What Public Visualization Can Learn from Street Art

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ABSTRACT

As public visualization is receiving more attention - in academic research as well as in everyday practice - we need to consider the physical environment as an important intrinsic component of its design. We propose that one should not disconnect a public visualization from the context in which it is read, as its immediate environment carries various meanings that influence its perception and interpretation. As the concept of street art also employs invisible meanings that are present in the environment in order to convey a message, it can act as a valuable resource for public visualization designers. As such, we will discuss four rhetoric strategies in order to demonstrate how street art practices succeed in relating to their environment, and how this relationship is able to trigger critical reflection. Departing from three public visualization case studies - which are inspired by street art - we discuss how they influence the appeal, the engagement and the sense-making process. For each of these rhetoric strategies, we describe design guidelines in order to help designers of public visualizations exploit communicational codes and meanings that are present in the environment.

Keywords: Public visualization, street art, urban visualization, public display, urban computing, casual visualization.

Index Terms: H.5.m [Information interfaces and presentation (e.g., HCI)]: Miscellaneous.

1 INTRODUCTION

In recent years, concepts of information visualization have been used for other than strictly analytical purposes [14], as 'casual' types of visualization aim to raise awareness, and encourage users to reflect upon the visualized issue [14]. To serve this purpose, casual infovis tends to borrow techniques from the arts in order to evoke curiosity, puzzlement, or even frustration, as well as to establish aesthetically pleasing designs. Even just the act of making data publicly available through its visualization, can allow social discussion and engage people to reflect on relevant insights [6]. Research efforts in public visualization demonstrate how infovis techniques can be exploited outside of work-related contexts, such as in public spaces [21]. While they become more common in everyday life, public visualizations are not limited to online media, but can range from physical sculptures or wearable objects [11], over ambient displays for the domestic context [16], to large, public screens [3]. Currently, the design of public visualization tends to focus on the intrinsic characteristics of its graphical representation, and neglects the role of eventual extrinsic qualities, e.g. the environment in which it has been situated. Therefore, this paper investigates the need to consider the environment as an intrinsic component of public visualization, which is analyzed and discussed through the lens of *street art*.

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1.1 Public Visualization

Early indications exist that public visualization can engage a broad audience in interpreting complex information [20], raise awareness on local concerns [19], and add valuable, situated meanings to locally relevant information [7]. The immediate environment of a public visualization is often exploited as an opportunistic medium to reach the wide variety of users for which the information is intended, e.g. by means of house-attached data dashboards [22] or by interactive projections [19, 20]. Even the street itself has been used as an information display medium, e.g. by drawing on asphalt [4, 12], or by attaching visualizations to existing urban furniture such as street signs [7]. Notably, in these particular projects, the environment adds valuable contextual meaning to interpreting the visualization, such as its situatedness to a specific street or neighborhood. This way, everyday environments are exploited as a rich, interpretable communication medium for making sense of a visualization for a broad, multicultural audience [21]. However, closer investigation is still required in how a surrounding environment can enrich a visualization in a meaningful, usable and valuable way, how this affects its general appeal, and augments the awareness or comprehensibility of a visualized issue.

In this paper, we will discuss four rhetoric strategies as ways to potentially understand how the everyday environment can be exploited in influencing the interpretation of visualizations in the public. We will base these strategies on seven rhetorical practices which were theorized in research on street art [5], apply them to three of our own public visualizations and convert them to design guidelines. More specifically, the strategies address how the visual appearance relates to the surrounding environment, and what these relations succeed in communicating to an audience. A first strategy, i.e. *information access* points out how to reach attention of a broad audience in an everyday environment. Secondly, we discuss *playfulness* as a rhetoric strategy to raise audience curiosity, which thus potentially influences the general interest in a public visualization. Thirdly, the *manipulation of existing meanings* is a strategy to encourage people to interpret the information in relation to the environment. Lastly, the strategy *ambiguous signs of authorship* aspires to entice passers-by to reflect on the information shown, including its intentions. Consequently, all mentioned strategies aim to unravel the rich and still largely untapped interplay between a public visualization, its environment, and its 'users'.

2 STREET ART

The arts have already studied how media can be related to the surrounding environment, and how this affects public engagement. *Public art* in particular is generally created for instalment in the public domain, as it pushes art outside of the traditional museum in order to become accessible to a broader audience. However, some critics accuse public art to be inaccessible, as it is not sufficient to be present in the public domain to be able to reach everyone [24]. Public art can be hard to

understand, and is therefore considered to be elitist [24]. On the other hand, there exist a few public art movements - such as *street art* – that seem successful in bringing art to those people who would not normally encounter or experience it, while still being commonly understandable and enjoyable.

