AESTHETICS VERSUS FUNCTIONALITY: CHALLENGING DICHOTOMIES IN INFORMATION VISUALISATION[1]

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Abstract

Information visualisation is an increasingly prominent practice focussed on making large amounts of data more accessible through visual media. Furthermore, an increased interest in the aesthetic value of visualisations is evident in the emergence of a sub-category of visualisation known as "information aesthetics", where visualisation is used in more artistic and experimental ways, with a strong focus on visual appeal. This aesthetic quality of certain information visualisations has attracted considerable debate and some traditional practitioners are concerned that "aesthetics" may detract from the functional or analytical goals of visualisation artifacts. This perceived divide between aesthetics and functionality may, however, result from two common misconceptions about "aesthetics" within design discourse. Firstly, "aesthetics" is often understood as an afterthought, or the superficial visual appeal considered after all other design decisions have been made. Secondly, "aesthetics" is often distrusted, with "decoration" seen as a sign of subjective interference with otherwise objective or neutral information transfer. This article explores various perspectives on the relationship between design aesthetics and functionality, proposing ways in which they may be more closely connected, specifically within an information visualisation context.

Key terms:

Communication design; design aesthetics; design functionality; information aesthetics; information design; information visualisation.

Introduction

The amount of data we interact with has increased exponentially in the last few years, and in an attempt to make information more accessible and understandable, an increased focus is being placed on the practice of designing information. Information visualisation is one such design practice, where large data sets are presented visually in order to reveal patterns and larger contextual insights.[2] 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 it 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.

Furthermore, a sub-category of information visualisation called "information aesthetics" has recently emerged, applying visualisation techniques in more artistic and experimental ways, with a strong focus

on visual appeal. However, this "new wave"[3] 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 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).

Principles outlined in Lima's (2009a) information visualisation manifesto include: 'do not glorify aesthetics' and 'avoid gratuitous visualisations'. Lima's (2009b) 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 field of information visualisation. 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'.

"Aesthetics", from this perspective, is seen as surface decoration and as a distraction from analytical visualisation goals. Various oppositional responses by theorists and practitioners such as Vande Moere, Stefaner and Crnokrak followed the manifesto, arguing that Lima's attitude towards the aesthetic is deprecating. Stefaner (in Lima 2009a) defends the work of certain visualisers such as Jonathan Harris, Ben Fry and Martin Wattenberg, who may be seen as "glorifying" aesthetics, but argues that their works have added significant value to information visualisation practice.

According to Andrea 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 particular approach. Lau and Vande Moere (2007:87) argue that current information visualisation practice focuses predominantly on effectiveness and functional considerations, while often neglecting the positive influence of aesthetics on task-oriented measures. 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. However, owing to the subjective nature of aesthetic experience and the difficulty in defining the "aesthetic" qualities of visualisations, measuring the influence of aesthetics on functional communication outcomes is particularly challenging.[4]

The perceived separation and tension between aesthetics and functionality is not a new topic in design discourse. Theorists such as William Morris and John Ruskin emphasised the importance of beauty in design during the mid-nineteenth century, specifically in relation to architecture, interior and product design,

and how these products influence the meaning of daily living. Some graphic designers, such as Paul Rand, have also emphasised the importance of the study of aesthetics in order to understand 'the language of art' (Rand 2011:[s.p.]), but others from more "scientific" fields of information design and information visualisation argue that "aesthetics" should not be overemphasised. Theorists such as Jorge Frascara (1988:25) believe that communication is of utmost importance and that the 'aesthetic quality of a design does not determine its overall quality'. Even though Frascara maintains that aesthetics is an important aspect of design, it is clear he wishes to shift the focus from the "visual aesthetic" towards measuring communication success, thus separating "aesthetics" from "functionality". As a result of practitioners aiming to assert themselves as concerned with communication, and not with "pretty pictures", this relationship between aesthetics and functionality remains a neglected topic specifically within information design discourse.

