Minimalism as a strategy for overcoming information overload of interface design for interactive city devices

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Abstract. The article is devoted to the consideration of the issues of forming a comfortable urban information environment using graphic design, namely, minimalism as a strategy for organizing visual information obtained through interaction with interactive interfaces in the urban environment. In modern megacities, devices with a touch screen increasingly provide the organization of the process of information interaction between a city and a person. From a visual point of view, they provide ample opportunities for the implementation of a graphic form. However, at the same time, the question remains to what extent the visual design of the software of urban information carriers affects the efficiency of their use, and how their aesthetic characteristics form the information and graphic ecology of the city. In recent years, the information space has expanded significantly; therefore, the organization of an environmentally friendly urban graphical environment has turned out to be associated with the need to apply approaches to organizing data that can reduce information and visual noise, as well as reduce the level of information pollution of the surrounding urban environment. This circumstance, on the one hand, enhances the importance of interaction design as a primary stage in creating an effective information design. On the other hand, it promotes a conscious restriction in the use of graphical tools, reflecting an ethical approach to interface design.

1. Introduction
The central issue of creating functional graphic design is the specificity of the visual interaction between man and any mechanical system. This item has been on the agenda since the middle of the 20th century when graphic design became an independent professional field. However, for the past time, the change of social paradigm from industrial to post-information type [4; 12] has predetermined fundamental changes of understanding graphic design as an instrument of human interaction with material environment, especially urban environment.

Therefore, visual designers had relied on the achievements of their predecessors and used principles of functionalism in the practical aspect of organising human interaction with mechanical systems by designing interfaces of different devices. This basis allows them successfully creating their projects in the post-war context of industrialisation, economic, social and information development. They based on the idea of using symbolic language as a tool of mitigating language difficulties and predetermined the development of graphic design as an instrument of overcoming problems of globalisation and informatisation [13, p. 48].

Design projects of that period, especially created by designers connected with The Ulm School of Design, as well as the principles they developed during the design process, including the semiotic approach to creating interaction sign systems, have been still applicable with the advent of the information age [14]. Moreover, they have become an inspiration source for many modern design solutions driven by the idea of creating functional interfaces. Even though inner contradictions school itself provided the impetus to the understanding the design as an instrument of improving quality of life through humanisation of the relationship between man and machine.
The approach of human-centred design [5] is closely connected with the development of interaction design in the second half of the 20th century as the professional field, which concerns the creating of the interactive digital systems. However, widespread increasing informatisation and the crisis of information hyper-consumption provide nowadays the gradual shifting the focus of designers attention towards humanisation of mutual relations not so much of a man and a machine (in global understanding), as of a man and information received using machine interaction [2]. This influences significantly on the features of visual representation of information, including designers, desire for minimalism in the use of graphic tools [15]. This trend should concern the visual design of city media devices. Today it is clear, that peculiarities of the organisation of visual information provide by these devices impacts not only on personal energy forces and time spending on step-by-step problem solving but also on the psychological comfort of citizens. It makes them an essential ecological factor of information and visual environment of the city.

In many cities, the interaction between different community members and city institutions (transport, museums, shops) drives towards distance communication assisted using interfaces of different digital devices. We can expect that because of the widespread use of city interactive devices minimalism strategy in the visual design of interfaces should help reduce the informational and graphic overload of the modern citizen.

2. Materials and Methods
According to Oleg Pigulevskiy, minimalism as a strategy of visual design is based on the importance of "sensory balance in conditions of information overload and commodity abundance" [7, p. 3]. In his words, minimalism as a component of functionalism "becomes one of the ways to create comfort, preserve the integrity of modern man" [6, p. 3-4]. Minimalism has long been a distinct phenomenon in graphic design. It is widely represented in different areas of work, from single samples of print design to a complex strategy of creating a corporate identity. Moreover, it is famous all over the world [16]. Modern UI-designers also frequently turn to minimalist aesthetics because of the fact, that combination of large and well-readable typefaces, colour coding of information, intuitive navigation and flat illustrations. These factors help them to create a design, which not only makes devices more beautiful and attractive to the customers but also solves the problems of functional perception of information [2, p. 356].

At the same time, the modern tradition of creating interfaces implies the separation of interaction design and visual design. Moreover, it is crucial in this case that understanding of user goals and wishes dominates over visual characteristics of the product and its aesthetic qualities. Hence, visual product design is the realization of users’ behavioural models, based on learning and anticipating their goals and not vice versa [2, p. 11]. So minimalistic design as a product of visual design embodies in a visual way an intelligent system of interaction, as well as abuse of visual effects and graphic redundancies in the design of interfaces often indicates invalidity of the interaction design.

At the same time, monitoring processes of interaction with interactive city devices connected with social infrastructure and learning its interfaces in terms of human-centred design have demonstrated that evolution of functional and aesthetic characteristics of user experience is based on the increasing influence of graphic design as an instrument of visual communication.

Figure 1 demonstrates that such graphic components as illustrations, infographics, pictograms, elements of corporate identity become increasingly common in interfaces of different payment and service terminals [6], ticket machines, ATMs, information kiosks and other similar objects of urban infrastructure in St. Petersburg museums, shops and other public places.
According to Maxim Philippov the relevance of such graphic elements can be explained by the fact that the harmony of human interaction with computer systems “is in the area of product development of information based on perception, not text, but visual units” [10, p. 17]. However, it does not reduce the importance of the pre-project analysis, research of needs of potential users and making models of user interaction on this basis. Method of observation made it possible to reveal such problem: the more complex the system (that is the person is deeply involved in the interaction process with the device), the more often there is a shift of focus of attention of experts away from the design of interaction towards the implementation of the graphic form. Thus, visual effects replace the original logic of interaction. It significantly damages both to the communication with the device and, as a consequence, to the ecology of the informational and graphic environment of the city.

