*], character [*ethos*], and emotion [*pathos*], all of which provide the substance and form of design communication. Designers draw on all three elements to some degree in every design argument, sometimes blending them with great subtlety in a product. Nevertheless, these elements may be analytically distinguished to reveal the different resources that are available for persuasion.

Lupton (1988:7) also explains how a rhetor makes decisions regarding style, or modes of appeal, depending on what will be most powerful or appropriate in the given situation. Lupton (1988:10) interprets Aristotle's modes as appeals that can "move, delight, or instruct". Even though not all of Buchanan, Lupton and Ehses' ideas are relevant in the context of this study, their interpretations shed light on how these appeals may be applied to information visualisation contexts. In the following rhetorical explanation of visualisations, a greater emphasis is placed on Aristotle's original writings on *logos*, *pathos* and *ethos*.

4.3.1 Logos *in information visualisation*

Buchanan (1985:9) explains how the *logos* in design can be seen as a "technological reasoning", which forms "the backbone of a design argument, much as chains of formal or informal reasoning provide the core of communication and persuasion in language". Buchanan (1985:9) believes that

> the problem of technological reasoning in design is the way the designer manipulates materials and processes to solve practical problems of human activity. Products are persuasive in this mode when, in addressing real needs, they meet those needs in a reasonable, expedient way. Technological reasoning is based, in part, on an understanding of natural and scientific principles that serve as premises for the construction of objects for use.

This line of reasoning attempts to persuade audiences that a certain artefact is both useful and important in terms of the designer's "premises or attitudes and values regarding practical life or the proper role of technology" (Buchanan 1985:10). According to Buchanan (1985:11), technological reasoning gives "intelligibility to designs that otherwise may seem to be superfluous indulgences". It is thus clear that this mode is related to the logical and practical dimensions of an artefact, and whether it fulfils (or exceeds) certain expectations regarding functionality. For Buchanan (1985:11) the technological reasoning in an artefact creates a persuasive effect in two ways, namely in process, as well as in the end result which is the

"accomplishment of something useful". In other words, when the problem of *logos* is resolved, it is useful or able to perform a function (Buchanan 2001:195).

The logical appeal is often emphasised as the 'backbone' of any information visualisation. It is possible to argue that the problem of *logos* in information visualisation is often solved through the aid of visual metaphors. It is worthy to note that metaphors are also referred to as rhetorical devices, showing how they form a part of the rhetorical argument. As was shown in Chapter Two, the structure or organisation of data is often made visual by using familiar spatial metaphors. Ehses (1988:6) explains how rhetorical strategies become effective when they depend on the use of "symbols and patterns which are familiar and alive for a given audience".

The *logos* of an information visualisation is traditionally considered the most essential principle of visualisation practice, and other appeals may even be seen as inappropriate in the context of 'neutral' information transfer. The aim of these visualisations is thus on clarity, accessibility and efficiency, and the *logos* may provide the logical means in order to achieve that. Greg Judelman (2004:5) argues that visualisations "should be designed to transmit the maximum amount of information with the minimum cognitive exertion required". Edward Tufte (1983:177) also shares this view and believes that unnecessary decoration, or "chartjunk", makes information more complicated, and does not assist in making it more understandable. Tufte (1983) defines "graphical excellence" as design that "gives to the viewer the greatest number of ideas in the shortest time with the least ink in the smallest space". In order to produce a visualisation in such an efficient manner, a designer would undoubtedly need to be skilled in 'technological reasoning' or *logos*.

The London underground map (Figure 19) originally designed by Harry Beck, is an excellent example of a visualisation with the major focus on this kind of *logos*. Passengers need to get from point A to point B as quickly as possible and the map needs to be very clean and clear in communicating the best routes. It is efficient and effective in conveying data, creating access to the complex city. The structure of the visualisation is not based on accurate geography, but rather on an abstract structure that represents the nature of subway travel more effectively (Iliinsky 2010:5). Noah Iliinsky (2010:5) explains that what matters most in this context is the relationship between subway connections and that by stripping away the irrelevant geographic information the "pertinent data" becomes more accessible. The London underground map thus presents an innovative and logical system whereby the viewer is 'persuaded' owing to its simplicity and coherence.
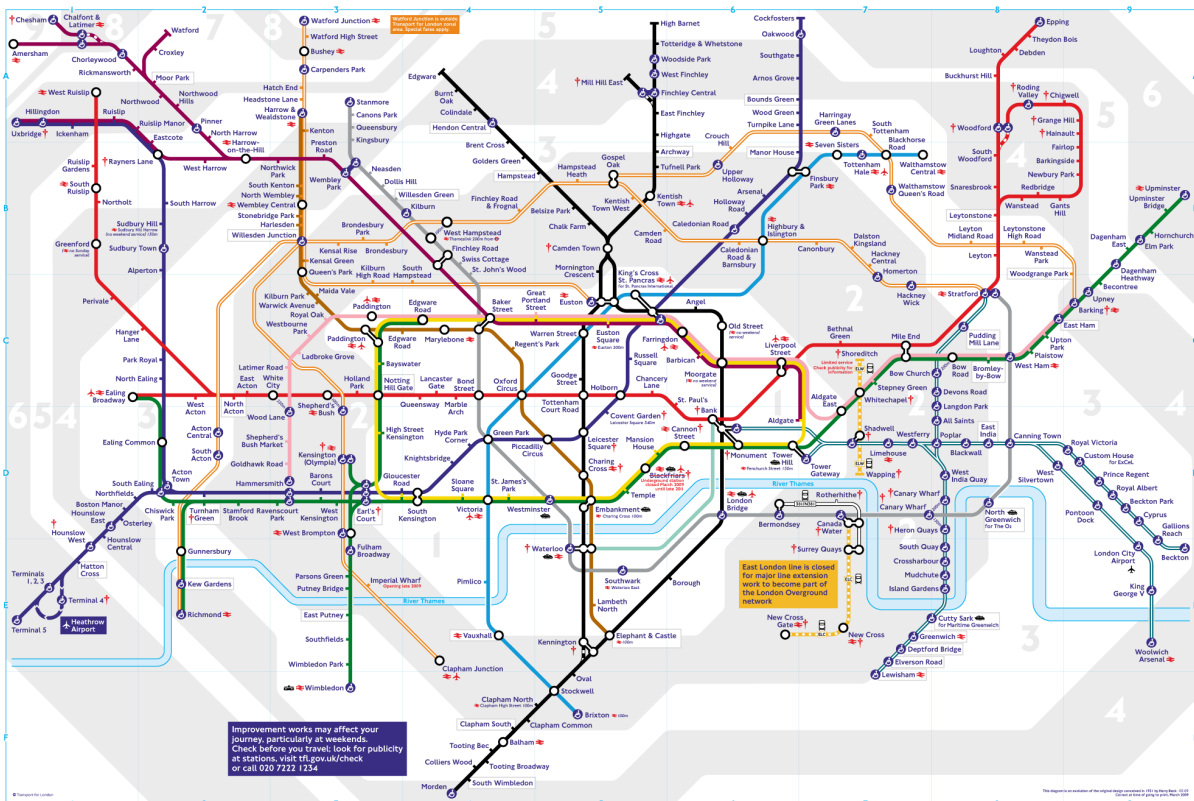
Figure 19: Tube map, 2011. (Original design by Harry Beck, 1931).
(Transport for London 2011).

In simple terms, *logos* in information visualisation may therefore be seen as the strategic organisation, or creation of a structure that enables people to navigate through complex information. According to Charles Hill (2004:27), rhetorical situations are complex, and an audience is usually faced with "a bewildering array of elements to consider – elements that may include statistics, charts, graphs, anecdotes and other narratives, items of physical evidence, and abstract ethical and philosophical arguments". Hill (2004:28) further explains how the rhetor needs to ensure that the audience is not overwhelmed by information, and that attention is focussed on the most important aspect of the case at hand. In the case of the London underground map, the viewer is bombarded with lines and names of places, but the careful use of a conceptual grid, colour coding and other visual markers, enables the viewer to easily access the most immediately relevant information.

According to Lupton (1988:7), *logos* or the appeal to the reason, "aims to instruct". She adds that this rational appeal often "employs signs of intellectual authority – statistics, hard edges, scientific drawings, quotations" (Lupton 1988:7). Stylistic connotations associated with *logos,* from this perspective, can be seen as factual, plain and logical (Lupton & Ehses 1988:14). This, however, is a rather narrow description of *logos.* Even though this stylistic approach is often found in information visualisations (such as the London underground map), it is also possible that *logos* can be approached in alternative ways. Deliberately unstructured or disorganised visualisations could potentially use a different kind of *logos* as a strategic advantage to highlight other important qualities of the data. Richard Wurman (2001:20) insists

that "order doesn't equal understanding", and that "understanding might involve accepting chaos". In certain cases, the general rules regarding functionality and efficiency are thus adapted. Furthermore, even though a clear, structured and logical appeal is the major focus of visualisations like the London underground map, it is important to recognise that they also contain elements of *pathos* and *ethos* in subtle ways.

4.3.2 Pathos *in information visualisation*

Hill (2004:28) explains how factors external to the actual argument (*logos*) also greatly influence the effectiveness of a rhetorical situation. An audience will also be influenced by the "tone in which the arguments are expressed" (Hill 2004:28). This tone relates to the *pathos* of an argument and is described by Aristotle as putting the audience into a certain 'frame of mind'. Aristotle believes that by understanding human emotions a rhetor can influence the mood of the audience, leading to a more favourable reception of ideas.

Buchanan (1985:16) emphasises that the type of emotion used in design is not an end in itself, but rather serves a communicative function in the broader argument. The aim of *pathos* is thus to "put an audience of users into a frame of mind so that when they use a product they are persuaded that it is emotionally desirable and valuable in their lives" (Buchanan 1985:16). According to Buchanan (1985:18), various emotional appeals are found in designed products, ranging from the trivial to the profound, and often in postmodern artefacts a full range is encountered. *Pathos* is described by Buchanan (2001:195) as related to "affordance", which relates to the "suitability or 'fit' of a product to the intended user". Affordance could be described as the way in which an artefact becomes suitable for human use in terms of both physical and emotional factors (Buchanan 2001:196). Buchanan (2001:195) thus explains that just as *logos* makes something functional, or in other words "capable of doing its work", *pathos* makes something usable, or suitable for human use.

Lupton (1988:7) explains that *pathos*, or the appeal to the emotions, "aims to move" by provoking non-rational and yet fairly predictable emotional responses. These emotions are both personal and shared with other members of the audience. As a result of stirring the emotions, *pathos* often comes across as being the most manipulative of the appeals. Sometimes designers use emotional appeals to "excite the passions of potential customers with trivial gimmicks that have little connection with technological reasoning or character" (Buchanan 1985:18). There are, however, more ethical and meaningful ways to utilise emotional appeals in the design of artefacts. According to Buchanan (1985:18),

> the strongest designers, those who are most articulate if not always most persuasive, are concerned with discovering new aspects of the utility of emotional expression in practical life. Their products attract and hold audiences in surprisingly different ways, and in this lies the importance of emotion as a mode of persuasion.