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". Furthermore, in the tradition of Adolf Loos' *Ornament and crime*,[5] aesthetics is often distrusted, with decoration being perceived as inappropriate to more serious design practice. In the tradition of Adolf Loos in an information visualisation context, "aesthetics" is often seen as a sign of subjective interference with otherwise objective or neutral information transfer.[6] 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.

Aesthetics is an integral aspect of design practice, and arguably more closely linked to "functionality" than contemporary debate suggests. Specifically in an information design context, where communication is the goal, aesthetic experience plays a major role in how messages are received and internalised. In an information visualisation context, Crnokrak (in Lima 2009a) explains that aesthetics is of vital importance to the overall communication value when stating that:

> good 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.

The aim of this article is not to devise a new definition of the term "aesthetics", but rather to highlight the current debates and concerns regarding the concept of "aesthetics" within the domain of information visualisation. Furthermore, a new perspective on the interconnected nature of aesthetics and functionality within an information design and visualisation context is proposed and the potential value of the aesthetic quality of visualisations is briefly considered.

From information visualisation to "info-aesthetics"

Information visualisation can be broadly defined as the 'mapping between discrete data and a visual representation' (Manovich 2010). Information is visualised

in a variety of forms such as diagrams, graphs, charts and maps, as well as increasingly innovative methods, and is seen in various research fields and industries. Information visualisation is currently studied predominantly from software engineering and information technology perspectives, with a strong focus on statistics and programming.[7] "Information visualisation" may, however, be seen as a broader discipline that includes static and hand-drawn artifacts presenting information through visual media, and has for centuries not depended on the use of computer technology.

According to Card, Mackinlay and Schneiderman (1999:1), the use of visualisation as external cognitive aid serves two basic purposes: firstly, to 'create or discover the idea in itself' and secondly, 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.[8] 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. Visualisations can thus be particularly powerful communicative and persuasive tools. According to Peter 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'.

The second purpose of visualisation, the communication of information through the visual, is the domain of information designers.[9] New software tools such as *Adobe Flash* and *Processing*[10] have enabled designers and artists, who tend to place a greater emphasis on aesthetic factors, to create visualisations without having been extensively trained in programming or visual analytics (Viégas & Wattenberg 2007:184). As a result of this accessibility, 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).

Various theorists from the field of information visualisation have started to focus on the aesthetic nature of visualisation practice. One of the most seminal authors on information visualisation and aesthetics is Edward Tufte[11] (1983; 1997; 2006), who is described as a pioneer in 'how communication can be both beautiful and useful' (Horn 1999:20). The influential new media theorist, Lev Manovich (2001; 2010), coined the term info-aesthetic to refer to contemporary information artifacts that exhibit aesthetic qualities. Both Tufte and Manovich provide rich and extensive histories of the practice of visualisation with ample examples, but do not offer comprehensive reasons for their aesthetic evaluations. An increasing number of examples of aesthetic visualisations can also be found in contemporary publications and online.[12] The following screenshot from *infosthetics.com* (Figure 1) shows some examples of visualisations considered as "aesthetic".

