Investigating the Role of Situated Public Displays and Hyperlocal Content on Place-Making

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Abstract. Our urban environments are increasingly being outfitted with various forms of digital media, such as electronic billboards, public displays and interactive lighting. While their deployment is commonly motivated by commercial and functional objectives, the impact on the urban fabric is often neglected. However, as public displays become situated in their environment and content becomes hyperlocal, they contribute to the place-making process and become a medium for local communication and information. In this article, we build upon an analysis of two recent case studies to propose four sets of design considerations for situated public displays in urban space. We argue that public displays should provide mechanisms to (1) warrant hyperlocal relevance of the messages that are communicated, (2) build a sense of trust from the surrounding community, (3) allow citizens to reflect on the meaning and functionality, and (4) elicit enriched experiences of the environment they are situated in.

Keywords: Public display, situated display, hyperlocal content, place-making, data visualization, community, urban data.

1 Introduction

The increased ubiquity of information technology and computing infrastructure in the urban environments is influencing our experience of public space. Obvious examples include public displays that support various degrees of civic engagement, such as sharing information with locals, providing a platform for culture, or encouraging commerce (e.g. [1, 2, 3, 4]). Less obvious examples consist of the invisible sensor-equipped urban infrastructure, that measure all kinds of urban data in order to monitor, analyze and optimize urban challenges, and ultimately, city life (e.g. [5, 6]). Such deployments often focus on making cities more 'efficient' and 'controllable' for local governments within the context of the Smart City (e.g. [7, 8]).

The importance of public space in the design and deployment of information technologies for human communication and collaboration is increasingly discussed and investigated [9]. In spite of the ambitions of the Smart City, there is a recent understanding that additional insights are still required on how the visible and invisible digital layer of the city can be more explicitly merged with the experience of

public space, and vice versa [10, 11]. This challenge raises several questions; such as how can we embrace the abundance of affordable information and communication technologies to elicit new perspectives onto urban space? How do such new perspectives influence our behavior, social interaction and experience, especially in times where qualities such as neighborhood cohesion and communication are perceived to be under threat? How can communication technologies be designed to more closely align with how people experience public space? And ultimately, how can this experience contribute to the formation of place, i.e. a stable environment that signifies closure and coexistence [12]?

Ideally, technologies allow people to engage with each other and experience spaces in new ways [13]. At the same time, one could argue that these are not necessarily "new" ways, but rather reclaim a wide range of values that have long-existed and have been well established in times when technology had not yet started to fundamentally influence urban life. As such, these new ways should reinvigorate qualities of public space as an environment that stimulates dialogue and social interaction, and that values a diversity of norms, interpretations and beliefs. Ultimately, such approaches should aim to improve acceptance, credibility and long-term sustainability of technology in urban space [14].

Communicating locally relevant information plays an important role in the creation of spaces for communication and interaction [15]. It has the potential to encourage citizens to act towards a more appropriated sense of place [16], by making them aware of local challenges, allowing them to gain a true understanding of these challenges, and providing them with the opportunity to respond and react.

This article builds upon the analysis of two in-the-wild field studies that communicate local information and create spaces for communication and interaction, in particular by way of situated public displays. Our analysis reveals four sets of design considerations that proved successful in contributing to civic engagement and the social experience of space, or in other words, the making of place. In particular, we focus on how the urban fabric (i.e. social, societal and cultural qualities of the urban environment) was influenced by the situated displays and their hyperlocal content, and vice versa.

2   Situated Public Displays

As one of the endeavors in bridging the digital with the urban presence, we have deployed two sets of public displays. Both were designed to communicate hyperlocal content, i.e. information that is affiliated with a specific geographic area, and with a particular relevance to local community members. It has been previously described in the context of citizen journalism (e.g. [17]) and user-generated messages on social media (e.g. [18]). In our studies, both sets of displays differed in the representation of information, the design approach, and the public interactions that were supported. This intrinsic adaptability rendered them situated in the local neighborhood, i.e. flexible in responding to the surrounding physical, temporal, spatial and social context, either by design or by the information they provide [19].

2.1 Street Infographics

Street Infographics was an urban intervention that visually represented data that is contextually related to local issues. This data was visualized through situated public displays in four adjacent streets of a neighborhood [20]. In this particular neighborhood, the advent of a new student-housing complex caused local residents to feel put aside by the local government. Residents perceived an imbalance between the efforts that were spent on attracting and satisfying local and foreign students, and their own needs. In order to put the common ideas and assumptions concerning local demographics in perspective, we decided to communicate the factual socio-demographic composition of this neighborhood.