Emotion (*pathos*) as part of persuasion (rhetoric) thus lies partly in the way in which it grabs and retains attention. Blair (2004:51) explains that there is an advantage in visual arguments over textual ones in that

they have a strong evocative power. This power is largely due to the fact that visuals can convey a lot of information in a short time (Blair 2004:51). Blair (2004:59) further states that visuals add "drama and force of a much greater order" to arguments. This is due to the visual possessing an "immediacy, a verisimilitude, and a concreteness that help influence acceptance" (Blair 2004:59). It is possible to argue that visual presentations of facts attract attention and serve as vivid evidence of certain phenomena. This is also often achieved through the use of visual metaphors. Hekkert (2006:165) explains how metaphors are effective stylistic devices that aid specifically in the expression of difficult concepts. For this reason, we often use metaphors to express our emotional feelings, as in 'frozen with fear'". Metaphors are powerful emotive tools that have the ability to make arguments of an abstract nature more vivid.

The following example of a pie chart, as part of a campaign by the Red Cross in Portugal (Figure 20), is not very effective in terms of a functional data display. The key shows that red indicates "children helped by the Red Cross this year" and the exact same red shows "children NOT helped by the Red Cross this year. This chart thus does not fulfil its most basic purpose to indicate percentage values.
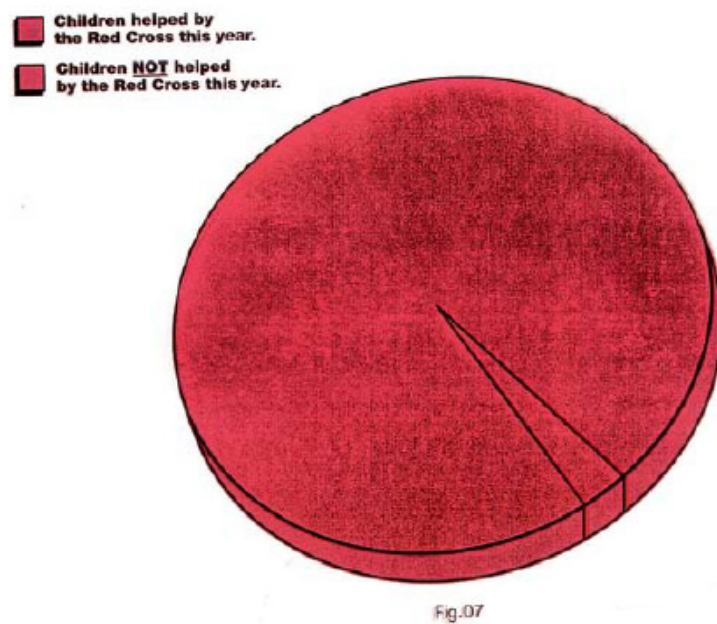

Figure 20: Leo Burnett, Lisbon, *Red Cross Portugal: It's in your hands*. 2009.
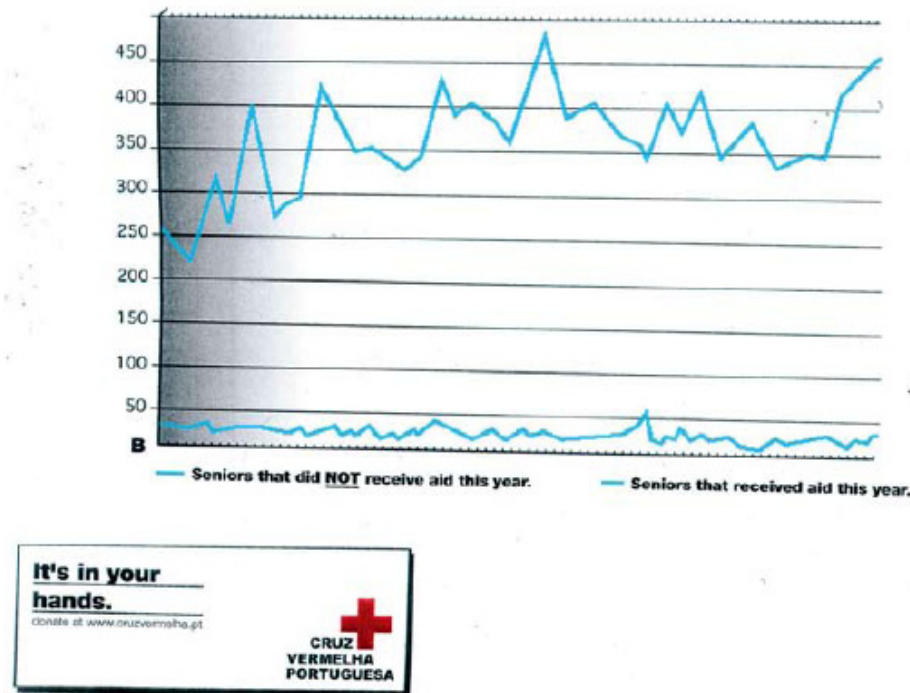(Ads of the world 2009a).

Figure 21: Leo Burnett, Lisbon, *Red Cross Portugal: It's in your hands.* 2009.
(Ads of the world 2009b).

A fever chart from the same Red Cross campaign (Figure 21) shows that there is an alternative purpose behind these charts. The two blue lines indicate, "seniors that did NOT receive aid this year" and "seniors that received aid this year". It is only after reading the caption, "It's in your hands" that the visualisations start to make sense. The charts are thus designed in a deliberately ambiguous way and understanding is dependent on the tagline that accompanies them. *Logos* is employed here as a rhetorical device to force cognitive dissonance in the viewer. These examples illustrate how visualisations may potentially elicit emotional responses based on the content, but also through the process of interpretation.

It is possible to argue that the main appeal used in the Red Cross campaign is that of *pathos*. The visualisation initially confuses the audience in order to elicit a deeper engagement. This in turn leads to an emotional response on interpretation, which is the main aim of the campaign. The Red Cross campaign invites further engagement because it initially does not make sense, and this deeper engagement leads the audience to consider the values displayed in the artifact. The audience may choose to either accept or reject these values, but the clever strategy employed here draws the viewer into the situation, forcing reflection. By presenting the outcome of the chart as open-ended and dependent on the audience's contributions, the message becomes an emotionally charged call to action.

Lupton and Ehses (1988:14) describe the stylistic associations with *pathos* as "passionate, vehement, discordant". Even though this is partly true for the Red Cross campaign visualisations, it is once again a rather narrow description of *pathos*. It is for instance possible for an emotional appeal to deliberately come across as neutral. To refer back to the London underground map example (Figure 19), it is possible to

argue that the *pathos* lies precisely in the fact that it comes across as neutral and therefore authoritive and reliable. This in turn relates to the last appeal, namely *ethos*.

4.3.3   Ethos *in information visualisation*

The *ethos* of an argument relates to the character of the speaker, and whether he/she comes across as having authority (Aristotle 2010:8). In a visualisation context, the *ethos* thus relates to whether the information comes across as factual, credible and authoritive. Lupton and Ehses (1988:14) explain how the *ethos* of a designed object evokes trust and respect. This relates to Buchanan's (1985:14) reading of *ethos* in terms of 'character':

> Products have character because in some way they reflect their makers, and part of the art of design is the control of such character in order to persuade potential users that a product has credibility in their lives.

Buchanan (1985:14) explains how designers can create products with a certain 'voice' that inspires confidence, regardless of whether the technological reasoning (practical functionality) is sound. We see this in contemporary branding, where products are often superficially perceived as reliable simply because they carry a certain label. Buchanan (1985:14) explains how the *ethos* also relates to deeper values such as "good sense, apparent virtue, and goodwill toward the audience". Even though the character of an artifact is very subtle, it is a very important mode of persuasion (Buchanan 1985:14). Buchanan (2001:196) simplifies the idea of *ethos* as the way in which users identify with a product, thus making it desirable.

Buchanan (1985:15) argues that an appearance of 'authority' is extremely important in the communication process, and that it is often valued more than common sense or intelligence. This authority is an extremely important aspect of the rhetoric in information visualisation. Kostelnick (2004:216) explains how the previously mentioned US statistical atlases (Figure 5) developed in a modernist style, "which fostered universal forms and aimed to objectify representations of cultural diversity by making them appear economical and perceptually transparent". The visualisation methods used in these atlases became familiar genres and this familiarisation lead to these forms being interpreted as "natural, direct representations of fact, unmediated by the lens of design" (Kostelnick 2004:225). Since representations of absolutely objective or neutral data do not exist, the conventions of statistical graphics only seem to be objective, when in reality they are bound to a particular ideological paradigm. A modernist 'rhetoric of neutrality'[2] is thus employed in order to appear objective and therefore more credible.

Tyler (1992:26) also explains that educational artifacts (such as information visualisations) often 'speak' in a tone of voice that presents information as fact. Rhetorical strategies of *ethos* are thus used in order to make information seem stable and dependable (Tyler 1992:26). Tyler (1992:26) further argues that this kind of factual information is often presented "without expressive characteristics that might suggest individual authorship", and appears to be communicated in an "omniscient voice". This "omniscient

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[2] This concept is borrowed from Robin Kinross (1985).

voice of science" seems to eliminate emotional qualities and present information as truth (Tyler 1992:26). This factual, anonymous 'tone' is often seen in visualisation artifacts such as the London underground map. If an artifact appears too subjectively constructed, people will perceive it as biased and therefore unreliable. Tufte (1983, 2006) outlines a variety of ways in which data can be presented in more neutral and unbiased ways. Tufte (2006:29) adds that visualisations "become more credible if constructed independently of a favoured result". This is, however, an unlikely scenario, as information can never be entirely neutral and visualisations are typically created with a particular communicative aim in mind.

Two fever charts (Figure 22) shown on Paul Gyford's (2008) weblog *Graphs that lie* illustrate this concern with information integrity and neutrality. The example on the left shows an actual fever chart that appeared in the *Guardian*, visualising a disastrous day at the Stock exchange. The graph on the left appears to be very dramatic. It could be argued that this dramatic effect has been created due to the fact that the graph does not start at 0, but rather at 1000 points. If on the other hand the graph was constructed starting at 0, as in the image on the right, the result appears much less dramatic. It may be possible to argue that the right-hand chart is more true to the data, and that it therefore has more integrity (Gyford 2008:[sp]).
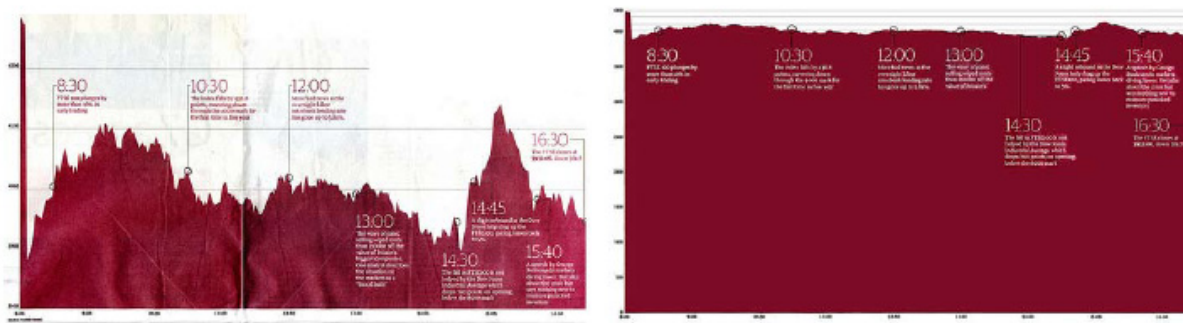
Figure 22: Phil Gyford, *Graphs that lie*, 2008.
(Gyford 2008).