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

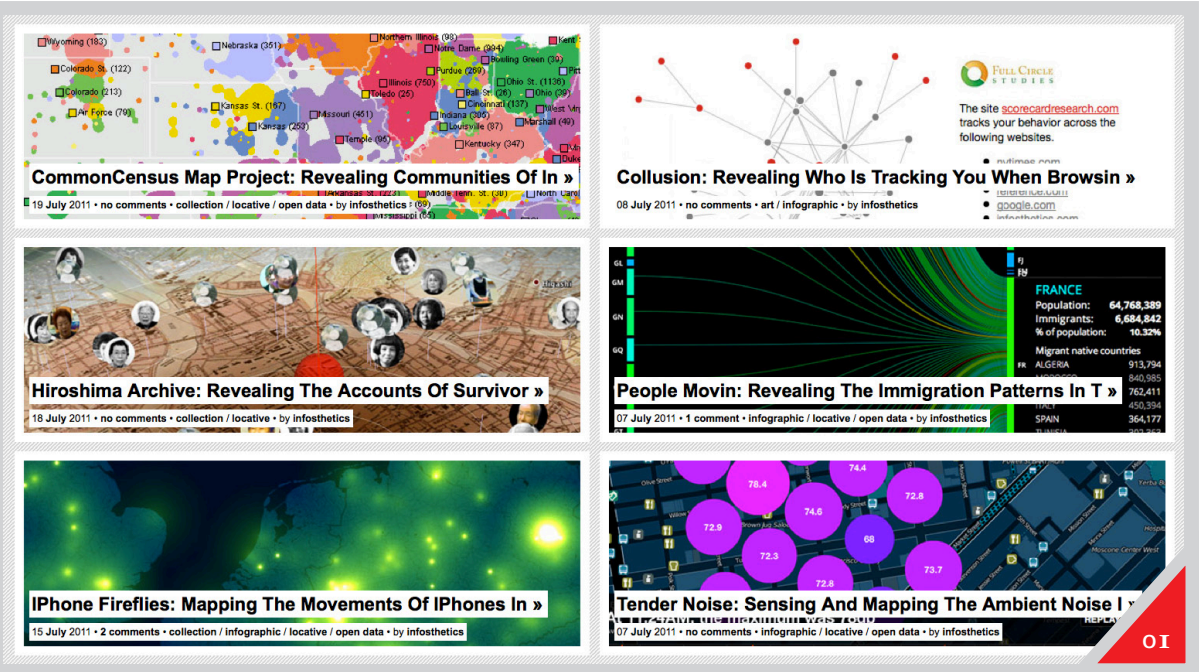

Figure 1: Information aesthetics website screen shots (Information aesthetics 2011).

awareness for aesthetics and have described the importance of aesthetics in visualisation practice.[13] Theorists such as Lau and Vande Moere (2007) venture further and try to uncover the aesthetic characteristics within visualisations and show a particular interest in the observed separation and tension between aesthetics and functionality. They do so, however, from a very pragmatic perspective, considering aesthetics as "artistic intent" and therefore the audience's aesthetic experience of visualisations has remained largely unexplored.

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 (Folkmann 2010:40). Neither does design research focus on how aesthetically pleasing artefacts may enhance functionality. As explained previously, it is not within the scope of this paper to define the concept of "aesthetics", but potential reasons why "aesthetics" is considered as separate from functional concerns is explored in the following section.

Design aesthetics as separate from functionality

"Aesthetics" is a concept traditionally explored within philosophy and the fine arts, and despite centuries of exploration, remains difficult to define. 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. 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 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).

Design objects may therefore also be regarded as aesthetic, but they are often situated in an uncertain space, being neither as "aesthetic" nor meaningful as artworks, nor as "functional" as artefacts 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. It is possible that the term "aesthetics" thus takes on a different meaning in a design context than in the fine arts.

Furthermore, there is a distinct shortage of literature on aesthetics specific to design, when compared to the fine arts, although there is an increased interest in filling this gap by contemporary authors such as Anna-Lena Carlsson (2010), Alain Findeli (1994), Mads Folkmann (2010), Sven Hansson (2005) and Paul Hekkert (2006). 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. Hansson (2005) and Hekkert (2006) focus on aesthetics as related to the functional use of products.

Carlsson (2010:451) argues that the notion of aesthetics as separate from functionality is a dominant view that has persisted throughout history, and is based on two perceived qualities of the aesthetic: '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'. These two perceptions are now explored in more detail. In common terms, from an engineering or technical design perspective, "aesthetics" is often understood as the surface qualities of artefacts. Using the example of architecture, "aesthetics" in this sense might refer to "styling" unrelated to the function of the building. Roger Scruton (2007:240), for instance, defines the aesthetic as the 'choices remaining when utility is satisfied', with these choices relating mainly to the surface appearance of the object. In an information visualisation context, similar perceptions towards aesthetic qualities are common.

