Public design: Tools, Techniques and Processes

María Menéndez Blanco
University of Trento
Via Sommarive 9
38123 Trento, Italy
menendez@disi.unitn.it

Antonella De Angeli
University of Trento
Via Sommarive 9
38123 Trento, Italy
antonella.deangeli@disi.unitn.it

Maurizio Teli
University of Trento
Via Sommarive 9
38123 Trento, Italy
maurizio.teli@disi.unitn.it

ABSTRACT

In this paper, we describe the analysis and design activities performed in the context of Città Educante. These activities are divided in three phases. The first phase presents the analysis of a previous project, which helped us develop three framing themes (i.e. *digital commons, matters of concern, attachments*). These framing themes can be understood as the object and characteristics of the design process. The second phase presents a design activity performed in the context of a university coursework. In this phase, the three framing themes were instrumental in the development and reflection of design activities. Building on the coursework projects, we elaborate on our understanding of the influence that a public design approach had on a group of Computer Science students. The third phase presents an on-going project, elaborates on how our previous activities and reflections are integrated into practice and discusses future activities.

In questo articolo, descriviamo le attività di analisi e di progettazione condotte nel contesto della "Città Educante". Le attività sono state divise in tre fasi. La prima è l'analisi di un progetto precedente, che ci ha aiutato a individuare tre temi attraverso cui inquadrare le attività (*digital commons, matters of concern, attachments*). Queste lenti possono essere lette come l'oggetto e le caratteristiche del processo di progettazione. La seconda fase è stata la conduzione di attività di progettazione nel contesto di un corso universitario. In questa fare, i tre temi sono stati strumentali allo sviluppo e alla riflessione sulle attività di progettazione. Partendo dal lavoro del corso, abbiamo sviluppato una comprensione dell'influenza che l'approccio di public design ha su un gruppo di studenti di informatica. La terza fase è focalizzata su un progetto in corso, basato sulle attività e riflessioni precedenti che sono integrate nella pratica progettuale e discusse in relazione a future attività.

General Terms
Design, Experimentation.

Keywords
Public design, education, design methods.

1. PUBLIC DESIGN

In the Sciences of the Artificial [18], Simon defined design as the "transformation of existing conditions into preferred ones" [p. 111]. He argued that design is a science of the artificial, which investigates how things ought to be, in comparison to natural sciences, which investigates how things are [18]. Schön [17] criticized this positivistic understanding of design and argued that the design process should not be considered as a systematic approach to solve well-formed problems since it addresses the "messy and problematic situations" in which design usually takes place. In this view, design can be understood as a field that deals with *wicked problems* [2]. The concept of wicked problem was introduced in the mid-1960 by Rittel during a set of lectures and defined in a guest editorial by West Churchman [20], who attended these lectures, as a "class of social system problems which are ill- formulated, where the information is confusing, where there are many clients and decision makers with conflicting values, and where the ramifications in the whole system are thoroughly confusing" [p.141]. An interesting characteristic of wicked problems is the notion of *symmetry of ignorance,* which Rittel described as the situation by which expertise and ignorance are equally distributed among all people who relate to the problem. There are therefore no experts on the subject matter of a wicked problem, and expertise might only be considered in terms of guiding the process of dealing with the problem [16]. Although the concept of wicked problems has been sometimes used in design to describe the social reality of the design process [4][2], the practical implications for design remain still unclear [2].