To theorists such as Tufte, a visualisation's data accuracy is of utmost importance in order to produce ethical, responsible presentations. Wurman (2001:32) on the other hand accepts that absolute accuracy is never truly possible, since all information is filtered by those who organise or represent it. Hall (2008:130) also agrees with this notion that data cannot be neutral as it is collected, processed and presented for specific purposes. Wurman (2001:32) argues that accuracy in itself does not necessarily lead to understanding, which is the ultimate aim of all information. Taking this into consideration, it is also possible to argue that both graphs are equally subjective in their constructions. The first graph, while appearing exaggerated, may arguably present a more apt argument about the significance of stock events of that day. The second graph, being more neutral or impartial, potentially fails to convey the significance of events. It could thus be argued that the first graph creates a better understanding than the second, or that both graphs combined would be helpful in terms of fully understanding the situation (Gyford 2008).

Extreme accuracy can often be a hindrance to good visualisation, where extreme detail detracts from seeing the bigger picture (Wurman 2001:57). Wurman (2001:94) argues that the quality of information is not only dependent on accuracy or clarity, but also in terms of how it affects the viewer. With reference to the Red Cross example, it is possible to argue that the visualisations do not lose credibility because they were constructed with a particular aim in mind. The authority of the voice in this example is arguably expressed through the Red Cross brand, or in other words the organisation's good reputation.

This relates to one of Lima's (2009a) principles of information visualisation, which emphasises the importance of citing one's sources. Building on the ideas of Tufte, Lima (2009a) argues that misconceptions may be avoided and credibility enhanced when disclosing the source of information. One can thus see that authority, integrity and the way in which it leads to understanding, is not a straight forward process. Every situation may require a unique rhetorical strategy in order to communicate that which is truly of essence. Elzbieta Kazmierczak (2001:182) argues that the 'truth' is relative and that, when making a decision "about the truthfulness of an image, we always have to ask 'in respect to what is it true?'"

Lupton (1988:7) explains that the *ethos*, or ethical appeal of a design artifact, "aims to delight, or win over". In the context of information visualisation, the aim to 'delight' seems shallow, but to 'win over' is most definitely a part of the rhetorical process. Lupton (1988:7) further explains how *ethos* focuses on "finer emotions of sensibility, taste, and philosophical belief" which is related to the "decorum and aesthetic qualities of design, often addressing the traditional values and moral tendencies of an audience". Lupton and Ehses (1988:14) describe the stylistic connotations of *ethos* as that which is "morally appropriate, beautiful, ornate, tasteful, likable". Even though it is also possible for a visualisation's *ethos* to be the exact opposite of what Lupton and Ehses describe, it is worthy to note how the *ethos* and the aesthetics of artifacts have been linked.

To conclude this section, the appeal of *logos* is potentially found in a visualisation's logical structure and organisation of information, *pathos* in the 'tone' or frame of mind it establishes, and *ethos* in the values such as credibility and integrity of data as well as the character of the creator. It thus becomes clear that information visualisations may be analysed according to Aristotelian rhetoric. While each appeal was analysed separately in this section, it is important to remember that the appeals cannot be separated in practice. All three are present in varying degrees in all visualisations. A compelling visualisation, such as the previously mentioned map of Napoleon's march by Minard, shows a sensitive application of all three appeals. Since this map also has potential in terms of aesthetic analysis, it will be used as an example in the following chapter, which compares aesthetic and rhetorical theory. Throughout the exploration of Aristotle's rhetoric, subtle links with aesthetic themes have started to emerge, and these will now be explored in greater depth.

CHAPTER FIVE

A COMPARATIVE ANALYSIS OF DESIGN AESTHETICS AND ARISTOTELIAN RHETORIC IN INFORMATION VISUALISATION

The study has shown that information visualisations can be both aesthetic and rhetorical. Both aesthetics and rhetorical theory have been identified as potentially valuable areas of study within design discourse, but they have thus far been investigated separately. Aesthetics in design is typically understood as unrelated to practical function, and as mere surface appeal, while rhetoric is more closely associated with practical outcomes. However, this study has shown that aesthetics in design is integral to the overall experience of products, and therefore also interconnected with functionality and communicative outcomes. Buchanan (1985:4) explains that

> ... when studies of the aesthetics of design treat form not only as a quality valuable in itself, but also as a means of pleasing, instructing, and passing information, or, indeed, as a means of shaping the appearance of objects for whatever intended effect, these studies are rhetorical also because they treat design as a mediating agency of influence between designers and their intended audience.

While Buchanan does not deliberately aim to find links between aesthetic and rhetorical theory, he shows an awareness of a broader functional aesthetic that is also rhetorical in nature. Other authors, such as Kostelnick (2004), Stroud (2008) and Tufte (2006), also hint at the links between aesthetics and rhetoric even though they do not explicitly explore the connections. Kostelnick (2004) considers the 'modernist aesthetic' of the US Statistical atlases as a rhetorical strategy and Stroud's (2008) exploration of Dewey's ideas on 'artful communication' implies a link between aesthetics (the artful) and rhetoric (communication). Tufte's book *Beautiful evidence* (2006) may also serve as an example of how these areas of concern are overlapping in current visualisation discourse. Tufte (2006:9) describes the concept of "beautiful evidence" as presentations that "delight both by the wonder of the spectacle and the accuracy of the expression", while providing reasons to believe the visual arguments (Tufte 2006:79). Throughout Tufte's book one thus finds examples of visualisations that are both aesthetically appealing and persuasive.

Before the similarities between aesthetics and rhetorical theory are analysed, the potential areas of divergence first need to be investigated. Aesthetic expression and rhetorical practice are not commonly associated with each other and by looking at the traditional differences one may gain a greater understanding of where the separation, and in some cases even the opposition, originates from. The assumption here is that the apparent differences are relative, and thus do not detract from the possibility of creating a combined framework. However, the following section remains necessary, since it outlines certain conditions under which aesthetics and rhetorical theory may be compared more successfully.

5.1 Seeming conceptual differences between aesthetics and rhetoric

From a philosophical perspective, rhetoric and aesthetic discourses have traditionally been studied separately. Aesthetics is commonly perceived as not serving a utilitarian function beyond the perceptual or sensual experience (being 'disinterested'), whereas rhetoric is considered more functional in terms of its support of communicative intent. Furthermore, the communicative intent of rhetoric is stereotypically seen as manipulative. Rhetoric as a field of study is thus often seen as less noble, and has defended itself throughout history "against a litany of philosophically motivated charges" (Poulakos 2007:336). Two potential 'problems' with aligning aesthetics and rhetorical theory are thus investigated here: firstly, the problem of manipulation, where rhetorical practice is seen as manipulative and therefore cannot be aesthetic; and, secondly, the problem of superficiality, which relates to the common notion that aesthetic artifacts contain deeper meaning than rhetorical arguments. The two 'problems' are interrelated, but are explored separately for the sake of clarity.

5.1.1   The problem of manipulation

According to Paul Ricoeur (1986:11), "rhetoric is philosophy's oldest enemy and its oldest ally", since rhetoric is an inherent part of philosophical reasoning, while at the same time it may be considered as a means to manipulate the 'truth'. Rhetoric is often associated with manipulative goals and this perception probably has its roots in ancient Greek oratory. John Poulakos (2007:336) explains how philosophers such as Plato emphasised rhetoric's artificiality "in the service of illusion and deception". In ancient Greece, mainly politicians, lawyers and priests employed rhetorical strategies in public addresses, and

> [t]heir object was to obtain a definite decision (on a campaign of war); to implant an opinion (concerning the prisoner at the bar); or to evoke a mood (in a religious ceremony). The domain of rhetoric is the domain of logomachy, the war of words (Bonsiepe 1999:167).

It is thus clear to see why Bonsiepe (1999:167) originally considered advertising as a specific area that shares the same persuasive aims as rhetoric. Other philosophers such as John Locke assert that rhetoric is used to "insinuate wrong ideas, move the passions, and thereby mislead the judgement" (in Poulakos 2007:336). Kant expresses a similar disapproval of rhetoric in stating that it is able to "move men like machines to a judgement that must lose all its weight with them upon calm reflection" (in Poulakos 2007:345). Kant nonetheless makes the link between rhetoric and aesthetics, arguing that rhetoric can be seen as aesthetic if it is motivated by its own purpose or if it is 'disinterested' (Poulakos 2007:346). This acceptable kind of rhetoric does not seek to persuade an audience, but is rather "a manifestation of artistic expression, pure and simple, the result of mental clarity, linguistic dexterity, imaginative resourcefulness, and ethical standing" (Poulakos 2007:346). However, this study has shown that aesthetic expression can never be truly 'disinterested' and in the same way rhetorical arguments are also created with a certain intention in mind. Lupton (1988:8) emphasises the fact that "all communication aims to direct the response of a particular audience".

Another difference between rhetorical arguments and aesthetic artifacts could potentially be found in how directly or forcefully they communicate. A common perception of aesthetic experience (as found specifically in the fine arts) is that it comes to us in a very subtle, ambiguous manner that is not overtly aimed at convincing or persuading but rather at contemplation and reflection. Dutton (2009:241) explains how truly great works of art need to have a certain "cool objectivity" that neither imposes a certain view, nor intends to "ingratiate [itself] with us". Dutton argues that if an artist's agenda is too forceful, the artifact may become more like a propagandist statement than a work to be interpreted or reflected upon. He adds that artworks with a very direct and forceful declaration of artistic importance may often be described as kitsch[1] (Dutton 2009:241). Nevertheless, works of art are "fundamentally intentional artifacts, even if they possess any number of nonintended meanings" (Dutton 2009:60).

Even though artists possibly do not aim to 'impose' a certain view, they may aim to communicate certain ideas in the hope of creating certain responses. Poulakos (2007:349) notes that "the implicit request for agreement, or the search for approval, has always been the goal of rhetorical persuasion". He argues that this search for approval is also found in the context of aesthetic artifacts that are often judged in terms of taste (Poulakos 2007:349). Poulakos (2007:350) also explains how art objects attempt to "evoke similar feelings of delight in the other and, in so doing, elicit the other's approval". Buchanan (1985:6) insists that "all humans have a share in rhetoric because all attempt to persuade one another of various ideas and beliefs", which is true for both rhetorical arguments and aesthetic artifacts.

It is fair to acknowledge that some rhetorical arguments come across as direct and forceful in their approach, but this is only one of many rhetorical strategies that a rhetor might employ. Furthermore, some artworks are quite direct and forceful in a similar manner, but this does not mean that they cannot be aesthetic. Both artworks and rhetorical arguments could thus be subtle or forceful in how they communicate. This relates to McCoy's (2000:80) investigation of the conventional distinction between 'information' and 'persuasion'. She observes how in some cases information is perceived as objective, while in other cases it is "labelled as persuasion, promotion, or even propaganda". She challenges this paradigm that considers persuasion as 'manipulation' and contends that 'persuasion' could simply mean the creation of a desire to engage with a piece of information (McCoy 2000:80).

The main issue of 'manipulation' is arguably not with directness or forcefulness, but rather with the integrity of intent. Poulakos (2007:346) explains that there is a general perception that "persuasion cannot be trusted because its methods are the same regardless of the righteousness or wickedness of its aims". It is possible to argue that persuasion is only 'manipulation' if it works towards deceitful goals, whereas if aimed at honourable outcomes it may be considered 'positive influence'. However, intentions are difficult to ascertain since they are not usually explicit in any visual text, and as a result the audience always judges the argument from a subjective perspective. Artifacts will generally not be seen as aesthetic if they are

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[1] It is important to note that the perception of 'kitsch' relies on prior knowledge of an art historical context and that the same object may be considered aesthetic by someone who is less knowledgeable in art conventions.

considered unethical, and similarly rhetorical arguments won't be persuasive if the *ethos* of the work is not acceptable. It is thus important to point out that rhetorical arguments can only be compared to aesthetic artifacts if they are persuasive in terms of their *ethos*, or in other words if they are perceived to be ethically sound or virtuous.