Such interfaces, which are toxic to the city environment, can be recognised by an abundance of textual information, confusing navigation, visual noise (illustrations, three-dimensional images, shadows). A significant example is a ticket machine in the St. Petersburg Metro (Fig. 2).

**Figure 1.** Interfaces of city interactive devices in St. Petersburg

**Figure 2.** The interface of a ticket machine in the St. Petersburg Metro.
Display here provides complex support of a process of buying and recharging a travel ticket by connecting the person and the system. It directs the person in the process of receiving the service, determines its quality and speed, and as a result, it influences on global user satisfaction and his emotional state.

The algorithm of actions is provided by the touch screen, which offers excellent opportunities for visual design. Visual effects, however, mask interaction problems that significantly reduce the quality of service. Timur Repin, the designer of "Mobile Up" company, which is known as the expert in the developing mobile products and services, drew his attention to this problem and proposed an alternative design based on rethinking and greatly simplifying the system of user interaction with the device and as a result graphical simplification of the design of the interface (Fig. 3) [8].

![Figure 3. T. Repin's project proposal for redesigning the interface of a ticket machine in the St. Petersburg Metro.](image-url)

3. Results
Following the strategy of minimalism in the user interface design of an interactive city, the device is an essential factor of the information environment arrangement. On the one hand, the limited use of graphic elements reflects a logical and functional approach to creating user-friendly information structure. On the other hand, it embodies an ethical approach to design because in the situation of total information overload, when the battle for attention is getting as intense as possible, aggressive design, which generates visual mess, is perceived not only as ineffective but also as disrespectful to the consumer.

Modern technical capabilities allowing to display on interfaces of interactive city devices many colours, various of typefaces, images and all kinds of visual effects produce an extra visual noise, which splits the focus of attention and facilitates uneconomical use of human energy, thereby preventing the receipt of important information. Thus, in the conditions of total information overload designers are additionally responsible not just to deliver a particular message by graphic means, but also to purposefully organise the entire interaction process considering the reduction of information load.

4. Discussion
In a general sense, information overload is a concept, the essence of which is that the presence of too much information leads to confusion, disorientation, and also causes difficulties in decision-making [9, 11]. As visual information dominates over other types of information, it is reasonable to consider the information overload from the visual point of view. Therefore, it is obvious the influence of the organization of the entire visual environment of the city on the level of information overload. Interaction with interactive city devices should be based on principles of respecting for a person's privacy, the specificity of perception and emotional comfort.

Visual pollution and visual noise together hurt the environment of modern cities. Not only medical experts, architects, psychologists, but also art critics and experts in visual communication pays their attention to its toxicity. According to Galina Kuryerova "the concepts of "mental pollution", "sign (semiotic) pollution", "visual noisiness" are moving from one article to another, and the "white noise” dominance which generates extreme exhaustion and satiety is recorded everywhere" [3, p. 505].
Alan Cooper also encourages avoiding visual noise. In his words "visual noise within an interface is caused by superfluous visual elements that detract from the primary objectives of communicating affordances and information" [2, p. 423].

Hence, it is not surprising that minimalism as graphic design strategy become nowadays increasingly popular. In particular, it concerns the process of information design of interfaces of interactive city devices. According to Jakob Nielsen's usability heuristics for user interface design, effective interaction design is based on principles of organization of information, which help to reduce information anxiety (visibility of system status, user control and freedom), improve understanding the content and promote better interaction with it (using uniform standards). All of these impacts on the visualization features, as it involves moving towards a minimalist design [15].

Swiss graphic designers have actively developed minimalism, as a graphic design concept, in the middle of the 20th century, and today it stays still popular. In the Oksana Vashchuk words, Swiss designers were in opposition to the mass pop culture, they "were guided by a socially-oriented worldview, choosing the categories "clarity", "responsibility" and "ethics" as the keywords" [1, p. 547]. Concise visual language not only contributes to the formation of a moving visual image but also helps to protect the consumer from the abundance of unnecessary, insignificant and distracting information. That is why minimalism strategy has gained new importance and become so popular nowadays. It helps to minimize stress, reduces the time of perception of information, promotes its better memorability, and forms ethics of design, which, due to information overload, extends to both the content and visual aspects.

5. Conclusion

The information revolution has significantly changed the quality of life of the modern man. Along with the apparent advances of the information age (mobility, data availability), we are witnessing an information explosion, which has led us to significant psychological problems: anxiety, information satiety. In the situation of information crisis, graphic designers have faced the new challenges, closely connected with the entire organization of the communication process between human and technic devices. For urban devices as a factor of comfortable city life, it is especially important, because they target multiply stakeholders.

If we consider the level of information pollution, it should be noted that the functionality of the graphic design is defined today by the quality of the information environment organization. It means a desire for information efficiency and reduction of graphic noise level simultaneously. Moreover, it makes further research focused on the abilities of minimalism as a strategy of visual design, especially crucial because it reflects a modern approach to the formation of comfortable information and visual city environment.

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