Existing literature in HCI does not provide a general definition of public design. The term has been mainly used in fields such as architecture, urban planning and service design to refer to design for public contexts. It relates to a kind of design that is socially, politically or environmentally engaged and which might contribute to the formation of *publics*, where publics are understood in Dewey's terms as: "a group of people who, in facing a similar problem, recognize it and organize themselves to address it" [5]. An example is the "Public Design festival", which has been held in Milano since 1995 and addresses the creation of interventions, installations and services for the urban context. Although the focus of the festival changes every year (e.g. the 2014 edition concerned the topic of food), a common theme is the design of concepts to improve public spaces through participative processes. In a similar way, the seminar "How public design?" was hosted by MindLab, a design company based in Copenhagen, where designers, policy makers and academics gathered to discuss how "design might drive public innovation to create new solutions as well as new publics". Another example is "The Public Design Workshop", a research studio at Georgia Tech University lead by Carl DiSalvo where technology is used as a tool to articulate issues, contribute to the construction of publics, provide new ways of empowering communities (e.g. homeless community), and stimulate reflection around issues of public interest (e.g. air pollution).

Public design can be interpreted from different perspectives and epistemological traditions. Due to its strong social component,

public design can be conceptually related to Social Innovation (SI). SI appeared in the 80s to refer to a particular aspect of innovation that related to social issues (e.g. healthcare and education) rather than to technological issues [7]. Over the years, SI has enlarged its scope to focus on meeting social needs by empowering local actors to develop the innovative products, services and models they need and want [14]. The upsurge of interest in SI within the EU is associated to the 2008 crisis, which unveiled a fault in the assumption of the Lisbon Strategy that investments in knowledge would equate to growth and jobs. Since then, several initiatives have sought to promote SI from the European Commission: one of the latest is the creation of a Horizon 2020 specific programme on employment and SI, allocating €919 million to SI [8]. In addition to the social-oriented SI, other approaches include laypeople in the innovation process such as the business-oriented open innovation [3] and the product- oriented democratizing innovation [19]. From the social perspective, democratizing and open innovation processes are sometimes criticized for: (a) limiting the participation to a close group of "lead users" selected by the managerial team; (b) supporting an unbalanced power distribution between users and companies in decision-making; and (c) being mainly driven by corporate interests and economic growth [1][10].

This literature review exemplifies the different ways in which public design can be understood. In this paper, we look at public design from an HCI perspective and refer to it as a participative transformation process which addresses collective conditions and which facilitates, or supports, the formation of *publics*.

2. FIRST PHASE

During the first phase, we investigated the theoretical background that can inform public design. This process was pursued through the analysis of an existing project, theory review and discussion with scholars. The outcome of this phase is the definition of a design space that can inform public design. This design space includes three framing themes: *digital commons*, *matters of concern* and *attachments*.

2.1 Case study – Smart Campus

In this case study, the project Smart Campus (2011-2014), we experimented with forms of participatory design by supporting and promoting students' active participation in the design and development of services for their own campus. The University campus acted as the pilot site for a vision that emphasizes the role of citizens not only as decision-makers, but also as builders of services. Four main actors participated in Smart Campus. University students acted as primary participants of public design. The funding body was a node within the EIT ICT Labs network, a EU initiative to support innovation for economic growth and quality of life. The University was a core partner of the funding body: within the Smart Campus project it represented both the beneficiary and the provider of the research capability.

The Smart Campus lab consisted of 25 members, either designers (N = 5) or developers: the former include researchers in HCI and interaction design; the latter include developers, student interns and the management team. Almost 500 students were invited to participate in the project: at the beginning, most of them were enrolled to the BSc or MSc degree in the Department of Information Engineering and Computer Science department; over time, students from other departments (e.g. Sociology, Industrial engineering, Mathematics, Law, Philosophy) were invited to join.

The project yielded a set of eight mobile applications that helped students in a variegated set of activities. The lab developed six of

these applications. The socio-technical infrastructure to design and develop facilitated the activities that resulted in the development of two mobile applications entirely developed by two groups of students. In addition, the project yielded a large corpus of qualitative and quantitative data coming from different sources such as forum, diaries, interviews, reports and mobile apps' activity logs. The analysis of the gathered data, along with a literature review and discussion with scholars, allowed us to identify three framing themes that can extend existing understanding of methods for technology design. These three themes (i.e. *digital commons*, *matters of concern* and *attachments)* are aimed to extend and facilitate the action and reflection on public design projects.

