

Notification in Motion. Theoretical Frameworks and Design Guidelines

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Abstract

The construct of notification in motion is here presented providing a picture of the complex, dynamic, emerging relationships occurring between the individual and the environment. In order to approach the design problem of information load, Peripheral Awareness has been described and contextualized in a theoretical framework. Some methodological approaches and examples related to this paradigm are then presented. Design guidelines for notification in motion are described. The overall picture that should emerge would be an ecological paradigm of human behavior, which could be taken in consideration while designing for notification in motion.

Keywords: Design Theory, Ecological Psychology, Peripheral Awareness, Notification in Motion.

1. Introduction

This contribution is about notification in motion; it draws some guidelines ranging from Ecological Psychology [15], Embodied Cognition [10], and HCI theory. Notification in motion is introduced here as a design paradigm, and described in its theoretical tenets, exploded in design guidelines according to the Third Wave of HCI [5]. The need for making a point about notification in motion comes from the proliferation of mobile technologies and applications that are not sufficiently grounded in HCI theory. In particular there are no clear statements addressing the private/personal space in conjunction with mobility as coordinates. This is a void leaving many questions unsolved. For example the issue of peripheral awareness in the context of notification in motion is largely unexplored, even if it represents a great potential for design purposes. This portion of design is introduced as a system of existing paradigms while being directed to a specific design field, which is to provide clues using mobile devices while the user is moving in the space. This offers tremendous potential but has some specific requirements (e.g. [22]). Peripheral Awareness is only one of the most important, but there are theories that can be isolated with authors like McCarthy & Wright [27][28] Bertelsen [2], Gaver et al. [12], Overbeeke & Wensveen [32]. In particular Schiphorst [35] addresses the dual nature of mobile devices, they are both deploying the information in the environment and address the physicality of the individual. The need for defining the relationship between the individual, the mobile device and the environment as notification in motion has grown out from the peculiar qualities of mobile devices, following the immersion of the individual in the environment and providing situated cues that improve his coupling with the world while following him in his physical movements and activities. In few words, notification in motion has place when the individual is alerting while he moves across the physical space: it can be mobile's ringing, vibration, street signals, ads, semaphores, or other people. The theoretical framework for notification in motion shifts from the desktop metaphor [5] and is deeply entangled with embodied cognition [10]. Indeed the mobile device creates a level of sense for the body and the elements of the environment, making them meaningful. Hence it represents the angle point between the embodied and distributed cognition (e.g. [19]). The embodiment of perceptions across the physicality of the human senses [11], offering to the individual a level of consciousness [8], which increase his knowledge of the surroundings and of himself. The construct of notification in motion is put in relation with the notion of context according to Dourish [11]. This in turn gives the more elements to start from, and further explore the paradigms of Peripheral Awareness [48] and Calm Technologies [47] along with Ambient Information Systems [17] which have some ground in the tacit dimension of Polanyi [33] and find some design guidelines in the paradigm of Embodied Cognition [10]. Hence notification in motion can be: tertiary [2] enchanting [29], affording [32], implicit [33], metonymic [3], unremarkable [41], calm [47], ambiguous [12], multiple [37] sense making [28], and empathic [49].

2. Rationale

Mobile and wearable technologies are modifying humans' interactions with artifacts and are changing the shape and the contents of their relationships with the environment [44]. To design for mobile technologies means to take into account the contextual and peripheral nature of the communication between mobile devices and individuals. The individual, immersed in the environment as an ecological system, puts the interaction with the technology in the background by means of contextual cues that require a limited amount and specific resources of attention. Sensors and wearable technologies, when coupled with mobile notification, constitute a rich medium with many possible applications. Information overload is an issue to face when considering this field. Hazelwood et al. [17] clearly summarize potentials and challenges and present Ambient Information Displays as a possible way to effectively deploy human attention as a finite source: "Current research in pervasive and ubiquitous computing is guiding us to a future where we are surrounded by innumerable information sources all competing for our attention. These information sources may manifest as both novel devices and as devices embedded in common objects, such as refrigerators, automobiles, toys, furniture, clothes, and even our own bodies. While this vision of the future has prompted great advancements in context-aware computing, wireless connectivity, multi-sensor platforms, smart materials, and location-tracking technologies, there is a concern that this proliferation of technology will increasingly overwhelm us with information. Our belief is that information should move seamlessly between the periphery and the center of one's attention, and that good technology should be highly transparent" (p.1). The Gibsonian paradigm of perception in motion is presented here and put in a relative context with notification through mobile phone. Peripheral Awareness is meant to encompass broader expressive potentials in this design space.