5.1.2   *The problem of superficiality*

According to Lupton (1988:8), the common prejudice against rhetoric as an "underhanded" or deceptive art, possibly stems from "a tendency to associate it strictly with style". In western philosophy one often finds rhetoric defamed as mere "garb of thought", or as something that merely decorates the facts (Lupton 1988:8). The second potential difference between rhetoric and aesthetics thus relates to depth of meaning.

Aesthetic experience, from a philosophical perspective, is commonly understood as complex and deeply meaningful and therefore as superior to rhetorical experience. This potentially comes from the traditional perception of rhetoric as a lesser art than poetics.[2] Poulakos (2007:337) explains how poetics discourse influenced Baumgarten and Kant in their views on aesthetics. Poulakos (2007:338) adds that Kant declared "poetry superior to rhetoric". Baumgarten has similar views in claiming that the difference between the two arts of speech is a matter of degree in terms of 'perfection' (Poulakos 2007:340). Poulakos (2007:340) explains how Baumgarten "presumably wished to show that poetry is the loftier of the two arts, the art that inhabits the more ethereal regions of the imagination, whereas rhetoric is the more prosaic art, the one with its feet on the ground, attending to the worldly affairs of everydayness". Poetry is therefore more commonly aligned to the concepts of 'beauty' and aesthetics, than rhetoric is.

The traditional divide between rhetoric and poetics is continued today with similar divisions between art and design, and aesthetics and functionality. Poetics is generally seen as a 'higher art' because it is not overly concerned with practical outcomes, whereas rhetoric is seen as a 'functional', everyday art. The prejudices against rhetoric are thus similar than those towards the design disciplines, when compared to the 'higher arts'. Buchanan (2001:186) explains that the common distinction between the fine and useful arts stems from a Renaissance legacy, where the "fine arts were associated with the liberal arts and mathematics, usually representing a vision of a Platonic ideal", while in contrast, the "useful arts were regarded as servile, materialistic, and lacking the degree of thought" belonging to the liberal and fine arts.

This study contests this narrow view, since aesthetics and functionality are not independent and because everyday, useful artifacts may provide powerful aesthetic experiences. In a similar manner, distinctions between rhetoric and poetics are not absolutely clear either. According to Valerie Peterson (2001:22), the distinction between rhetoric and poetics is based on "false dichotomies" which "misses the overlap of the two realms". Poulakos (2007:341) argues that considerable overlaps between rhetoric and poetics are

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[2] Aristotle's work *Poetics* deals with the written traditions of poetry and prose and is often seen as a basis for aesthetic study. Poetics relates to the ancient Greek *poesis* which refers to the "making" of an object (Carlsson 2010:451).

evident and that Aristotle for instance pointed out that "both poetry and rhetoric are productive sciences with several common concerns". These common concerns relate to the eloquence of communication and the creation of an engaging experience. According to Ricoeur (1986:9), Aristotle's rhetoric originally covers three areas: "a theory of argumentation (*inventio*, the invention of arguments and proofs), a theory of style (*elocutio*) and a theory of composition (*compositio*)". Unfortunately, the latest understanding of rhetoric has been diminished or restricted only to the "theory of style" (Ricoeur 1986:9). As a result, contemporary rhetoric has been reduced to "one of its parts" and has come to be seen as an "erratic and futile discipline" (Ricoeur 1986:10). Returning to the original meaning of rhetoric, as being concerned with more than 'style', is thus crucial in accepting it as a thoughtful and creative practice that is by no means superficial. Even though Ricoeur (1986:12) also sees rhetoric and poetics as disciplines with different purposes, he identifies the use of metaphor as having a foot in both domains, indicating that creative expression is present in both practices.

It is also important to bear in mind that aesthetic artifacts are generally accepted as engaging and meaningful, because 'aesthetic' is a label that describes the totality of a positive experience. 'Rhetorical', on the other hand, is not an evaluative term in the same sense and thus not all rhetorical arguments are necessarily eloquent or persuasive, even though the intention is to reach that status. It is therefore possible for some rhetorical arguments to be superficial and lacking in deeper meaning (in a similar manner as so-called kitsch artifacts, for instance), but these arguments would not be as persuasive as their more engaging and meaningful counterparts. One should thus only consider eloquent arguments in drawing comparisons between rhetorical and aesthetic qualities.

Lastly, it is also important to acknowledge that in order to experience an artifact as deeply meaningful, a viewer needs to adopt a certain attitude or 'Deweyan mindfulness'. Stroud (2008:164) argues that communication can become aesthetic if the viewer "*attends* to means and ends as integrally connected" and "*values* means and ends in a connected fashion". The orientation towards the artifact thus adds to its meaning and depth. An artwork is only aesthetically appreciated if there is a certain focus on and awareness of both 'means' and 'ends' and in a similar manner rhetorical arguments can be perceived as aesthetic if the viewer is mindfully aware. This relates to Folkmann's (2010:46) observation that in order for a design artifact to be perceived as aesthetic, there needs to be a "sensuous relation between an appealing object and a sensitive subject". It may moreover be possible for a designer to engineer engagement in a way that stimulates greater mindfulness. Crnokrak (The luxury of protest 2011b) describes his approach to stimulating engagement through visualisation as follows:

> I'm a believer in the power and allure of discovery – engineering a desire in the user to delve deep into the design and to explore interconnected elements that give the user a sense of commitment to the design ... Giving easy answers to the user ultimately results in boredom and apathy. I treat my audience with respect and present them with work that is challenging and thought provoking in its use of visual forms and their connection to complex concepts.

It thus becomes clear that even though rhetorical practice is often perceived as manipulative and superficial in comparison to aesthetic expression, this is not true of particularly eloquent arguments. From this perspective, rhetorical strategies could be portrayed as an ethical practice "concerned with imagination, with form-giving, and with the appropriate use of language to facilitate human affairs" (Ehses 1988:5). Julian Jenkins (2009:193) also believes that rhetoric should be celebrated as a "fundamental and creative thinking art". Jenkins (2009:191) draws attention to the fact that Aristotle's rhetoric shows how arguments should not be based on facts alone, but that they need to be constructed and presented in way in which they can have meaning and influence.[3] Aristotle was, according to Poulakos (2007:336), one of the few philosophers who championed the necessity of rhetoric. The following section proceeds to compare aesthetics and rhetorical theory in relation to Aristotle's appeals.

5.2   Conceptual similarities between aesthetics and Aristotelian rhetoric

Various conceptual links between aesthetics and rhetorical theory have surfaced throughout the previous chapters. In some still isolated cases aesthetics and rhetoric are being directly linked in philosophical study. Poulakos (2007:335) argues that the eighteenth-century aesthetic theories of Baumgarten and Kant owe a large debt to rhetoric and that a rhetor could be described as "an artist of words". Heinrich Plett (1999:313) points out that by definition rhetoric could be considered the "art of speaking well" and that the adverb 'well' can also be interpreted as 'persuasively', 'skilfully' or even 'beautifully'. Quite obvious thematic links can thus be identified between aesthetics and rhetorical theory.

Buchanan (1985:16) explains how emotion (*pathos*) is a "bridge of exchange with aesthetics and the fine arts", technological reasoning (*logos*) "is the bridge with the natural and social sciences" and character (*ethos*) is "the bridge with ethics and politics". Buchanan's comparisons are, however, based on a narrow conception of aesthetics in design, and all three appeals (*logos*, *pathos* and *ethos*) may be considered bridges with the aesthetic. Buchanan's separations between aesthetics, science, and ethics does not account for the complex nature of aesthetics, which engages a viewer on a variety of levels: intellectual/cognitive, emotional/experiential and ethical/moral. Although these concepts are fluid, for the purpose of illustrating similarities between Aristotle's three rhetorical appeals and the various aesthetic themes, the following section looks at each appeal separately and systematically. To illustrate how all three appeals are present in the same argument, and also how they influence each other, a single visual example is analysed.

As explained previously, more direct similarities between aesthetics and rhetorical theory may be found when comparing that which makes an argument particularly eloquent with that which makes the same artifact aesthetic. *Carte Figurative* by Minard, as shown here again (Figure 23), is a suitable example in comparing aesthetic and rhetorical theories since it has on various occasions been lauded as both aesthetic and persuasive. Marey describes Minard's map as "seeming to defy the pen of the historian by its brutal eloquence" (in Tufte 2006:127).

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[3] Jenkins applies rhetorical theory to an organisational management context, but his ideas are potentially relevant to communication in any sector.
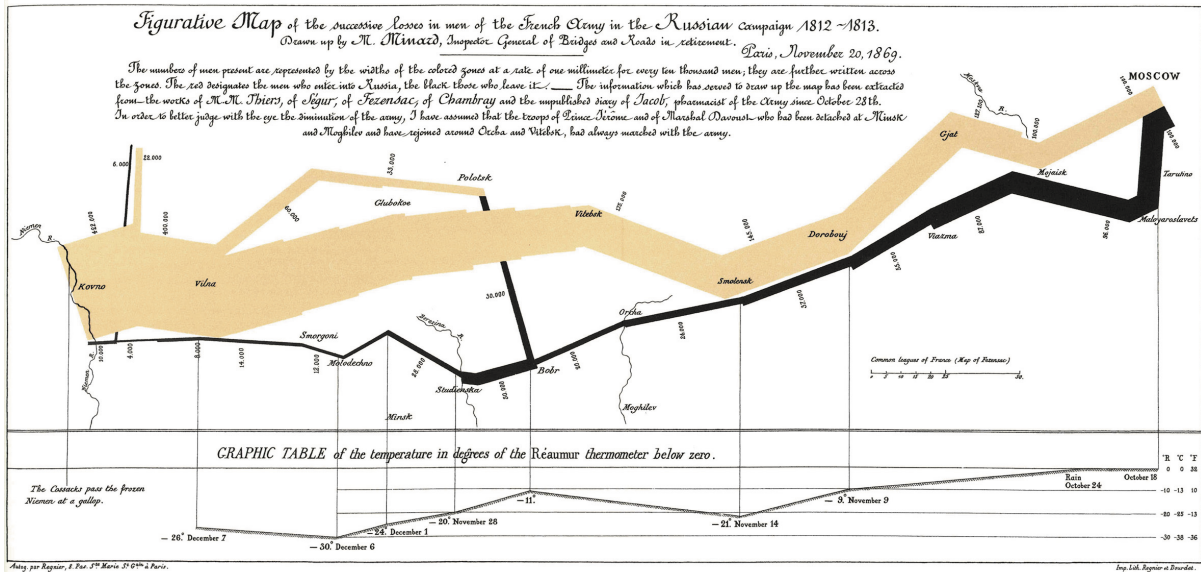
Figure 23: *Translated Carte Figurative*, Charles Joseph Minard 1869.
(Tufte 2006:123).

5.2.1 Logos *and the aesthetic artifact*

At their most basic levels, both aesthetic artifacts and rhetorical arguments are manifestations or units of expression perceived through the senses. Aristotle (2010:8) describes *logos* as "the proof or apparent proof, provided by the words of the speech itself". *Logos* is thus mainly concerned with the text or expression itself. In a visualisation context one might argue that the *logos* relates to the content as presented through visual form.