In each street, two socio-demographic data dimensions for that particular street (i.e. student population and immigrant population) were visualized in an infographic, through the use of icons (see Figure 1). The number and color of icons represented the proportional share of students versus that of foreign nationals, indicating who are temporary residents and who are more permanent. The design of the infographic resembled the characteristics of a typical street sign, in terms of its color scheme, typography and physical dimensions (see Figure 2). By physically attaching the visualizations to existing street signs, they implied to officially represent information of that particular street. As passers-by walked along the four streets, they were given opportunities to compare the various data of the different streets. We observed the visualizations during five days and semi-structured interviews with 35 onlookers were conducted in order to measure their understanding and interpretation of the visualization. The intervention provoked a variety of reactions among locals and passers-by, such as curiosity, personal reflection, stimulating social interaction and perceptional changes, and an increased insight in the socio-demographic data.

Fig. 1. *Street Infographics* consisted of a series of visual representations of local data, attached underneath existing street signs.

Fig. 2. Detailed view of *Street Infographics*, that highlights its iconography, depicting the amount of students versus permanent residents, and the share of Belgian and foreign nationals within both demographic groups.
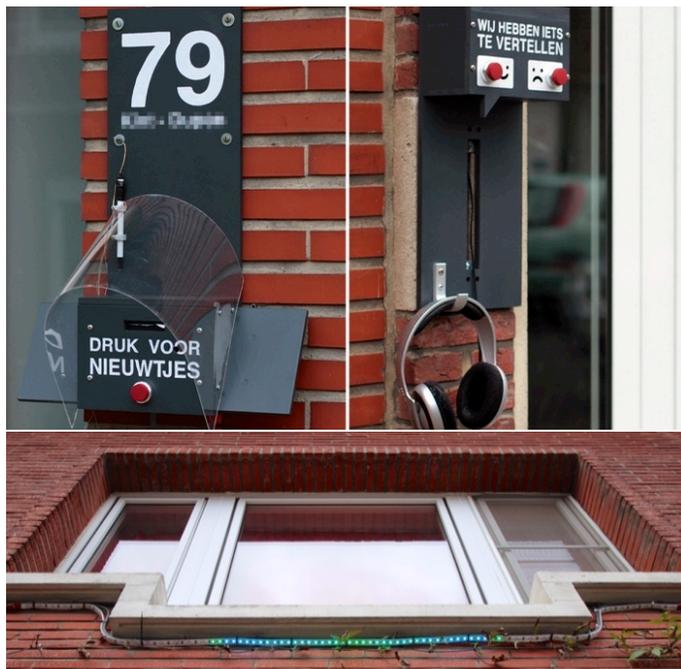

Fig. 3. *StreetTalk*, consisting of three situated public displays that allowed messages to be printed (*Readl*, top left), audio fragments to be listened to (*Listen*, top right), and ambient sound levels to be visualized (*Shush*, bottom).

2.2 StreetTalk

StreetTalk consisted of three situated public displays that were attached to house facades [21]. The displays were conceived in a participatory design process with households, and specifically designed to facilitate communication and interaction between them and the local neighborhood. The resulting designs consisted of: 1) *Readl*, a thermal printer that delivered household-generated messages, 2) *Listen*, an integrated audio system allowing neighbors to listen to household-generated audio messages, and 3) *Shush*, a lighting installation that raised awareness on street noise by visualizing ambient sound levels (see Figure 3). Involvement of households in the design process resulted in displays that challenged traditional screen-based formats.

   The displays were custom developed with off-the-shelf hardware components and attached to the façades of private residences. Their impact on the neighborhood was subsequently evaluated during an eight-week in-the-wild field study. Halfway through the study, ten people participated in semi-structured interviews that aimed to reveal their experiences with the displays and the messages they provided. They consisted of neighbors living near the participating households, as well as people living in surrounding streets who occasionally passed by (e.g. on their way to work).

   Our study has indicated the qualities and challenges of situated public displays, in terms of sustaining engagement while enticing trust, warranting accessibility, arousing curiosity and their local situatedness. Based on our findings, we feel encouraged to promote the notion of situated public displays by way of active participation from local citizens in both the design and maintenance processes.