Carlsson (2010:452) further contends 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) 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 Kant's concept of "disinterest" has largely led to aesthetics being restricted to formal qualities or "embellishment" that if removed, would leave the underlying message intact.

An example of the aesthetic as 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 too focussed on functional dimensions.

Design practice, as situated in a functional context, is highly concerned with pragmatic "everyday" concerns such as the needs and wants of the consumer, as well as the interests of the client and manufacturer (Folkmann 2010:41). Design is thus not pursued 'for its own sake' but is instead situated around the 'complex negotiation between "problem formulation" and "solution generation"', often directly linked to patterns of consumption (Folkmann 2010:41). The view of functional objects as incapable of being aesthetic and aesthetic objects being less functional is philosophically problematic. Gordon Graham (2005:170) highlights the issue of form versus function[14] 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). Here ideas on expression come into play and Graham (2005:179) explains how concepts such as grandeur and elegance are often expressed through the formal aspects of architecture. In architecture, the "aesthetic" expressions are thus 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". Just as the relationship between form and function are more interconnected in architecture, it may be argued that the same applies to information design products such as information visualisations.

Design aesthetics as interconnected with functionality

There are various ways in which the aesthetic quality of design artifacts may be considered more closely connected with functional dimensions. Hansson (2005) proposes a theory of 'aesthetic duality', where design objects can be aesthetically appraised both for their functional quality as well as other non-functional qualities. Hansson (2005) 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. Aesthetic judgements related to practical function are thus typically directly linked to satisfaction of use (Hansson 2005).

It is possible to argue that design artefacts cannot be considered aesthetic if they are poorly designed in an instrumental sense. Hansson (2005) uses an example of a mathematician who finds a proof "beautiful". If, however, the mathematician discovers that the proof is incorrect or flawed, he might reconsider his aesthetic sentiments (Hansson 2005). Hansson (2005) thus defends a 'contributory thesis' which states that 'satisfaction of functional requirements in most cases contributes positively to aesthetic value'. He explains how two objects that appear very similar (similar in terms of their visual aesthetic), may perform functions with different levels of efficiency (Hansson 2005). 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 artefacts.

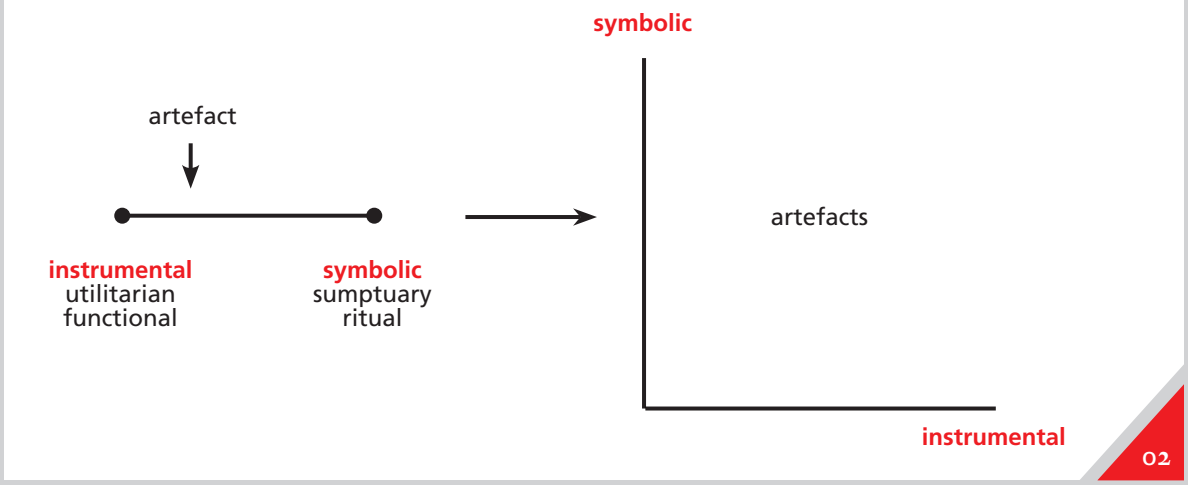

Figure 2: Findeli's model of artefacts, showing the 'instrumental/symbolic polarity: from an excluding opposition (left) toward the space of artefacts (right)' (Findeli 1994:53).