Gary Aylesworth (2005:[sp]) points to the connection between rhetoric and aesthetics in that they both "pertain to the sharing of experience through activities of participation and imitation".[4] Poulakos (2007:337) explains how rhetoric has its roots in the "human capacity to create in and through language, interested visions of order and to share them with others". Both aesthetic artifacts and rhetorical arguments are thus created or designed with an aim to create 'order'. According to Dutton (2009:237), artistic masterpieces fuse myriad disparate elements, "layer upon layer of meaning, into a single, unified, self-enhancing whole". Even though Dutton refers to art in particular, it has been proposed that other aesthetic artifacts such as aesthetic information visualisations are produced in a similar manner. Buchanan (1985:21) claims that design as an activity is an "architectonic art" that "all forms of production for use have in common". Architectonic arts are activities that plan and organise the "efforts of the other arts and crafts, giving order and purpose to production" (Buchanan 1985:21). Buchanan (1985:21) further argues that design activities are guided by another architectonic art, namely rhetoric: as an "art of thought", formulated and presented to an audience. Rhetoric in information visualisation may thus be understood as the 'thought' presented to the audience through a logically ordered structure. According to

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[4] Imitation in this sense relates to Aristotle's concept of *mimesis,* which is an innate human tendency to represent aspects of lived experience, and is also found in language (Dutton 2009:32). Dutton (2009:33) explains how "imitation is a natural component of the enculturation of individuals".

Buchanan (2001:195), for the designer, *logos* is the "intelligent structure of the subject of their design". Intelligence and skill are thus vital to constructing coherent and persuasive arguments.

Tufte (1983:177) believes that when one comes across a unique and brilliant graphic such as Minard's *Carte Figurative*, it can be "described and admired", but that there are no set rules on "how to create that one wonderful graphic in a million". Despite the fact that there are no 'rules', Tufte (1983:177) identifies certain characteristics that enhance how visualisations are perceived; they

> ... have a properly chosen format and design; use words, numbers and drawing together; reflect a balance, a proportion, a sense of relevant scale; display an accessible complexity of detail; often have a narrative quality, a story to tell about the data; are drawn in a professional manner, with the technical details done with care; avoid content-free decoration, including chartjunk.

It is possible to argue that Minard's visualisation excels in all of these guidelines, both in terms of form and content. In terms of form, the visualisation establishes an integration of words, numbers and drawings in an appropriate format and scale. In other words, there is formal unity in the way it is constructed. It is also 'beautifully' executed, in other words, skilfully and with care. Not only is it constructed in a neat and professional manner, but it also presents a great amount of complexity in a manner that is logical and easy to comprehend. Minard's visualisation is multi-faceted and quite dense, displaying information across various dimensions. This includes information regarding "the size of the army, its two-dimensional location (latitude and longitude), the direction of the army's movement, and temperature on various dates during the retreat from Moscow" (Tufte 2006:129).

Various factors are shown in a "broad, pluralistic, problem-directed" manner, and the viewer can thus gain greater insight into the whole situation (Tufte 2006:131). According to Tufte (2006:129), it represents multiple variables with "distinct clarity", without the need for any further explanation. Tufte (1983:177) explains that the aesthetics of information displays are "often found in simplicity of design and complexity of data". This also relates to the design aesthetics principle of efficiency, where pleasure is derived from achieving a goal in the most economic manner. Minard's map succeeds in conveying a large amount of relevant information in a simple and striking graphic.

Despite its density, there is no superfluous decoration that detracts from the focus of this display. In the tradition of Adolf Loos' *Ornament and crime,*[5] Tufte (1983:177) particularly disapproves of unnecessary decoration or "chartjunk". This relates to Hekkert's (2006:169) ideas on the aesthetics of functionality specifically in terms of the 'beauty' of efficiency. Aesthetics has been shown to relate to the use of 'minimal means', meaning that a particularly efficient structural solution can be appreciated aesthetically. Dutton (2009:236) explains that aesthetic masterpieces "incite pleasure by presenting audiences with the highest degree of meaning-complexity the mind can grasp". Complexity in this sense "does not mean sheer complicatedness but rather the densely significant interrelations" present in a work (Dutton

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[5] Adolf Loos' essay *Ornament and crime* (1908) condemns the decoration of artifacts as superfluous and degenerate (Coles 2005:22).

2009:236). Minard's map can be considered a prime example of efficiency in structure, consisting of 'densely significant interrelations'. Dutton (2009:237) explains that interactions with such extraordinarily constructed artifacts may lead to "staggering moments of aesthetic experience":

> ... where the events that make up the whole of a vast novel, an opera, or a poem,
> sonata, or painting fall meaningfully into place. The finest works of art draw us into
> them in order to yield up the deep, intricate imaginative experiences. They are marked
> by the utmost lucidity and coherence.

As mentioned previously, the *logos* of a visualisation can take on various forms, and unstructured or disorganised visualisations, could potentially have different rhetorical aims in mind. Van Heerden (2008:7) states that aesthetic visualisations create a "multi-layered symphony of expression" and often these visualisations are intricate and complex. Some aesthetic visualisations may come across as confusing at first, but as explained previously, this might be a strategic advantage due to providing the viewer with a pleasurable experience of decoding. The experience elicited by the form and content of the aesthetic artifact (*logos*), thus forms part of the overall persuasive and aesthetic context. This brings Aristotle's second appeal, namely *pathos,* to the fore.

5.2.2   Pathos *and the aesthetic experience*

Aristotle (2010) describes *pathos* as "putting the audience into a certain frame of mind". *Pathos* is thus mainly concerned with the audience's perception of the argument and the overall experience. Aristotle understands that emotional appeals aid communication outcomes and describes them as "all those feelings that so change men as to affect their judgements" (Poulakos 2007:344). It is fairly straight forward to see how both aesthetic and rhetorical situations lead to engaging experiences and as such the most obvious link between aesthetics and rhetoric is often found on this level. A rhetor could, according to Poulakos (2007:336), be described as "an artist of words attentive to the impact that inventional ingenuity and forceful expression could have on an audience".

According to Buchanan (1985:16), the emotional element or *pathos* of design arguments, is "sometimes regarded as the true province of design, giving it the status of a fine art". Dutton (2009:234) explains how works of art arouse emotion through a total structure and complex interplay of various factors, and it could be argued that design artifacts appeal to the emotions in a similar manner. In a visual sense, the emotions are often stirred indirectly as a result of "interpretation and allied idea" (Dewey 1934:237). It is thus important to note that *pathos,* though being an appeal to the emotions, encompasses the overall response, both cognitive and emotional.[6] It has been shown that aesthetic artifacts often "unite every aspect of human experience: intellect and the will, but also emotions and human values of every kind" (Dutton 2009:237). Information visualisations arguably employ *pathos* in a similar manner for setting an overall ambience or mood. Rational and emotional responses are thus fused into an overall experience.

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[6] It is important to note that separating the emotional and rational is problematic, and that the "simple binary distinctions such as 'emotional vs. rational' have been problematised in the theoretical literature and demonstrated as invalid by much of the empirical research into cognitive and neurological processes" (Hill 2004:27).

It is possible to argue that Minard's map engages the viewer on a variety of such levels. The overall 'mood' is immediately established by the carefully constructed form. From there the process of decoding the content also engages the viewer and potentially leads to an emotional response, due to the nature of the event depicted. The information presented has a narrative quality to it and as a result the viewer becomes more actively engaged in the reading. Even though the event is presented as a chart, Minard succeeds in humanising the data. Tufte (1983:177) believes that the interpretation of information visualisations plays a large role in their appeal, and that the "best graphics are about the useful and important, about life and death, about the universe. Beautiful graphics do not traffic with the trivial". Even though the significance of any information is a relative concept, Minard's map of Napoleon's march may nevertheless be described as a compelling narrative that fits Tufte's description. The army visibly reduces in size throughout the graphic, and quite dramatically at certain points such as the Berezina river crossing (Figure 24). In imaginative participation, the viewer can thus picture the army struggling against the cold and harsh environment. This also relates to Dutton's (2009:237) view on how 'serious content' such as "love, death and human fate" adds to the aesthetic greatness of certain works of art. In other words, they "do not attain greatness through prettiness or attractiveness" (Dutton 2009:238).
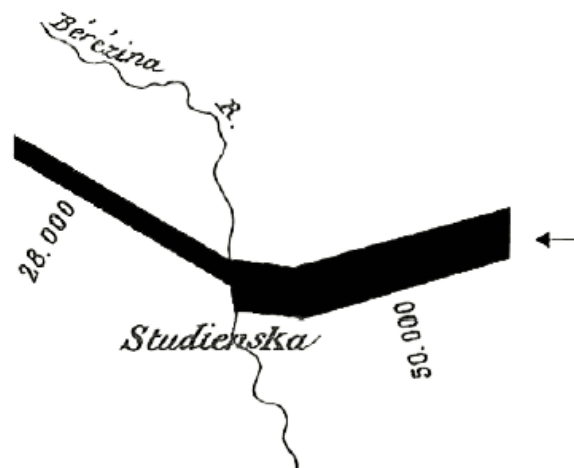

Figure 24: Detail from *Carte Figurative*, Charles Joseph Minard 1869.
(Tufte 2006:127).

Emotional responses elicited need not necessarily be positive in order to be considered aesthetic. Pieter Desmet (2004:12) notes that "it is not assumed that to serve humans' well-being, designers should create products that elicit only pleasant emotions. Instead, it may be interesting to design products that elicit 'paradoxical emotions', that is, positive and negative emotions simultaneously." Furthermore, it "may be interesting for designers to investigate the possibilities of designing paradoxical emotions because this may result in products that are unique, innovative, rich and more challenging or appealing than those that elicit only pleasant emotions" (Desmet 2004:12). Even though Minard's map is quite poignant, it is important to note that the *pathos* or emotional response evoked by a visual argument is not necessarily

'emotional' in an intense or vehement sense. As illustrated by Kinross, the 'mood' of an information design artifact is often neutral, in order to come across as more objective or authoritive.[7]

It is thus possible to argue that Minard's map engages the viewer on a variety of affective and cognitive levels. Not only does the visualisation invite closer inspection and interpretation, it also engages the viewer in constructing the scenario in the imagination. Minard's visualisation is extraordinary even in today's cluttered visual environment, and it is possible to argue that engaging with it is akin to "*an* experience" where the focus is both on brilliantly executed 'means' and profoundly meaningful 'ends'. Kazmierczak's (2001:179) calls this a "'thoughtful' revelatory aesthetics" present in certain diagrams, which relates to the creative way in which they can reveal certain higher level concepts to a viewer. According to Vande Moere (2005:36), artistic representations "capture people's attention by evoking emotional responses" and therefore "effectiveness and aesthetics may not be as independent as they initially seem". Wurman (2001:85) also states that in order for people to "acquire and remember new knowledge, it must stimulate curiosity in some way". As part of the eloquent argument, the rhetor may deliberately employ novel means to capture attention and get a message across. As mentioned previously, this is because people are more easily engaged by things that are new to them. The same is true for aesthetic artifacts that are often valued for their originality. Van Heerden (2008:7) explains how aesthetic information visualisations break away from processes and formulas that often weaken the intended message through clichés. This then leads to a stronger connection between data and viewer, which ultimately "opens up new meaning" (Van Heerden 2008:7). Minard's map was revolutionary for its time and is still considered an unusually eloquent graphic. It arguably engages the viewer more deeply because it is out of the ordinary.