2.2 Framing themes

2.2.1 Digital Commons

According to the Nobel Prize Elinor Ostrom, commons is a third-way institutional arrangement to manage specific resources, being natural or digital, that is neither the state nor the market, but rather a collective effort of the people directly interested through means that are based on democracy more than on hierarchies []. Typical examples of natural commons are water, pastures, or fishery seas; while typical examples of commons related to digital resources are Wikipedia and the various incarnations of Free/Libre and Open Source Software (FLOSS) [9]. In a commons perspective, the legal status of what is managed (e.g. FLOSS or Creative Commons licensed material) is entangled into distributed and collaborative managerial practices. Therefore, from a design perspective, a *digital commons* can be defined through two main features: a legal protection and distributed governance in the management of the interactive artefact.

2.2.2 Matters of concern

The concept of *matters of concern* as opposed to matters of fact was recently introduced to the HCI community by the elegant work of Di Salvo and colleagues [6]. Coming from Bruno Latour's work in Science and Technology Studies, matters of fact refer to expressions that claim to report objective conditions, whereas matters of concern refer to "highly complex, historically situated, richly diverse" political and social conditions [11].

The concept of matters of concern have been explored as a way to problematize the contingencies and controversies that occur in a design process [1] and reflect on how HCI design can contribute to their expression and articulation [6]. In particular, the concept proved to be particularly useful in understanding the complexity of requirements in public design and in the identification of communication breakdowns within the project.

2.2.3 Attachments

The concept of *attachment* has been proposed as a perspective to elaborate on motivations for participation when designing technology with a PD approach [12]. Marres highlights that *publics*' motivation for participation is not rooted on the expression of a popular will on but the articulation of a public issue [13]. This difference is especially relevant for design, since the possibility to articulate matters of concern and discuss contingent requirements is what differentiates publics from other kinds of actors, such as stakeholders [12]. The articulation of matters of concern does not only allow people identify and associate to public issues but it also enables the emergence of new relationships between individuals, resources, and objects. These relationships might motivate the association of people to a specific issue and they can be understood as attachments.

According to [13], attachments can be created by means of dependency or commitment.

The integration of the three framing themes provides a unique perspective for public design. This perspective envisions a design space shaped by digital commons, as the "object of design", and matters of concern and attachments, as "characteristics of the design process". In the following phases, these framing themes have been used to develop the design interventions and to reflect on their outcome.

3. SECOND PHASE

The second phase lasted from October 2014 to January 2015 and happened in the context of Human Computer Interaction (HCI) course in the MSc of Computer Science. As part of the coursework, students were given the possibility to choose the topic of their practical coursework among three options: HCI for Digital Social Innovation (DSI), Participatory Design in Games with a Purpose, or Participatory Development in Open Source Software. In this paper we will focus on the projects developed as part of HCI for DSI topic, where students were invited to "design an interactive artefact which can contribute to your community".

The goal of the activities in this phase was threefold: first, it experimented with forms of constructivism teaching methods by supporting learning with practice-based examples; second, it supported interdisciplinary learning approaches by inviting computer science students to initiate a design process from a community or social theme/problem instead of a technological issue, as it is usually the case in their curricula; third, it experimented with design and research methods for public design.

3.1 Case study – HCI for DSI

In total, seven groups (number of group members varied from two to five students) selected the topic of HCI for DSI. The design activities were instantiated as workshops and individual meetings. In total, five workshops were organized. Workshops were designed among four members of the research group and conducted by one of them. Workshops lasted two hours, were held outside the HCI course hours and were presented as supporting, non-obligatory, activities.