Another theorist who considers aesthetics from a design perspective is Paul Hekkert (2006). 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.

Functionality as a concept is thus much broader than mere utilitarian concerns. Patrick Jordan (2002:13) explains how once basic functionality is achieved, users develop the additional need for pleasurable experiences.[15] According to Jordan (2002:9), people are wired to seek pleasure, and design artefacts are a major source of pleasure in people's lives. He explains that humans have created both decorative and functional artefacts throughout history in order to increase their quality of life (Jordan 2002:9). Users potentially find pleasure in objects that are not merely tools, but also meaningful objects that they can relate to (Jordan 2002:14).[16] Jordan (2002:15) uses the example of recycled products, where pleasure is obtained from the product's alignment with personal values of care for the environment.[17]

Findeli (1994:52) explains how artefacts are traditionally perceived from the user's perspective, between two different "poles" (Figure 2, left diagram). On the one side, objects are instrumental or utilitarian and on the other end objects are valued for their 'symbolic, ritual or sumptuary qualities' (Findeli 1994:52). Findeli explains how most design objects people 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 artefacts. 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.

Findeli (1994:52) thus proposes a new model of artefacts, 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 artefacts can be both instrumental and symbolic simultaneously. Traditional roles of production can be mapped out on the model, with artists situated closer to the "symbolic" end, and engineers closer to the "instrumental" end. 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). 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'. 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'.

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 3), 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 instrumental or utilitarian efficiency.

Findeli (1994:62) makes a valuable contribution to understanding design purpose 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. Aesthetics and function cannot easily be separated, since some objects serve an 'aesthetic function' (Hansson 2005). It is possible to

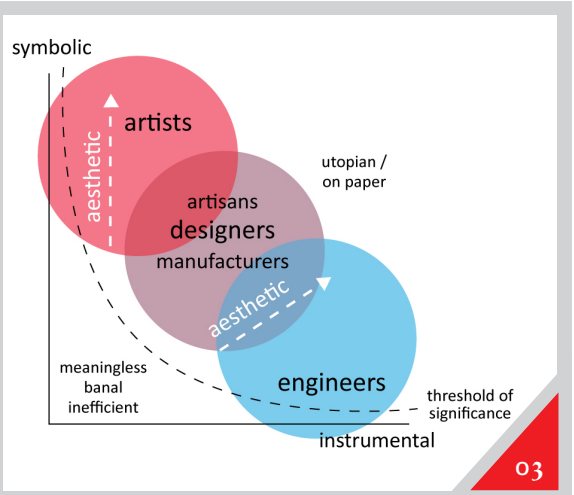

Figure 3: Adaptation of Findeli's Space of artefacts (Findeli 1994:54).

build on Findeli's model in order to understand aesthetics in an information design and visualisation context. In the traditional sense, "aesthetics" is understood as closer to the "symbolic" side of the map, but it may be possible to argue that aesthetics in design is related to both "symbolic" and "instrumental" values. Particularly in a communication design context, "symbolic" and "instrumental" values are often closely connected. Folkmann (2010:40) explains how 'aesthetics touches upon one of the most vital matters of how design functions as a means of communication'. Buchanan (1985:4) also explains that the concept of communication is central to all design practice, and specifically in a field like information visualisation, the communicative function is of great importance.

Stroud (2008) investigates John Dewey's theories specifically in a communication context in order to ask how communication can be aesthetic. 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 Dewey (1934:40), thoughtless or insensitive practice or procedures (below Findeli's 'threshold of significance') are the real "enemies" of aesthetic experience.

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[18] could thus potentially be profoundly aesthetic, depending on the subject's orientation towards the situation. 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'.