Figure 1: Street Infographics: one of the street signs with a visualization attached to it [7].

Street art is an all-encompassing art form that is generally situated against an urban backdrop, and has grown directly from the *graffiti revolution* [18]. This means that – unlike graffiti – street art can hold various and different media types, such as stickers, posters, sculptures, performances, video projection and more. Typically, street artists tend to question the existing urban environment through its own language, and do so by installing temporary, spontaneous and situated interventions [18]. Inspired by *art activism*, street art interventions deploy the practice of *disruptive aesthetic* to attempt to unsettle existing political conditions, shared meanings and personal values, and often replace them with new ones [13]. For instance, in the urban intervention *Taking back to the street*, guerrilla artist and architect Cirugeda transformed trash containers into places for social interaction [17]. This way, citizens are allowed to create temporary public places whenever they want, without needing permission of the city council. Through its disruptive approach, street art aims to communicate directly with the public at large about socially relevant themes [24].

2.1   Visualization versus Street Art

We propose that public visualization can be considered as the information visualization equivalent of street art versus traditional art, as they both distinguish themselves from an elite group of expert 'users', and both aim to reach a large, lay audience by being easy-to-understand, creating awareness and finding subjective emotional connotations with the information shown. Obviously there are also differences; street art is driven by delivering a strong activist message, while public visualization aims to communicate data in a more impartial, objective and transparent way. It can be questioned however, if an impartial visualization can actually exist in public space, as any public manifestation of information can potentially be interpreted as a political act with some deliberate message [7]. Therefore, since visualization is increasingly becoming concerned with communicating social issues, visualization design should follow a more critical approach [8]. Furthermore, public visualization has not yet fully exploited the possibilities of using space and time as a medium. Therefore, this paper aims to explore how public

visualization can better deploy the surrounding context through applying proven street art practices. Notably, learning from street art is not only applicable to urban (outdoor) environments, but could also be applied in broader and semi-public settings, such as musea, hospitals, city halls etc.

Specifically, we propose that the qualities of street art for public visualization are fourfold: (1) temporality, the transient appearance encourages people to explore the information then and there; (2) the ability to be located anywhere, provides the chance for the information to be locally and timely relevant; (3) spontaneity allows designers to intervene when specific issues are trending; and (4) altering the urban condition is known as a way to promote change [13]. We start by describing three of our own public visualization case studies that are all designed to intervene in the urban environment yet differ in terms of display media. All three visualizations were inspired by forms of street art rhetoric, which we will be discussed in Section 4, in terms of how our design choices intended to influence the appeal and interpretation of each visualization.
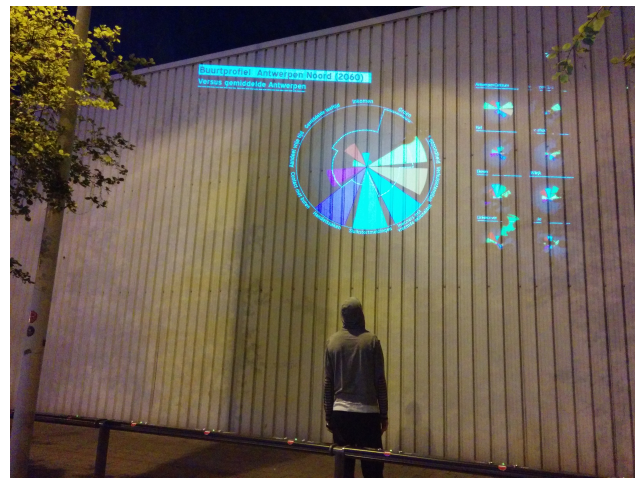

Figure 2: Projection bombing a neighborhood with visualization.

3   PUBLIC VISUALIZATIONS CASES INSPIRED BY STREET ART

3.1   Street Infographics

In our public visualization *Street Infographics* [7], we attached casual infovis boards to existing street signs in a neighbourhood of Leuven, a mid-size city in Belgium. Here, the planning of a student housing complex provoked local concerns about the perceived unequal distribution between students, foreigners and permanent residents. Our goal was to inform residents of the actual situation of the socio-demographic composition. Therefore, we collected socio-demographic data of four specific streets, and visualized two data dimensions, i.e. the number of permanent residents and whether they were native. We distributed these data dimensions of the inhabitants of the street by means of categorizing 100 infographic-like icons (Figure 1). The graphic design of the visualization mimics the characteristics of a street sign in terms of color scheme, font choice and physical size. The actual data source was explicitly stated on the back of each sign.