Engaging the audience happens through the skilful integration of form and content. In some cases the audience is aware and appreciative of the 'means' while at other times they may be oblivious of it. It is possible to argue that aesthetic visualisations create a more direct awareness of the 'means' as intrinsically valuable. Minard's map for instance is appreciated not only for the data and the message that it contains, but also for the way in which it has been brilliantly designed and constructed. Dutton (2009:55) explains how representation is enjoyed for two main reasons:

> ...we can take pleasure in how well a representation is accomplished, and we can take pleasure in the object or scene represented... The first is about skill, rather than representation as such; the second is reducible to pleasure in the subject matter, rather than representation in itself.

This relates to the dual significance of communication as "instrumentally valuable for future states of affairs as well as being an immediately valuable instantiation of community activity with others" (Stroud 2008:176).

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[7] This authoritive tone relates very closely to the *ethos* of rhetorical arguments, and is explained in more depth shortly.

Pathos could therefore be seen as drawing a viewer in by engaging the viewer on various levels, thus making the audience an active participant in the communication process. Neither rhetorical arguments nor aesthetic artifacts are unidirectional and the audience influences the communication outcome. It could be argued that aesthetic visualisation, through inviting participation, may lead to more powerful experiences that are potentially more intense and therefore more memorable. By being sensitive towards *pathos*, a communicator may thus be able to reach an audience on a deeper level, encourage reflection and therefore aid the internalisation of information. However, this can only happen if the audience has confidence in the source, which relates to the broader contextual values displayed in an artifact through its *ethos*.

5.2.3   Ethos *and aesthetic authorship and values*

Aristotle (2010:8) describes *ethos* as being dependent on the personal character of the speaker, not in terms of the inherent personality, but rather the perceived character as presented by "what the speaker says". In this sense, *ethos* in an information visualisation context refers not directly to the author, but rather to the character of the visualisation that may create a certain impression of its creator and contextual values in the mind of the audience.

As explained previously, Buchanan links the concept of *ethos* with the 'voice' of an artifact. Even though Buchanan mentions the clear links between *pathos* and aesthetics, he also shows how the aesthetics of an artifact adds to this 'voice'. Buchanan (2001:196) suggests that aesthetics can potentially be described as "an expression of the voice of the designer" and the appeal thereof lies with "an identification we feel with the voice of the product". This 'voice' is arguably what reassures us when confronted with an argument. We identify with the 'voice' and feel reassured when it comes across as truthful and trustworthy. A rhetor may thus appeal to an audience's ethical sensibilities by aiming to come across as authoritive and reliable. As mentioned previously, some visualisations potentially achieve this authoritive tone through a modernist aesthetic or a 'rhetoric of neutrality' that comes across as objective and therefore more legitimate.

The appearance of neutrality in visualisations is often achieved through meticulous execution and a seemingly unbiased, objective approach to merely presenting the facts (as often encountered in charts and graphs). Skilful execution is extremely important in building trust with the viewer as care in construction could potentially be linked to prudence and other qualities of integrity. The execution of form and content in a visualisation thus adds to the overall *ethos* or 'voice'. Minard, trained as an engineer, had the technical skill to construct meticulous graphics (Tufte 2006:134) and his craft and skill is clearly visible in his map. This display of care and skill arguably adds to the map's overall appearance of authority, as well as its aesthetic quality. Beyond skill, the demonstration of careful execution may also be linked to passion and commitment, which are also aesthetically appreciated qualities in the creative process. Tufte (2006:134) argues that Minard's map is compelling because of his passion about the subject matter. The

'passion' is arguably visible in the way that the visualisation has been thought through and constructed with a sharp attention to detail.

Skill and passion are aesthetically valued due to the fact that they relate to the creator's 'performance'. The author or creator's performance is also judged in terms of factors such as originality, truthfulness and integrity. Dutton's (2009:178) examples of plagiarism and forgery in fine arts contexts illustrate the influence of integrity and authenticity on aesthetic judgement. Even though originality and authenticity may be specifically important to art appreciation, there is still a strong link between ethical design practice and aesthetic appreciation. Visualisations that make use of incorrect data or that aim to deceive its viewers would arguably not be seen as aesthetic. Minard's map is arguably constructed in an ethical manner and as such it is perceived as more aesthetic. Tufte (2006:132) explains how Minard documented his map very thoroughly, indicating the sources of his information, stating assumptions, acknowledging his authorship and thus taking responsibility for the presentation. All of these elements add credibility to the visualisation. Figure 25 shows a detail of the map's text that states: "Drawn up by CJ Minard, Inspector General of Bridges and Roads in retirement" and "The information which has served to draw up the map has been extracted from the works of ..." and he continues to name his sources.

Figure 25: Detail from *Translated Carte Figurative*, Charles Joseph Minard 1869.
(Tufte 2006:123).

Beyond the content, a well constructed, coherent argument *(logos)* could also add to an argument's credibility. Glenn Magee (2009:63) explores the connections between order and truth and explains how there is a certain "intuition that the beauty of a philosophy is an indicator of its truth". Beauty in this context is related to the order or harmony in a theory, and in certain cases even to symmetry (Magee 2009:65). Magee (2009:65) argues that if a philosopher's theory "happened to 'work out' in such a way that it displayed an aesthetically pleasing symmetry and uniformity, then this was an indication that it was not an accidental human contrivance but a revelation of the truth". It is thus clear to see that aesthetics can be connected to this perception of *ethos*. Magee (2009:69) argues that if the beautiful is considered to be true

> ... then an aesthetically pleasing theory will always be attractive to us, and we will always be persuaded – at least to some extent – to entertain the possibility that it is true. The same is true, in an even more direct and obvious sense, of an oration or an essay that is aesthetically pleasing in the sense of being eloquent.

Magee (2009:69) thus argues that an aesthetically pleasing argument may potentially aid persuasion because it is perceived as elegant, and therefore profound and wise. Accordingly, Minard's map is

eloquent and persuasive, partly because of its aesthetics as manifested in balanced and elegant proportions and composition.

Both rhetorical communication and aesthetic artifacts are subject to ethical judgement because they are situated in an 'intentional' category. Dutton (2009:174) explains how "intentionally artistic uses of language are particularly liable to assessment in terms of what they reveal about the character of a speaker or writer". In other words, artworks, poems and other intentionally 'artistic' expressions often invite more severe criticism than everyday expressions, especially directed at the creator's performance and intentions. Both aesthetic artifacts and rhetorical arguments are created with communicative intent, and the audience needs to be reassured that the intentions of the communicator are sound. Tufte (2006:141) explains that creating visual presentations "is a moral act as well as an intellectual activity". Tufte (2006) prefaces his book *Beautiful evidence* with a quote from the artist and typographer Eric Gill: "If you look after truth and goodness, beauty looks after herself". Tufte supports this philosophy throughout his work. In order for something to be considered beautiful (or aesthetic), it needs to adhere to certain standards regarding the integrity of the data. In other words, in order for a visualisation to be considered aesthetic, it should not skew the facts or represent false findings. It should not manipulate a viewer into believing something that is not true. A direct link can once again be seen between aesthetics and *ethos*. Arguably Tufte admires Minard's map, not just because it is brilliantly conceptualised or executed, but also because it has integrity in the representation of facts. However, to state that Minard's map is an objective representation of reality would be incorrect, as all information is mediated and can never be truly objective.

It remains impossible to present information in a completely neutral manner as there is always an intention behind the creation of a visualisation. Ethical intentions are an important aspect of *ethos*, irrespective of whether all the content is 'true'. Minard's visualisation was arguably created against the backdrop of a more personal agenda. Minard's war graphics[8] can be seen as anti-war statements, emphasising the devastating effects of war (Tufte 2006:136, Friendly 2002:45). Kostelnick (2004:227) elaborates on this idea and believes that Minard's chart "brilliantly expresses the consequences of expansionism and implicitly argues to keep French resources at home rather than squandering them on schemes abroad". It is thus possible that the *ethos* of Minard's map is centered around the ethical implications of war, which also adds to its aesthetic value. One of the principles of great aesthetic works identified by Dutton (2009:239) is "authenticity of artistic purpose" which is related to a "moral vision" or a display of a belief in something substantial. The intention or purpose thus relates to the underlying sentiment of an argument, associated with deeper values and beliefs. As Dewey (1934:231) explains, in order to be considered aesthetic, physical structure has to be used with the support, reinforcement and extension, through enduring time, of human values".

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[8] Minard's map of Napoleon's march originally appeared alongside another map of Hannibal's similarly devastating military campaign (Friendly 2002:45).

As mentioned previously, some visualisations employ a neutral rhetoric in order to come across as objective. However, 'neutral' visualisations may not necessarily be regarded as aesthetic because they come across as authorless. Visualisations that are typically created for analysis, rather than presentation or communication, are arguably only focussed on task efficiency and 'disburdenment' and cannot afford to attract attention to 'means' (Borgmann 1995:15). Although such visualisations definitely have a place, more complex or nuanced information may possibly benefit from an approach that invites deeper engagement.

Aesthetic visualisations generally exhibit greater evidence of subjective expression. Buchanan (2001:196) explains that when the aesthetics, in terms of 'voice', becomes the major emphasis of an artifact, it is often regarded as fine art. According to Buchanan (2001:196), this is how some functional products end up in fine art museums. Even though Minard possibly did not intend for his visualisations to be seen subjective expressions, his signature style has become known over the years and linked to an overall *ethos* related to his reputation as a visualiser and artist. Friendly (2002:33) argues that Minard developed his "graphic technique to an art form", and that the map of Napoleon's march "represents his finest achievement". Minard's signature expression thus enhances the aesthetic reception of his work.

It has been shown that visualisations may be classified both as aesthetic artifacts or persuasive arguments when they display certain characteristics such as order and skilful execution (*logos*), an ability to engage the viewer (*pathos*), and an ethical concern for broader contextual values (*ethos*). The comprehensive conceptual similarities identified between aesthetics and rhetorical theory thus suggest that a combined aesthetic-rhetorical framework may be developed. The following section considers what such a framework can look like and what the potential benefits thereof may be.

5.3 Towards a combined framework for aesthetics and Aristotelian rhetoric in information visualisation

5.3.1 *An initial proposal*

Even though aesthetics and rhetoric are located in separate areas of theoretical discourse, extensive similarities have been identified, specifically when applied to the area of information visualisation. Rhetorical arguments and aesthetic artifacts are similarly 'designed' and share similar communicative goals. Furthermore, these goals are reached through employing similar strategies, such as to create structurally brilliant presentations (*logos*), to engage the audience and evoke a response (*pathos*) and to create a favourable impression and be held in high esteem (*ethos*). The following diagram (Figure 26) serves to summarise findings and illustrate how the various concepts explored in the study are related.