The workshops addressed the following topics: Idea generation, idea refinement, design research methods, stakeholders map refinement and empathy maps, and final report discussion. In general, workshops started with a presentation on the specific topic, which was followed by hands-on design activities. In addition to the activities performed during the workshop, students engaged in ethnographically-inspired tasks such as observations and interviews. Furthermore, groups were given the possibility to discuss about their projects with an expert. During these meetings, each group presented their design idea to an expert, whose background varied from ethnography to social sciences and computer science. The topics that students addressed varied from expenses tracking to street noise measurement. Table 1 contains a complete list of the projects.

In term of our framing themes, students were guided throughout the design activities in order to identify matters of concern and understand people's attachments to them. Final design proposals suggest that the performed activities, guidance and proposed techniques contributed to the understanding of the design process in "public design" terms. For example, the group who addressed the issue of high occupancy in university libraries started with a technological-oriented solution (i.e. library occupancy monitoring system using sensor-based devices) and, throughout the workshops and performed activities, evolved into a mobile

application complemented by physical artefacts (i.e. written cards) that could be left on the library desks. In particular, during one of the workshops, students decided to spend considerable amount of time in reflecting on the text to be written on the card.

Table 1. HCI for DSI Projects

Project	Description
Coffee sharing	Knowledge sharing platform for university students based on exchange processes
Light the night	Technological light installation aimed to create awareness of street noise
BiblioTN	Platform which addresses the issue of crowed libraries
RoomMate	Web platform for affinity-based lodging search
Desgining by Senior	Analysis of public services websites (e.g. social security) which are difficult for older adults
Magic Wallet	Web and mobile platform for expenses tracking and saving suggestions
Service : Sanba	Guidelines for smooth inclusion of international students into university

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Another example is the group that worked on the "Light the night" (Figure 1), who wanted to address the issue of street noise next to bars during the night. In Trento, the topic of street noise and nightlife is a hot and controversial issue: neighbors are bothered by people who talk outside bars and young people complain about the little nightlife offer. However, students struggled to find a technological solution to the issue and wanted to drop the topic. In this case, the design activities helped students to disregard the search of a technological solution in the early phases and focus on understanding the issue (i.e. matters of concern), who was involved and why they were involved (i.e. attachments). They discovered that, in addition to neighbors and people standing outside bars at night, policemen and bar owners had different forms of attachments to the issue. In particular, one of the central pubs became very interested in the project since, due to the street noise, they had been thread with anticipating the closing time, which would influence their economical benefits. This attachment facilitated the participation of the bar owner in participatory design activities organized by the students. At the end, the students proposed an interactive light installation which was aimed at increasing people's awareness of street noise by displaying the decibels and showing a message/image aimed at

persuading people to decrease the noise. In conclusion, comparing with previous years, this year's projects have addressed a more variegated set of issues and suggest an increased awareness of socio-technical issues related to technology design.
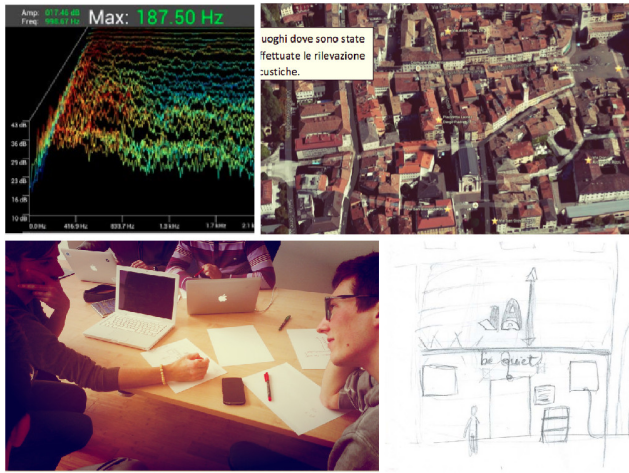

Figure 1. Activities within the "Light the night" project

The practice-based knowledge acquired in this phase, along with the framing themes previously developed, have been instrumental in the design of the activities in the public design case study presented on the third phase.