This kind of 'Deweyan mindfulness' is, however, not at the forefront of the traditional information visualisation agenda, where objectivity and neutrality are the main aims. Albert Borgmann (1995:15) explains how the superficial understanding of aesthetics in design may be attributed 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 or interface is thus 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. This sounds similar to debates encountered in the visualisation community, where more traditional practitioners believe that the medium should merely present the data in the most objective and neutral manner.

Stroud (2008:167,168) 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, and 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 is in opposition to Kant's theories of "disinterest", which requires an experience to be removed from practical affairs in order to be aesthetic. Goldman (2005: 265) explains how Kant's theory of "disinterestedness" does not take into account the heightened aesthetic experiences that are often gained from aesthetic artefacts that also perform an instrumental function, such as, for instance, attending a service in a cathedral. Aesthetic experience thus takes into account both the functional outcome as well as the "medium" through which the outcome is achieved. 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 viewer becomes more aware of the "means" as a subjective expression and becomes involved in decoding or uncovering meaning, which remains central to the aesthetic experience.

Gianfranco Zaccai (1995:9) argues that 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'. In examining the aesthetic qualities of design objects, it thus becomes important to not only consider the formal visual (surface) qualities of the artefact, but also the way in which it functions. Aesthetics in design is more closely linked to functionality, especially when a broader definition of functionality is adopted, which includes 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 meaningful interactions. 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.

"Info-aesthetics" vs. "objective" information visualisation

Having explored the various ways in which design aesthetics is interconnected with functional communication outcomes, the question of "objectivity" in information visualisation remains to be answered. One of the main reasons why traditional visualisation practitioners do not approve of an aesthetic focus in visualisation practice is because it is perceived as too "subjective". In other words, by attending to the aesthetic quality of a visualisation, in both form and content, certain ideas may be forced, thus "cheating" in the process of neutral information presentation.

The idea of "neutral" information or communication is, however, problematic, even if some presentations "pretend" to be objective.[19] 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. It is important to accept that the visualisation designer 'shapes an experience, or view, of the data with a particular aim in mind' (Van Heerden 2008:6). The intent influences the manner in which the designer embarks upon presenting the information, and the aims may be as diverse as 'to clarify, confuse, inspire, redress, and connect' (Van Heerden 2008:6).

Furthermore, it is possible to argue that information visualisations created with the traditional, "neutral" approach to data presentation, become sterile and hinder critical engagement or reflection. Borgmann (1995:15) explains that an overemphasis on functionality and "disburdenment" may lead to artefacts that are less engaging and therefore less meaningful. The seminal information architect and theorist, Richard Wurman (2001:32), argues that absolute accuracy of data in itself does not necessarily lead to understanding, which may be considered the ultimate aim of all information. In order to stimulate understanding, other factors like retaining interest and making information memorable and meaningful become more important than the "objectivity" of data.

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 artefacts become dehumanised.[20] 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,[21] but this does not stimulate engagement and as a result the information is not internalised, remembered or reflected upon. McLaughlin (2009:314) believes that ambiguity in artefacts may be a significant contributor to encouraging reflection, and aesthetic visualisations often employ ambiguity as a strategic tool in encouraging engagement and soliciting reflection. It is under these circumstances that the information may influence perceptions through more meaningful engagement.

The following example of a pie chart, as part of a campaign by the Red Cross in Portugal (Figure 4), 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.

It is only after reading the caption, 'It's in your hands' that the visualisation starts to make sense. The chart is thus designed in a deliberately ambiguous way and understanding is dependent on the tagline that accompanies it. The visualisation initially confuses the audience in order to elicit 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 the audience to consider the values of the message and the audience may choose to either accept or reject these values. 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.