Aristotle's modes of persuasion
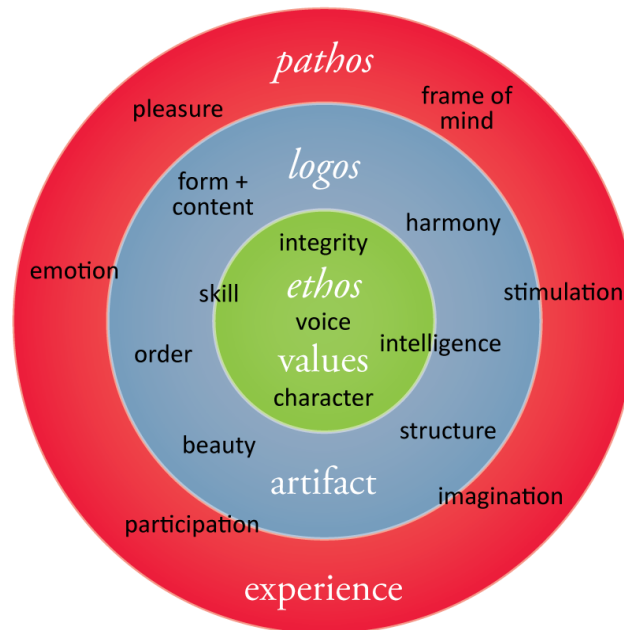
Figure 26: Initial proposal for a combined theoretical framework, by the author.

In the diagram, as in theoretical discourse, rhetoric and aesthetics are approached from different angles, with a different set of terminologies. While aesthetics and rhetorical theory are focussed on separate expressions in human culture (i.e. artworks vs. arguments), their successful implementations or manifestations are reached through similar strategies. It is clear that there are distinct overlaps between Aristotle's three rhetorical appeals and the aesthetic qualities of certain information visualisations. These conceptual similarities have been visualised in the diagram across three tiers. Various keywords are indicated across the three levels, but are meant to be read as fluid and not as being confined by solid boundaries.

The inner tier represents the *ethos,* or core values of a visualisation, related to the character or voice through which it communicates. This element or appeal aims to establish credibility and trust through displays of virtue and integrity. It is related to the ethics of the visualisation and without it neither persuasive nor aesthetic communication would be possible. The *ethos* is manifested through the *logos*, which could be considered the visualisations form and content, or in other words the interface between the designer and viewer. This relates to Dewey's (1934:106) ideas on the 'expressive object' which is the "connecting link between artist and audience" and therefore a necessary element in aesthetic experience. Any aesthetic experience requires an object to be experienced, but "not every object invites or rewards an attempt at aesthetic appreciation" (Goldman 2005:265). Not all rhetorical arguments or visualisations thus lend themselves to be aesthetically appreciated. Various characteristics of the artifact's form/*logos* may

enhance the persuasiveness and aesthetics, such as the display of unity and order, competence and skill. When the information is presented with efficiency and elegance, the viewer is more likely to accept the information as true and therefore the *logos* adds to the overall *ethos*. All the elements are thus interconnected. Both the artifact/*logos* and the core values/*ethos* influence the overall aesthetic experience/*pathos*, which is situated on the outer tier of the diagram. The viewer is thus put into a certain frame of mind, making him or her more receptive to the message being presented. By engaging the viewer in deeper imaginative participation and by encouraging reflection, a visualisation may thus become more persuasive and aesthetic.

The initial diagram shows that a combined framework is indeed possible and that aesthetics and rhetorical theory pertain to the similar manner in which certain visualisations reach their goals. However, further research and conceptual development is required in order to present a coherent combined aesthetic-rhetorical framework.

5.3.2   *The potential value of a combined framework*

Both aesthetics and rhetorical theory have been identified as important areas of further study specifically from an information design perspective. A combined framework could potentially augment an understanding of rhetoric and aesthetics as individual discourses, as well as create a more holistic understanding of the communication process in the fields of information design and visualisation.

Throughout the study the complexity of aesthetic perception has been highlighted, and the proposed combined framework may potentially aid in explaining the concept of aesthetics, while not oversimplifying it. Aesthetics, under this new conception would be seen as related to more than mere surface appeal or decoration, and as more closely connected to practical and ethical concerns. According to Zaccai (1995:10), design aesthetics could be described as the "proper balance of functional, ethical, and physical values". Furthermore, by aligning aesthetics with rhetorical theory, a greater understanding may be reached in terms of how the aesthetic is expressed on a variety of levels. By considering the Aristotelian appeals (*logos, pathos* and *ethos*), aesthetics may be seen as not only expressed in the physical visualisation artifact (*logos*), but also as dependent on ethical dimensions surrounding authorship and values (*ethos*), and on the viewer's interaction or overall experience (*pathos*). This relates to Carlsson's (2010:450) views on considering aesthetics in design not as a static quality, but rather as a creative activity in which the recipient or viewer takes part. The aesthetic experience created by certain design artifacts thus emphasise the role of the audience and suggests "deeper engagement with the communication process" (Tyler 1992:28). Information visualisations are produced and received by people, and a rhetorical approach focuses on all the role players in the process. This potentially leads to a more holistic and humanised approach to communicating information.

By definition, rhetoric is concerned with changing perceptions and attitudes, and is as such often scrutinised from an ethical perspective. By considering aesthetics as being similarly powerful, a more ethical practice may potentially be developed. Ehses (1988:6) suggests that rhetorical theory in design

> implies a shift away from a formalistic, aesthetic/stylistic imperative towards a functional, aesthetic/ethical imperative. The former tends to offer perfect models only to be imitated and technically refined: imitation instead of invention. The latter accepts that all design has social, moral, and political dimensions, that there is no sphere of pure information, and accepts the challenge to make designs that are conceptually, visually, and functionally appropriate for particular clients and audiences in particular environments.

Ehses' call for a "functional aesthetic/ethical imperative" thus takes for granted that function, aesthetics and ethics are all interrelated. This new approach to aesthetics may furthermore be emphasised as an 'art' that requires dedication to master. Stroud (2008:176) explains that "like all arts, fine or technical, artful communication will be a learned and cultivated skill", which may indicate why it is important that aesthetics theory be taught, developed and nurtured in a design education context.

Through a combined aesthetic-rhetorical framework, a better understanding of rhetorical practice may also be reached. Rhetoric is often perceived as a superficial and deceptive 'art', but by aligning it more closely with aesthetics, rhetoric may be reframed as an 'artful' practice aimed at creating coherent and eloquent communications that engage audiences in an ethical manner. According to Stroud (2008:176), the "communicator, through careful attention and valuing of the 'means' of communication, transforms a material just as much as the sculptor does, and both do it with thoughts of the reaction of an audience (formal and informal) in mind". Rhetoric, in this positive view, could be seen as an approach to creating more meaningful interactions with design artifacts such as information visualisations. This relates to Tyler's (1992:28) ideas on using persuasion in design to create an experience for the audience. 'Experience' is often associated with functionless 'aesthetic', but Tyler (1992:28) argues that it may be used to display deeper beliefs and values. Furthermore, by stimulating a desire to interact with information, persuasion in design could be reframed as aiding the user by reducing the effort needed to navigate through more complex information (McCoy 2000:81). In a visualisation context, persuasion could thus relate to the 'desire' to interact with the presented information, thus decreasing the perceived effort in reading.

When considering rhetoric as more closely aligned with aesthetics, it becomes easier to embrace rhetoric as an approach to create "new modes of interaction and deeper levels of connection with the user" (Jenkins 2009:196). Jenkins (2009:193) argues that rhetoric, in this positive view, could open up a "whole range of subjective, interpersonal and value-laden factors that are deliberately (though somewhat disingenuously) discarded from the analytical toolkit". This 'analytical toolkit' has to a large extent been the major focus of visualisation practice as well as broader design studies, possibly as an attempt to advance the design disciplines' professional status. According to Victor Papanek (1988:4), many designers focus on "systematic, scientific, and predictable" processes in an attempt to rationalise design as a

respectable discipline, but often this focus is at the expense of communication. Papanek (1988:4) argues that this 'rational' approach "leads to reductionism and frequently results in sterility and the sort of high-tech functionalism that disregards human psychic needs at the expense of clarity".

However, Papanek (1988:4) also identifies the opposite in designers who follow an intuitive approach that is "not reductionist but stifling in its rich romanticism. Even though intuition is an important aspect of the design process, an unjustified 'romantic' approach is not the answer. Both of these approaches thus clearly fall short, and have in separate ways damaged the design disciplines' professional reputation. Understanding aesthetics and rhetoric as holistic approaches to communication could potentially lead to information visualisation products that are highly functional as well as deeply meaningful.

Both aesthetics and rhetorical theory study the nature of engaging experience, which is a vital part of the successful visual communication process. According to Wurman (2001:248), "interaction with information is what enables possession" and thus makes it more likely to be of value in the future. By revisiting Shedroff's *Overview of understanding*, shown in the beginning of this study, one may argue that experiences are essential to the processing of higher level information and the formation of knowledge. DiSalvo (2002:70) explains that "while the emergence of knowledge is a phenomenon, which may not be completely deconstructed, it may be cultivated through the design of engagements, and of experiences". Aesthetic information visualisations that engage the viewer and provide more meaningful experiences are thus more likely to be remembered and applied in some way. This may in turn lead to greater insight, which could be described as "the most precious form of information" (Wurman 2001:16).

CHAPTER SIX

CONCLUSION

6.1   Summary of chapters

Chapter One provided a background context and outlined the aims of the study. The underlying assumption of the study – that design aesthetics theory could potentially be aligned with Aristotelian rhetorical theory specifically in an information visualisation context – was made clear. The aim was not to argue that rhetoric and aesthetics are identical discourses, but rather that they share similar goals and strategies.

Chapter Two provided an overview of information visualisation practice and argued that it can be seen as a sub-area of information design practice. Recent developments in the visualisation field as well as the increasingly prominent field of information aesthetics were explored in relation to selected examples. It was shown that the aesthetics of visualisations is receiving increasing amounts of both positive and negative attention from the visualisation industry. Due to the complex nature of aesthetic experience and differing interpretations, a more thorough investigation into aesthetic perception needed to be conducted.

Chapter Three shed light onto the complex nature of aesthetic experience by investigating both classical and contemporary theories. Recurring themes identified throughout included aesthetics as: sensory perception; a manifestation of beauty; a manifestation of unity and order; demonstration of skill; and an engaging experience. Aesthetics is often interpreted as 'disinterested' and removed from everyday concerns, and as such it is often a misunderstood from a functional design perspective. It was shown that there are general misconceptions about the nature of aesthetics in design, where it is often perceived as related merely to surface appeal. Design aesthetics was thus introduced as a new category within broader aesthetics theory, where functionality is interrelated with overall aesthetic experience. The theories explored in this chapter were applied to the analysis of information visualisation examples. Even though aesthetics theory was explored only briefly, this chapter identified the most common aesthetic themes to be used in the comparison with rhetorical theory later in the study.

Chapter Four explored rhetorical theory with a specific focus on Aristotle's three rhetorical appeals. Rhetoric, as the art of persuasive or eloquent communication, was shown not only to relate to the traditional practice of oratory but also to visual design contexts. Aristotle's three rhetorical appeals, namely *logos*, *pathos* and *ethos*, were explored in greater depth and were applied to an analysis of information visualisation examples. It was shown that the *logos* of a visualisation is found in the actual argument as presented through form and content. The visualisation becomes eloquent in this regard if it organises and presents information in a logical and coherent manner. The *pathos* of the visualisation was shown to relate to the viewer's frame of mind and includes emotional responses evoked in the process.

This could also include more seemingly 'neutral' approaches, depending on the specific communication goal. The last appeal, *ethos*, was described as relating to the integrity of the data and the overall credibility of the visualisation's voice. It was shown that well-executed visualisations with attention to detail speak with greater authority and therefore evoke feelings of trust. Lastly, even though the three appeals were discussed separately, it was argued that all the appeals are interrelated and present in different ways in all information visualisations.