3. How Public Displays Support Place-Making

In both studies qualitative feedback on people's experience with the situated public displays was collected through observations and interviews with passers-by and community members. In the following, we discuss insights from both case studies based on the feedback that was collected, and present relevant design considerations.

3.1 Warranting Hyperlocality

Street Infographics. The topic of the infographic illustration was based on a prevalent local issue (i.e. perceived socio-demographic imbalances), by publicly showing the actual figures. As sensitive information was disclosed to the wider community, the perceived socio-demographic imbalance among local residents could potentially be amplified. Indeed, some residents who were part of a minority group objected the presence of the signs. This was observed when a resident slammed the door as researchers approached him to participate in a follow-up interview. His actions were put in perspective at a later time, when a family member explained that despite living in the street since childhood, his social background and ancestry made him feel part of

the minority group of temporary residents. On the other hand, the hyperlocal data enabled other community members to clarify how the size of their demographic group compared to others in the street. As such, this information helped in understanding the viewpoint of other local groups. For example, in an interview a local resident revealed feeling ashamed for having overestimated the student population in the neighborhood by more than twice the actual amount (80% perceived versus 31% actual).

StreetTalk. Neighbors were particularly appreciative of messages that took immediate inspiration on local occurrences. These commonly involved references to local individuals, locations that fulfill an established role in the neighborhood, community events, and news announcements that tended to only consider the area in close proximity of the display. The attachment of neighbors to local information is exemplified by a message that informed about the recent death of an international artist. While this message closely aligned to the interest in music of the household that published it, some neighbors argued, "*I didn't know that person; I was not interested to hear about that. However, when the death of the neighbor at number 78 was announced several weeks ago, then I was sincerely touched*". At the same time, we discovered that while local messages were successful among nearby residents, neighbors from distant streets refrained from interacting with the displays as they were attached to houses inhabited by "*unfamiliar people*".

Design considerations. Hyperlocal content requires the co-existence with the surrounding context. By separating content from context, content will ultimately loose its meaning. As a result, public displays only become situated in their environment through the hyperlocal nature of the message they communicate, its local relevance, and the community it addresses. At the same time, publishing hyperlocal content is confronted with three challenges:

· Its physical reach is potentially limited, as information may lose meaning when viewed by people that are unfamiliar with the local community.
· The sustained creation of hyperlocal content may be impeded by the absence of readily available news.
· Even within the same geographical area, interpretations, appreciations and expectations of hyperlocal content can vary drastically. While some content can be hyperlocal in nature, this does not imply it is considered relevant by a large group of locals (e.g. as it concerns a topic that only very few people can relate to).

Situated urban displays should therefore aim to accommodate the various expectations, beliefs, values and norms that characterize the local urban environment and its inhabitants:

· Hyperlocal content on situated public displays should focus on information that local inhabitants can easily relate to, through a physical proximity (e.g. the immediate surroundings), social intimacy (e.g. concerning familiar individuals, occurrences or discussion topics) or cultural connectedness (e.g. respecting a multitude of local backgrounds and interests). This requires providing a stream of accessible, non-controversial data that is related to the neighborhood.

· Publishing hyperlocal content raises the need to overcome issues of unfamiliarity, in particular for people that are unfamiliar with the local neighborhood. While a method such as selecting content based on an individual's level of familiarity with the neighborhood comes to mind, this may also encompass more elaborate techniques, such as expanding the prototypical design space of public displays to allow for open-ended interpretations to emerge, or integrating opportunities that stimulate and reward social interactions with local inhabitants.

· The objective of hyperlocal content should not be about conveying preferences or ideologies. Instead, hyperlocal content should allow people to resist or sustain its meaning on their own terms, in order to allow for the emergence of a range of shared interpretations (e.g. distinguishing between local news, official or citizen-instigated propaganda, and commercial advertising purposes).

3.2 Establishing trust

Street Infographics. As public displays are meant to address 'everyone', they fulfill an important role in conveying trust and providing relevant information. *Street Infographics* were attached to official street signs. This connection with "official" infrastructure resulted in occasional onlookers that searched for indications of authorship, such as by looking at the backside (see Figure 4). The factual data made some citizens question aspects such as privacy and content (e.g. "*Is it ethically correct to display the number of foreigners?*"), while some connected the location of the signs with the credibility of the data (e.g. "*The numbers must be official, it is part of the street sign!*").