By attaching visualizations to existing street signs, we subtly disrupted the everyday environment. While the visualization did not openly specify what location the data represented, its attachment to an existing street sign implied it to be information of that particular street. We deployed the visualization in four adjacent streets so that a third data dimension, i.e. the physical

location, became available for passers-by who then had to explore the immediate environment for other signs in order to make data-driven comparisons.

3.2   Projection bombing with visualization

In the second case study, we used a mobile video projection to 'bomb' different (urban) surfaces (see Figure 2). The data was based on a top five of issues that were trending in that certain neighborhood, according to a local survey in 2012 [23]. The overall goals of the intervention were to inform residents on the actual situation on several of the trending issues, to encourage them to reflect on the concerns, and to trigger social discussions in the neighbourhood. The data was collected from the local government [1] and visualized it as a star graph with 9 data dimensions, i.e. income, green area, health, migration, foreign born citizens, illegal dumping, amount of retail, contact with neighbours, leisure time and average age, which each was depicted as a distinct starburst graphic. The main visualization revealed several statistics of the local neighbourhood. This representation was contrasted by 8 smaller star graphs, each representing the same data for 8 nearby neighbourhoods of the same city. Three notable qualitative quotes of locals concerning one of the issues were shown to illustrate the local relevance of the data shown, e.g. "*This area might become to expensive for the common man*". The starburst visualization and the quotes were alternated by use of animated transitions, while the data source was clearly visible on the projection.

We used a mobile projector unit powered by means of a car battery, a car, a Raspberry Pi and a projector. The projection was particularly noticeable because of its approximate 3 by 3 meters physical size, and its non-trivial placement in the urban environment. We never announced when and where we would deploy a projection, and were sometimes present in multiple areas during a single evening. We projected on an abandoned factory, which is surrounded by café's and restaurants in the middle of the neighborhood. In a couple of months, this factory will be demolished, raising concerns with the locals about the new destination of this space. For those who were aware of this issue, the visualization seemed to engage with this concern, as some data dimensions dealt with opportunities for redevelopment, i.e. the little amount of green area and the unequal distribution of income. However, the visualization was always comprehensible, relevant and meaningful without local knowledge of this issue.

3.3   Sight on Local Data

In a third case study, we designed a street art installation for the city of Leuven, Belgium, which we installed during a one-day trial run (Figure 3). Here, we did not depart from an existing local issue, as we wanted to explore what citizens were interested in through offering them a range of datasets. The general purpose of our design was to allow citizens to explore their city from a data-centric perspective, and encourage them to find meaningful connections across the data and statistics shown.

The physical appearance of this installation was reminiscent of a preliminary prototype; it did not look polished, but rather accentuated the typical bottom-up, DIY character of a temporary intervention. Its physical design resembled an urban telescope, which sufficiently familiar yet strange to entice passers-by to look through. The exterior of the installation was 1.80 meters high, 0.30 meters wide and 0.60 meters deep. Within the installation, people were invited to explore ten different datasets, such as birth rate, number of inhabitants, unemployment rate, people receiving benefits, disadvantaged people, number of parks, number of

waste, income, energy use, and CO_2 emissions. We generated a time series line chart for each dataset, ranging from 2003 until 2011, which were normalized so they could be accurately compared. The graph lines were engraved on transparent Plexiglas (30 x 30 cm) plates. Each plate stated the title of its dataset and its information source. The telescope itself featured 3 slots, which allowed users to insert plates, look through the telescope with the inserted transparent plates, and subsequently compare a maximum of 3 datasets. None of the visualizations stated where the data originated from, which resulted in some ambiguous reflections (e.g. *is it data about the country in general, the province or the city?*). However, the obvious telescope metaphor encouraged passers-by to further interpret the environmental context and connect the visualization to the environment it was situated in.

4   RHETORIC STRATEGIES

Figure 3: Two passers-by interacting with Sight on Local Data, inserting a Plexiglas plate with one dataset in the telescope.

The following rhetoric strategies are based on existing research on street art rhetoric [5]. By applying them to our own case studies, we aim to formulate novel rhetoric strategies for public visualization, and reflect on how visualization designers could consider more creatively the role of the physical environment.