Chapter Five compared the preceding chapters' theories regarding design aesthetics and Aristotelian rhetoric. The potential divergences between theoretical discourses were first highlighted, indicating that there are certain conditions under which aesthetics and rhetorical theories can be compared. It was also shown that not all rhetorical arguments will be seen as aesthetic and only that which makes an argument particularly persuasive or eloquent can be compared to aesthetic qualities. The theories were subsequently compared in relation to Minard's highly acclaimed information visualisation *Carte Figurative*. It was shown that even though aesthetics and rhetoric are clearly not identical discourses, they are indeed very closely aligned in their goals (to communicate eloquently) and strategies (by creating an 'argument' that appeals to the audience/viewer in terms of cognitive, emotional and ethical features). Comprehensive similarities between design aesthetics and Aristotelian rhetoric were identified and the development of a combined framework for rhetoric and aesthetics in information visualisation was justified. The last part of this chapter made use of a preliminary diagram to propose a way forward for a combined framework, while outlining some of the potential benefits that such a framework may provide if developed more comprehensively.

6.2   Contribution of the study

This study has shed light on current trends in information visualisation practice as well as two important and often neglected areas of discourse related to design practice and theory, namely aesthetics and rhetoric. Aesthetics, for one, with its close link to the fine arts, has been avoided in design discourse because of common misconceptions. According to Folkmann (2010:40), it is important to study aesthetics in design, as not doing so "leads to diffuse and sometimes unqualified discussions". Similarly, rhetorical practice has also been investigated in more depth and applied in an information visualisation context. Rhetorical practice, traditionally seen as manipulative, was reframed as a creative and ethical aid in the creation of more meaningful communication experiences. The study thus challenged preconceived ideas and contributed to the ongoing discussion surrounding the nature of both aesthetic experience and rhetorical practice, specifically in a functional communication design context. By studying aesthetics and rhetorical discourses collectively a greater understanding of the communication process in information visualisations may be gained. This may in turn provide insight in terms of creating more engaging and meaningful communicative experiences, that are to a large extent lacking in contemporary design and visualisation practice.

The aim of the study was not to find definitions or objective 'truths' about aesthetics or rhetorical theory but rather to explore alternative perspectives in order to gain a greater understanding of how theories may inform visualisation practice. It is thus important to emphasise that this study merely provided an alternate way of looking at aesthetics and rhetorical theory by highlighting the commonalities between the discourses from a design perspective. It is possible that entirely different conclusions could be reached by focussing specifically on the differences between these theoretical paradigms. This is not, however, a problem in an explorative study such as this that bears in mind the fluidity of concepts such as aesthetics and rhetoric.

On a philosophical note, the study aimed to contribute to broader discourse by questioning the rigid boundaries between the concepts under investigation. Traditional dichotomies such as art versus design, aesthetics versus functionality, and neutrality versus subjectivity have been contested. The common insistence that information visualisations are automatically objective and purely 'functional' is thus not only a fallacy, but also unhelpful in terms of creating engaging communicative artifacts. It is possible to argue that an insistence on keeping concepts discrete prevents a more rounded understanding of the totality and complexity of the communication experience.

6.3   Suggestions for further research

A few logical extensions have become apparent throughout the study. Firstly, the potential combined framework could be developed further by analysing both aesthetic and rhetorical theory in greater depth. Owing to length limitations, this study could not provide a fully comprehensive analysis of aesthetics and rhetorical theory, but the initial research validates that there is indeed potential to develop a combined framework in future. In terms of rhetorical theory, a more comprehensive study of theories other than Aristotle's might be worth investigating.

Secondly, aesthetics and rhetorical theory may be applied to other areas of information design practice in order to see whether other design products share similar aesthetic and rhetorical goals and strategies. This could potentially be extended beyond the realm of information design, and used to analyse other design products or even works of art.

Thirdly, studies in terms of how people perceive and respond to the aesthetics and rhetoric (persuasiveness) of information visualisations (or other design artifacts) may be worth investigating. Based on what supporters of aesthetic information visualisation[9] have said, a widespread assumption has been made that aesthetics add to visualisations' communicative effectiveness. However, this assumption may be tested by comparing aesthetic perception with functional communication outcomes such as recall and understanding. Due to the intricate and subjective nature of aesthetic experience, this would not be an easy undertaking.

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[9] This includes theorists and practitioners such as Crnokrak (in Lima 2009), Hall (2008), Lau and Vande Moere (2007), Van Heerden (2008) and Viégas and Wattenberg (2007).

Lastly, a further study could potentially highlight how the aesthetics and rhetorical theories relate to a broader South African context, where audiences are potentially not as visually literate. It may be worthwhile to investigate aesthetic preferences and rhetorical strategies from a local perspective as they may need to be adapted within a non-Western context. Well documented South African examples of 'aesthetic information visualisation' were at this stage difficult to find, but the practice is likely to become more prevalent in the near future. This study may prove a helpful guide to the theory for those who aim to participate in the emerging field of information visualisation. A study that focuses on how aesthetics and rhetorical theory relate to a local context may thus potentially be a valuable aid for future South African visualisation practice.

6.4   Concluding remarks

It has been argued that an integrated aesthetic-rhetorical approach to communication could potentially lead to more engaging and meaningful interactions with information, which is lacking in a contemporary society overloaded with information. DiSalvo (2002:76) argues that "the obscene proliferation of information in our daily lives" has placed us in a "crisis of meaning" where the opportunities of meaningful interaction with information, and the potential knowledge it may lead to, are ignored. Shusterman (1997:39) also warns that information overload might lead to a degeneration of "experiential, affective capacities" and assimilation into the "mechanical information processors that are already our most intimate companions in work and play". Even though a mass of information is readily available at our fingertips, it is not interacted with in a meaningful manner and arguably neither fully understood nor internalised.

DiSalvo (2002:70), in reference to Dewey's theories, explains how knowledge is generated through the active interaction with information. According to DiSalvo (2002:77), information design can be approached as a way to transform information into knowledge by providing more meaningful experiences with information and saving us "from its potentially numbing crush upon our lives".[10] DiSalvo (2002:77) argues that in order to revitalise information,

> ... we must begin to approach interfaces not as tools, but rather as a medium in and of themselves. A medium differentiates itself from a tool in that the product of a medium reveals the essence of medium in its execution. The interface designed for the emergence of knowledge must be reflective of both its content as of itself. As a place of interaction, the interface becomes a place where the potential for the creation of knowledge exists. As a place of knowledge, this is where we find meaning and create experiences which are memorable.

Stroud's investigation of aesthetic experience, as a situation in which a subject is orientated in a manner that is mindful and appreciative of both the 'means' and the 'ends', is relevant here. In order to be perceived as aesthetic and meaningful, an information visualisation arguably needs to be more than a 'tool'; it needs to be 'reflective' in terms of the data (ends) as well as the way in which it is presented

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[10] DiSalvo (2002) speaks specifically from a web interface perspective, but his ideas are arguably relevant to any information interface, including information visualisations.

(means). However, Stroud (2008:170) argues that this kind of aesthetic experience is often lost through a "habituated orientation" towards productivity focussed outcomes, instead of being attentive towards the present situation. Furthermore, Stroud (2008:170) believes that "the fine-tuned and attentive focus on meeting the present situation is what makes our present activity most adapted and immediately valuable, as well as most instrumentally valuable for reaching consequent states of affairs that hinge on how we handle the here and now" (Stroud 2008:169). In other words, when a communicative utterance becomes valuable in itself, it potentially also becomes more effective in terms of task functionality.

Influential design theorist Jorge Frascara (2002:39) argues that an excessive focus on efficiency may lead to overwork and other negative impacts on people's lives. Frascara (2002:39) suggests that the focus of design should shift from mere functionality or "design that makes life easier" towards "design that works to make life better". This includes designing for "sensual and intellectual enjoyment, the promotion of mature feelings, ability to reach high degrees of consciousness about our lives and our actions, and cultural sensitivity to build civilisation and relate constructively to others; all those things that make us specifically human" (Frascara 2002:39).

Frascara (2002:39) thus sees design as a vehicle not only for increasing efficiency, but also for reflecting on the human condition, which could ultimately lead to greater meaning and significance in people's lives. In order to reach this greater level of meaning and significance, the design focus needs to shift from 'disburdening' users towards products that are more "conducive to engagement" (Borgmann 1995:18). Engaging experiences with information cannot occur when the ultimate goal of communication is to make the medium 'invisible' so as to not be distracting. Borgmann (1995:16) thus urges designers to provoke and reward engagement by focusing on the aesthetics of design. It is possible to argue that an even greater awareness of 'engagement' may be gained when focusing on a combined aesthetic-rhetorical approach, as suggested by this study.

Information visualisation is an area of design practice that could be highly influential in creating greater understanding of complex phenomena. However, visualisations are only valuable insofar as they engage people and stimulate critical thinking and discussion. According to Thackara (2005:168), "visualisations of complex knowledge can attract attention – but the best learning takes place when groups of people interact physically and perceptually with scientific knowledge, and with each other, in a critical spirit". Designers should thus develop the knowledge and skills in terms of presenting information in a way that is not only clear and accurate, but also meaningful in how it encourages critical reflection. Antonelli (2008:22) supports this practice of 'critical design' focussed on "design for debate". 'Critical design' practice does not require objects to be immediately functional, but rather useful in how they stimulate thinking and discussion on important issues (Antonelli 2008:22). Crnokrak also supports this 'critical design' approach to visualisation practice and believes that complexity and ambiguity should be embraced, especially in presentations of "more complex and nuanced issues" in society where stimulating discussion is the most important goal (The luxury of protest 2011b).

Hall (2009) believes that the most valuable effect of considering a design object as an argument is that it "allows us to look under the hood and consider it not as an inevitable or neutral invention but as something that embodies a point of view". As emphasised throughout the study, there is no such thing as neutral information, even if some presentations 'pretend' to be purely objective. It is possible to argue that information visualisations, created with a traditional 'neutral' approach to data presentation, become sterile and hinder critical engagement or reflection. More aesthetically focussed design practices potentially have the capacity to "open our eyes in the critical way that knowledge does" (Kuhlken 2004:108).

Findeli (1994:61) explains that "subjectivity, that is, the deliberate involvement of the subject into the object, which rationalism considers as its major epistemological obstacle, should be accepted" as part of ethical design practice. McLaughlin (2009:315) also supports this view and argues that conceiving "information design as art", may orientate designers to engage in practices that provide more meaning. McLaughlin (2009:304) explains how art provides an alternative view of reality, not presented objectively, but rather as integrated with subjective, lived experience. McLaughlin (2009:316) explains that the art of information design lies in "bringing information close, in the sense of relating it to our experience, and yet maintaining sufficient distance to allow us to gain perspective on the meaning of that information in the broader context of our lives".

This unashamedly subjective approach is certainly appropriate, especially when aiming to communicate more complex information. It may even be considered ethically problematic to aim at presenting information as objective or neutral since it carries the promise of objectivity without being able to fulfil that promise. Jenkins (2009:195) emphasises the importance of human factors and argues that humans are more adept at processing both quantitative and qualitative information and to make decisions that are appropriate to wider contexts. The old paradigm of accurate, mechanical information transfer is no longer accepted as effective in terms of knowledge generation. Designers, when understanding their roles as aesthetic-rhetorical communicators, can embrace their subjective human capacity at grappling with information and produce communicative artifacts that are articulate, engaging and meaningful.

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