Fig. 4. Passers-by occasionally looked for indications of authorship, for example on the backside of *Street Infographics*.

StreetTalk. Both the interior and exterior of a house typically reflect how its residents see themselves, and how they aim to be perceived by others [22]. *StreetTalk* displays were given to households and mounted to the facades of their private residences, therefore becoming a part of the households' public exposure. This design decision made residents feel personally responsible for the displays and the messages they conveyed. For example, prior to publication, residents carefully assessed the nature of messages to be nonpolitical, comprehensible and objective. The physical attachment to façades also proved helpful in building a sense of trust and credibility among neighbors. This particular design decision made them feel confident in the nature of the messages, which was further amplified by design qualities, such as the visible cabling, the ludic functionality of the displays, and their handmade look-and-feel. Ultimately, this proved to be beneficial in promoting dialogue between neighbors and the participating households (see Figure 5).

Fig. 5. Attaching public displays to facades of private residences, in addition to the messages being controlled by a local inhabitant, proved successful in creating spaces for casual communication and social interaction.

Design considerations. Situated public displays are expected to be flexible in responding to their surrounding context, while resembling the values and beliefs of the organization, individual or community that owns and controls them. This can be exploited as a quality to establish trust and credibility among the citizens, households and organizations their messages aim to address. Supporting situatedness involves more than merely providing locally relevant information, but extends to the careful consideration of a range of design characteristics relating to:

· The careful consideration of the physical location where a public display is being installed, in particular the role or meaning of that location in the surrounding environment (e.g. different connotation between the façade of private residence and street furniture that is owned and maintained by a local authority).

· Declaring or proving the authenticity of data sources, by unambiguously indicating the source (e.g. reference to city council) or by considering the physical location of the public display (e.g. façade of a community worker's residence).
· Their unobtrusive presence in the urban environment in order to not interfere with everyday life of the city. At the same time, situated public displays should provide sufficient clues for those that are interested to engage in further exploration and sense-making processes (e.g. deeper analysis of the meaning of content).

3.3 Stimulating Reflection

Street Infographics. The public presentation of factual data does not necessarily involve expressing an opinion, but may still provoke distinct expectations and reactions [23]. When asked about what was presented on the displays we learned that onlookers went beyond stating a simple data fact or trend, but also expressed a more personal reflection. Some residents revealed that their opinion on the issue being represented had changed in a positive way. Others connected the public appearance of contested data with political propaganda.

StreetTalk. While the situated displays did not explicitly aim for personal reflections to emerge, residents revealed they had reconsidered the goals of the displays beyond their communicative value. The design of the displays seemed to exhibit characteristics of the participating households, as well as a predominantly playful rather than functional nature. As such, there was no single preferred use or clear narrative, allowing people to choose their own experience [24]. For example, some considered *Shush* to be a device that playfully intertwined light and sound, rather than a device that purely aimed to patronize neighbors about street noise.

Design considerations. Situated public displays negotiate a multitude of purposes, well beyond their obvious value in communicating data and information to a heterogeneous urban audience. Therefore, situated displays should, by design, enable people to resist or sustain meaning on their own terms, allowing for multiple interpretations and reflections to emerge. The intrinsic quality of such situated displays to trigger a rich range of experiences from people may be exploited by paying particular attention to:

· The information that is shown, such as locally relevant information that people can easily relate to and query for patterns.
· Their design characteristics, such as resembling local features (e.g. community characteristics) and exhibiting an open-ended and "surprising" nature.
· The interactions they support, such as facilitating interaction beyond established techniques (e.g. touch, body posture).

3.4 Enriching Experiences

Street Infographics. Although the presence of *Street Infographics* in the everyday streetscape did not obstruct common activities, some onlookers mentioned they noticed "something" was different than usual. Their presence also proved successful in motivating onlookers to explore adjacent streets, in an effort to discover additional street signs and to compare the different datasets of multiple streets and acquire a deeper understanding of the composition of the wider neighborhood. In fact, in follow-up interviews, local residents even requested to display additional demographic data, such as the amount of young families and children, age distributions, etc. They felt this could deliver additional surprising insights, and influence their view on the neighborhood.