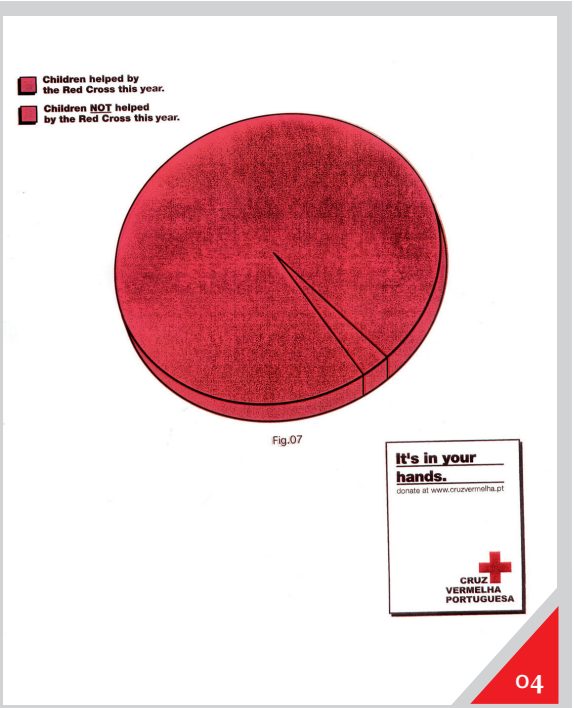

Figure 4: Leo Burnett, Lisbon. *Red Cross Portugal: It's in your hands* (Ads of the world 2009).

Conclusion

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 often ignored. 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. Designers have an important part to play in the creation of more meaningful experiences but, as McLaughlin (2009:303) points out, we first need to ask how we can 'revitalise information' so that it matters to people. DiSalvo (2002:77) suggests 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.

The design theorist 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". Borgmann (1995:16) urges designers to provoke and reward engagement by focusing on the aesthetics of design. In this context it becomes important to recognise design aesthetics as neither superficial nor functionless, and to accept that subjective expression is part of ethical and effective information visualisation practice.

Notes

1 This paper is part of a larger study completed for a Masters degree in Information Design, titled *An exploration of the conceptual relationship between design aesthetics and Aristotelian rhetoric in information visualisation*, submitted at the Department of Visual Arts, University of Pretoria, 2011.

2 Information visualisation, concerned with the organisation and presentation of information, is for the purpose of this study situated as a specialist practice within the broader discipline of information design.

3 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.

4 Authors such as Cawthon and Vande Moere (2007) have attempted to measure the influence of aesthetics on task-oriented measures, but in general these types of studies are uncommon, hypothetical and inconclusive.

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

6 This notion of neutral information presentation is challenged throughout this paper, since all data is sampled, filtered and manipulated into carefully constructed visualisations, aimed at conveying certain messages.

7 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) approach information visualisation from disciplines such as human-computer interaction and software engineering.

8 Van Wijk (2005:79) explains that visualisation allows

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'.

9 Shedroff (1994:1) states that information design 'addresses the organisation and presentation of data: its transformation into valuable, meaningful information'.

10 *Processing* is an open source visualisation application, available for download at www.processing.org.

11 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).

12 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* (managed by Manuel Lima) and *Infosthetics* (managed by Andrew Vande Moere).

13 Many of these practitioners also made their approaches to aesthetic visualisation known through responses to blog posts by Lima (2009a; 2009b), as mentioned previously.

14 The well-known phrase "form follows function", coined by American architect Louis Sullivan in the late nineteenth century, promoted the idea that a building should be constructed according to its use and that unnecessary decoration should be avoided (Graham 2005:174).

15 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.

16 Jordan (2002:14) 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).

17 Stuart Walker (1995:15) also investigates this connection between aesthetics and ethics, specifically from an environmental sustainability perspective.

18 Shusterman (1997:33) explains that Dewey's goal was to 'break the stifling hold of what he called "the museum conception of art", which compartmentalises the aesthetic from real life'.

19 Hall (2008:130) explains that data cannot be neutral as it is collected, processed and presented for specific purposes.

20 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'.

21 Robin Kinross (1985) investigates the 'rhetoric of neutrality' that is often employed in order to make artifacts appear objective and therefore more credible.

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