4.1   Information access

The rhetoric strategy of information access indicates the difference between street art and contemporary art, as street artists renounce artistic sacralisation to allow freedom in the search for more powerful communicational codes or metaphors [5]. Street artists want to reach 'everyone' and accomplish that in different ways; i) *replicability*, which increases the chances of exposure and retention; ii) *desirability*, which breaches the barriers of audiences' attention; iii) *accessibility*, which strives for easily understood codes of interpretation; and iv) *participation*, which is the ability to involve passers-by in discursive activities [5]. As such, street art is never forced upon the audience; people do not have to buy a ticket to access, or consult a catalogue to understand the underlying meaning. Street art is available whenever the audience wishes to engage with it, and as such aims to overcome the feelings of elitism [2]. For example, street artist Banksy's stencil technique is easy replicable. His visual language appears to be desirable and is also immediately understandable for a large audience, while his absurd use of humor provokes participation and interpretation of the issue he is addressing.

In public visualization, this strategy addressed the need to address a large and maybe uninterested audience. For instance, the medium of *projection bombing* allowed our public visualization to be *i) replicable*, as it can be repeated on different surfaces in the same neighborhood, and as such reach more people. Also, the medium had a certain entertaining value, which makes it *ii) desirable* for an audience to experience. An outdoor projection is not commonly seen, as it is mostly deployed during special events, such as urban lighting festivals. In addition, the projected visualization was designed to be *iii) accessible* and easy-to-understand by using a familiar type of visualization, namely a starburst graph, which can also be found in newspapers or television news. The addition of animated transitions suggests how to the visualization should be read, while the animated quotes encouraged onlookers to interpret the visualized issue and formulate their own reaction on the issue. Furthermore, the everyday environment creates the opportunity for passers-by to *iv) participate* in the visualized topic in terms of discussing it with friends or other passers-by. All these design choices contribute to whether a person will engage with a public visualization or not.

Deliberately creating situations to publicly display information in an unobtrusive yet noticeable way, allows passers-by to approach the visualization in a wide range of opportunistic ways. It is this freedom of interacting and engaging with a visualization that can lead to public acceptance and ownership, and encourage meaningful conversations and social discussions about the issue.

4.2   Playfulness

As a direct derivative of graffiti art, street art often transforms landscapes in a 'cartoonified' way in order to mix the serious with the humorous [5]. Through the use of bright colors and recognizable forms and shapes – which are in contrast with the everyday grey urban backdrop - many street artworks are able to catch the attention of passers-by. The growth of street art styles and themes has brought diversity - as it is no longer limited to cartoon metaphors – yet the movement is still characterized by a playful-like approach. For example, the work of Cirugeda concerns implanting large and familiar urban furniture, such as trashcans or containers, yet he succeeds to design them in such a way that they slightly deviate from existing urban conventions, e.g. by adding 'legs' [17]. A playful approach does not mean the intended message cannot be critical; it imparts a fresh, positive look of the environment that helps engage public attention.

This strategy will mostly influence the intrinsic design of a public visualization. The playfulness of a visual design should be considered according to the environment context. For example, *Sight on local data* deployed a telescope metaphor, which is a typical instrument for observing the outdoors. In a museum context, the physical appearance (i.e. white, clean, wooden legs) of this installation would not look out of the ordinary. However, in the urban environment, the installation stands out and draws the curiosity of passers-by. Once the attention is grabbed, the actual interaction between a passer-by and the visualization occurs in a playful way. For instance, the tangible concept of grabbing data and putting them into slots was unusual and intriguing, while its openness encouraged people to investigate and reason about otherwise complex and boring data statistics.

Playful metaphors, ironic codes or other humorous visual design strategies can draw attention, and engage an audience. The playful approach can be implemented in various ways, such as the choice of data, the visual representation, the way of interacting etc. or a combination of the above.

4.3   Manipulating existing meanings

The third strategy challenges the meanings that are given to everyday objects in public space. For example, trivial urban elements as asphalt can become a striking information carrier [4], or a trash can turn into a skate ramp [17]. Street art emphasizes the unexpected opportunities that arise from urban environments, i.e. often forgotten, invisible media, to make noticeable, add surprise or elicit curiosity. Thereby, street art tends to disrupt familiar conditions to encourage citizens to explore new interpretations, meanings and opportunities. For example in 2005, urban art and design collective *Rebar* turned an existing parking space into a temporary park - complete with grass, picnic blankets and chairs - in order to question the existing meaning of public spaces, and in extent, question the political conditions on the freedom of using public space [15].