StreetTalk. Households mentioned that the public displays seemed to motivate a slower pace, as people were surprised by the unusual devices, were expected to press a button, and wait for a printed or audible message, or make noise in front of the house: "*The displays seemed part of a puppet theater that households directed*.". Neighbors, both those who were familiar with the neighborhood and those who only irregularly passed by, were stimulated to interact with the displays because of their open-ended functionality and peripheral presence (see Figure 6). In contrast to the *StreetTalk* displays, traditional public displays that one commonly encounters in public spaces seemed more susceptible to criticism and suspicion. This was mainly attributed to the perceived dominant presence of large public displays, and their tendency to communicate information with limited local relevance.

Fig. 6. The open-ended functionality of *StreetTalk* motivated interaction out of leisurely and opportunistic interests (e.g. city workers that were interested in the goals and expectations).

Design considerations. Through their latent presence, situated public displays are capable of eliciting new perspectives onto well-known environments, allowing people to engage both the periphery and the center of their attention. While this is conceptually similar to Calm Technology [25], situated public displays have the particular advantage of being deployed in public spaces, and therefore potentially influencing our overall urban experience, especially by way of:

· Integrating elements of surprise. While a situated public display in itself can be surprising (e.g. appearing in an unexpected place), also its unexpected behavior (e.g. concealing its core functionality) or distribution of hyperlocal content (e.g. distributing little-known local information that may even be provocative) has the potential to encourage citizens towards exploring their environment in unusual, novel and enriching ways.
· Leaving expectations about the display, its functionality and content ambiguous. While motivations for interacting with situated public displays range from leisurely to social grounded, they have the particular ability to support novel urban behaviors. For example, they have proven to be beneficial in motivating and sustaining interaction and engagement towards useful and habitual activities. Such ambiguity positively influences public acceptance and endurance of the display and its content, as people start questioning its purpose as an individual art piece, official communication channel, or community-driven notice board. We feel encouraged to promote this notion, as both *Street Infographics* and *StreetTalk* have both been spared from vandalism, despite their fragile and self-made look-and-feel.

4. Conclusion

Situated public displays should be considered beyond the traditional interpretation of urban technology as a series of tools that make cities 'less complicated' and 'more efficient'. Instead, they should be considered as a promising opportunity that is capable of generating new relations with the urban environment, by building a relationship of trust with citizens, allowing individual interpretations to emerge, and presenting locally relevant information. We investigated the inherent challenges and qualities by visualizing otherwise contested data (*Street Infographics*) and by inviting individual citizens to participate in the design and maintenance of public displays (*StreetTalk*).

Based on our studies, we have presented four sets of design considerations that should be investigated when deploying situated public displays that aim to deliver hyperlocal content. Our analysis focuses on the experience of public displays within the local environment rather than the functionalities, aesthetics or technologies they embody. We argue that, by investigating these considerations during the design process, situated public displays have the potential to positively contribute to the experience of urban space, and contribute to the emergence of 'place', while warranting the appreciation of content by the local community.

We believe our analysis also motivates further reflection on how ordinary, typically unconventional elements of the built environment can fulfill a role as a

public display. This would enable endeavors that go beyond the traditional notion of rectangular and screen-based formats. As a result, instead of continuing the deployment of large-scale, location-agnostic and context-independent public displays, one may well consider embracing existing street furniture as situated carriers for sharing hyperlocal information in urban neighborhoods.