4. THRID PHASE

The phase has started in March 2015 and addresses matters of concern in the context of people, and in particular kids, with learning disabilities. In this context, our activities are focused in supporting three processes that we have learnt to be paramount in public design, i.e., elicitation, articulation and reconciliation, or rejection, of matters of concern.

Current activities are addressing the development of a socio-technical infrastructure that can support future design interventions. In particular, one of the upcoming milestones is the "Dyslexia awareness week", for which we aim to organize a set of events and, showcase artistic installations and technological artefacts related to dyslexia. These activities entail a large infrastucturing effort, which involves the identification of different matters of concern and attachments. For this purpose, we are currently conducting interviews with a list of identified actors and ethnographically-inspired activities (e.g. field studies).

5. CONCLUSION

The analysis and empirical activities presented in this paper contribute to the development of methodological and pragmatic aspects of public design. The definition of the three framing themes as relevant concepts in the process of public design constitutes the first contribution of our work. Building on these framing themes, we have experimented with different existing design methods and reflected on their suitability for public design. Our current work is focusing on the modification of existing design methods and the creation of new ones. As an overarching goal, future work will be aimed to develop co-constructivist approaches grounded on the connection among the university, educational system and public themes. Our expectations are to develop not only conceptual and methodological methods for public design but also technological artefacts.

7. REFERENCES

[1] Björgvinsson, E., Ehn, P., and Hillgren, P.A. Participatory design and democratizing innovation. In Proc. *PDC 2010*, ACM Press (2010), 41-50.

[2] Buchanan, R. Wicked problems in design thinking. *Design issues*, 5-21 (1992).

[3] Chesbrough, H.W. *Open innovation: The new imperative for creating and profiting from technology*. Harvard Business Press, 2003.

[4] Coyne, R. (2005). Wicked problems revisited. *Design studies*, 26(1), 5-17.

[5] Dewey, J. (1927). The public and its problems: An essay in political inquiry. Penn State Press.

[6] DiSalvo C., Lukens J., Lodato T., Jenkins T., and Kim T. Making public things: how HCI design can express matters of concern. In *Proc. CHI 2014*, ACM Press (2014), 2397-2406.

[7] Drucker, P. F. The discipline of innovation. *Harvard business review* 63, 3 (1984), 67-72.

[8] European Union Financial Programming and Budget. http://ec.europa.eu/budget/mff/programmes/index_en.cfm

[9] Hess, C., and Ostrom, E. *A framework for analyzing the knowledge commons*, 2006.

[10] Kanstrup, A. M. A small matter of design: an analysis of end users as designers. In *Proc. PDC 2012*, ACM Press (2012), 109-118.

[11] Latour, B. Why has critique run out of steam? From matters of fact to matters of concern. *Critical inquiry* 30, 2 (2004), 225-248.

[12] Le Dantec, C. A., and DiSalvo, C. Infrastructuring and the formation of publics in participatory design. *Social Studies of Science* 43, 2 (2013), 241-264.

[13] Marres, N. The Issues Deserve More Credit Pragmatist Contributions to the Study of Public Involvement in Controversy. *Social Studies of Science* 37, 5 (2007), 759-780.

[14] Murray, R., Caulier-Grice, J., and Mulgan, G. The open book of social innovation. *National Endowment for Science, Technology and the Art*, 2010.

[15] Ostrom, E. Governing the commons: The evolution of institutions for collective action. *Cambridge university press*, 1990.

[16] Rittel, H. W., & Webber, M. M. Dilemmas in a general theory of planning. *Policy sciences*, 4, 2(1973), 155-169.

[17] Schön, D. A. *The reflective practitioner: How professionals think in action.* 1984

[18] Simon, H. A. *The sciences of the artificial*, 136(1969), MIT press.

[19] Von Hippel, E. *Democratizing innovation*. MIT press, 2005.

[20] West Churchman, C. "Wicked Problems". *Management Science*, 4, 14 (1967).