Deploying this strategy for a public visualization can trigger initial curiosity and sustained interest. In *Street Infographics*, passers-by noticed how something within their familiar environment had changed (i.e. an enlarged street sign), which attracted their attention and made them curious [7]. Furthermore, the strategy can also be used as a means to seize the existing environment as an additional, situated layer of information. This way, the design of a visualization can be simplified by deleting excess information, such as specific data dimensions, legends or data sources. In *Street Infographics*, the installation did not explicitly state in what context the data should be interpreted, yet the well-considered placement of the signs on multiple locations clarified this. However, some onlookers also questioned the intentions of the signs; whether it was an act of propaganda, an artistic expression or governmental communication [7]. The ambiguous design approach encouraged people to interpret the information, reflect upon the issues and form their own opinion on them. After all, well-considered ambiguous design has the power to empower people to actively participate in the sense making [9].

The manipulation of existing meanings is a rhetoric strategy that exploits the presence of familiar yet often unconventional media, such as those commonly available in the environment, in order to be noticed and trigger curiosity. Secondly, this strategy encourages users to reflect upon the underlying meanings of known elements, which can add an additional layer of interpretation to the visualization. Therefore, manipulating existing meanings with the situated representation of information can stimulate critical views or question common interpretations.

4.4   Ambiguous signs of authorship

Due to its illegal character, street art is often anonymous. However, some street artists recognize each other's style in order to identify authors. Banksy, for example, has been credited for a number of pieces, yet he never signed them. The ambiguous nature of ownership of street art pushed the pieces to be 'really' public, i.e. as art that is not owned or claimed by anyone but offered to the public at large to own and even appropriate it, of the art itself as well as the message it conveys.

Rather than focusing on or identifying the author – or designer – public visualization should be concerned about presenting the data source as objectively as possible [10]. Such data provenance strategies can include the citing and/or linking of data sources, additional references, methodological or statistical choices, as well as annotating exceptions or eventual corrections. In *Street Infographics*, we made the deliberate choice to partly obscure the information source, which was stated at the back of the signs. Yet the particular placement of the visualization, i.e. the connection to an existing, official street sign, established trust (as illustrated by

one onlooker: "*it must be true, it is part of the street sign!*") [7]. This ambiguity of authorship and data source impels people to question the actual truth and reflect on the issues at stake [9].

Presenting additional information such as authorship or data origin in an ambiguous way can cause users to question the reliability and purpose of a public visualization. Yet ambiguity also has the potential to encourage deeper, more critical reflection of the information shown, and encourages various degrees of trust and re-appropriation. However, in contrast to street art, the practice of information visualization is based on objectivity and credibility, which it should respect first and foremost. Therefore, ambiguity in public visualization can also be reached by relating to interpretable, contextual elements, such as location (e.g. official signage), staging (e.g. multiple visualizations at different locations), timing (e.g. election time), or social setting (e.g. poor neighbourhood versus rich).

5   LESSONS LEARNED

Based on our past experience, we list some contextual challenges for the design of public visualization. As demonstrated in this paper, these challenges can also open up rich possibilities for designers to work with.

Reliability. A public visualization will be considered to be objective, which necessitates an ethical responsibility towards the public. Notably, the natural perception of objectiveness can also be abused (e.g. for propaganda).

Location. The location of a public visualization, impacts its meaning. As such, a general approach for widely spread public visualizations seems challenging.

Timing. The environment is exposed to all sorts of alterations, ranging from environmental, political or cultural conditions, over infrastructure works to public manifestations, which all potentially impact how a public visualization can be interpreted.

6   CONCLUSION

The contextual environment, which is inherently partly unpredictable, naturally impacts the engagement and interpretation of a public visualization. In this paper, we have drawn parallels with rhetoric strategies used in street art, in order to explore how to integrate and even mash the environment as an intrinsic component of a public visualization. The rhetoric strategy of *information access* creates opportunities to allow people to engage with the information in various degrees (or not). *Playfulness*, as rhetoric strategy in the everyday environment, draws attention and encourages people to interact with the information, potentially in a sustainable way. The rhetoric strategy of *manipulating existing meanings* entices people to interpret the visualization in close relationship to its immediate environment, which in itself provides for a rich, contextual situation. And finally, the rhetoric of *ambiguous signs of authorship* impels people to question the relevance, reliability and purpose of the information for themselves, allowing for various degrees of re-appropriation. In conclusion, we thus propose the surrounding environment as a powerful yet still largely untapped contextual medium for public visualization.

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