References

1. Struppek, M.: Urban Screens - the Urbane Potential of Public Screens for Interaction, Intelligent Agent 6, 2, (2010)
2. Fatah gen. Schieck, A., Kostakos, V., Penn, A.: Exploring Digital Encounters in the Public Arena, in Shared Encounters, pp. 179-195, Springer London (2010)
3. Fischer, P. T., Hornecker, E.: Urban HCI: Spatial Aspects in the Design of Shared Encounters for Media Facades. In: Proceedings of the Conference on Human Factors in Computing Systems 2012, pp. 307-316. ACM (2012)
4. Memarovic, N., Fatah gen Schieck, A., Kostopoulou, E., Behrens, M., Traunmueller, M.: Moment Machine: Opportunities and Challenges of Posting Situated Snapshots onto Networked Public Displays, in Human-Computer Interaction – Interact 2013, pp. 595-602, Springer Berlin Heidelberg (2013)
5. Shin, D.-H.: Ubiquitous City: Urban Technologies, Urban Infrastructure and Urban Informatics, Journal of Information Science 35, 5, 515-526 (2009)
6. Murty, R. N., Mainland, G., Rose, I., Chowdhury, A. R., Gosain, A., Bers, J., Welsh, M.: Citysense: An Urban-Scale Wireless Sensor Network and Testbed. In: Proceedings of the Conference on Technologies for Homeland Security 2008, pp. 583-588. IEEE (2008)
7. Chourabi, H., Nam, T., Walker, S., Gil-Garcia, J. R., Mellouli, S., Nahon, K., Pardo, T. A., Scholl, H. J.: Understanding Smart Cities: An Integrative Framework. In: Proceedings of the International Conference on System Science 2012, pp. 2289-2297. IEEE (2012)
8. Nam, T., Pardo, T. A.: Conceptualizing Smart City with Dimensions of Technology, People, and Institutions. In: Proceedings of the International Digital Government Research Conference 2011: Digital Government Innovation in Challenging Times, pp. 282-291. ACM (2011)
9. McCarthy, J., Wright, P.: Technology in Place: Dialogics of Technology, Place and Self, in Human-Computer Interaction - Interact 2005, pp. 914-926, Springer (2005)
10. Foth, M.: Handbook of Research on Urban Informatics: The Practice and Promise of the Real-Time City, IGI Global, 2009
11. Paulos, E., Honicky, R., Hooker, B.: Citizen Science: Enabling Participatory Urbanism, in Handbook of Research on Urban Informatics, pp. 414-436, IGI Global (2008)
12. de Certeau, M., Rendall, S.: Arts De Faire, University of California Press, 1988
13. McCullough, M.: Digital Ground: Architecture, Pervasive Computing, and Environmental Knowing, MIT Press, 2004
14. Vande Moere, A., Wouters, N.: The Role of Context in Media Architecture. In: Proceedings of the International Symposium on Pervasive Displays 2012, pp. Article No. 12. ACM (2012)

15. Dourish, P., Bell, G.: The Infrastructure of Experience and the Experience of Infrastructure: Meaning and Structure in Everyday Encounters with Space, Environment and Planning B: Planning and Design 34, 3, 414-430 (2007)
16. Vande Moere, A., Hill, D.: Designing for the Situated and Public Visualization of Urban Data, Journal of Urban Technology 19, 2, 25-46 (2012)
17. Glaser, M.: The New Voices: Hyperlocal Citizen Media Sites Want You (to Write)!, Online Journalism Review, (2004)
18. Hu, Y., Farnham, S. D., Monroy-Hernández, A.: Whoo.Ly: Facilitating Information Seeking for Hyperlocal Communities Using Social Media. In: Proceedings of the Conference on Human Factors in Computing Systems 2013, pp. 3481-3490. ACM (2013)
19. Carter, S., Churchill, E., Denoue, L., Helfman, J., Nelson, L.: Digital Graffiti: Public Annotation of Multimedia Content. In: Proceedings of the Conference on Human Factors in Computing Systems Extended Abstracts 2004, pp. 1207-1210. ACM (2004)
20. Claes, S., Vande Moere, A.: Street Infographics: Raising Awareness of Local Issues through a Situated Urban Visualization. In: Proceedings of the International Symposium on Pervasive Displays 2013, pp. 133-138. ACM (2013)
21. Wouters, N., Huyghe, J., Vande Moere, A.: Streettalk: Participative Design of Situated Public Displays for Urban Neighborhood Interaction. In: Proceedings of the 8th Nordic Conference on Human-Computer Interaction, pp. 747-756. ACM (2014)
22. Bachelard, G.: The Poetics of Space, Beacon Press Boston, 1969
23. Dörk, M., Feng, P., Collins, C., Carpendale, S.: Critical Infovis: Exploring the Politics of Visualization. In: Proceedings of the Conference on Human Factors in Computing Systems Extended Abstracts 2013, pp. 2189-2198. ACM (2013)
24. Sengers, P., Gaver, B.: Staying Open to Interpretation: Engaging Multiple Meanings in Design and Evaluation. In: Proceedings of the Conference on Designing Interactive Systems 2006, pp. 99-108. ACM (2006)
25. Weiser, M., Brown, J. S.: The Coming Age of Calm Technology, in Beyond Calculation, pp. 75-85, Springer (1997)