3. Humans interacting with mobile technologies

Convergence of media and tools, along with the disruption of contents of communication have been becoming embedded in the daily life, provoking novel ways to experience the environment [40]. The manipulation, the anatomies, the proximity, and the human gestures, are just a few elements occurring in the spheres surrounding the individual while he interacts with mobile technologies. The physicality of the individual shows its urgency, where things such as eyesight and manipulating skills affect the shape and the guidelines of mobile tools. These technologies also require different metaphors than personal computers; they have to embrace the context and at the same time being more essential and intuitive, such as making use of different dexterity of hands. To design for mobile technologies means to take into account the contextual and peripheral nature of the communication between mobile devices and individual. The desktop metaphor requires full attention and no other interaction. Mobile technologies, along with distributed sensing technologies, contribute to providing an augmented experience of the outside, and communication tools provide diverse chances to relate with the external world. Also, mobile technologies fused with social networking are collapsing and giving birth to novel trajectories and genres of sociality, which have still do not have a defined shape (e.g. [1]). At the forefront of the technological potentials of smartphones with sensing and GPS technology, in Human-Computer Interaction (HCI) there has been a rich panorama of literature presenting the opportunities for mobility. The model of situated reasoning provides a view of human cognition which is spread across the different possible artifacts, tools, objects and elements of the environment, and people get help from manipulating the external representations in order to take decisions and be supported in their processes [19]. People can access information that is contextualized to the geographical place and interact contingently with the world. This ongoing situated interaction offers the possibility of creating novel chances for improving the human relationship with the surrounding. Also, the resilient and context sensitive communication opportunities that are available with smartphones increase and push forward new levels of the human sharing of contents, each relating to the other, and the spreading of information.

4. The Gibsonian construct of perception in motion

The work of J.J. Gibson [15] on perception in motion is our starting point for modeling our construct of notification in motion. In his seminal book, “The ecological approach to visual perception”, Gibson introduces a novel approach to the act of perceiving, which is described as an emerging and ongoing activity resulting from motion that continuously modifies the visual perspective, the cognitive processes, the feelings and the previous knowledge, in order to extract the invariants from the environment. This implies a constant co-ordination and mutual feedback between perception and action, body and mind, individuals and environment. These ecological relationships have given the basis for new perspectives on theoretical constructs like practice and affordance [42][31]. Dourish [11] has approached the nature of context with the same ecological perspective; his paradigm is consistent with the Gibsonian one. Context is, under a phenomenological perspective, mutually defined in an emerging and continuous process of interpretation and reinterpretation. Dourish defines context as a relational property occurring between objects in the environment and human activities, as emerging dynamically from this interaction, as having an occasional and contingent nature, and as actively produced, maintained and enacted in the course of the activity. Therefore when people interact with technologies, the context is continually negotiated and redefined. Also, practice is “engaged action with artifacts and information that make those artifacts meaningful and relevant to people” (p.26). The relationship with the context, the individual, and mobile technologies, is hence of the ecological kind. Movements define perception and context is progressively and continuously redefined by human activity. Accordingly the sensory-motor system plays a pivotal role in the apprehension with the environment and the cognitive manipulation of its elements as a knowledge and reasoning tool [20].

5. Peripheral Awareness and notification in motion

Going beyond the discrete zero/one conception of notification, there is a large possibility for using visual, hearing and tactile senses, and it provides scales of stimuli that engage in a dialogue with the user and his/her ongoing behavior. Peripheral awareness is located at the boundaries between the foreground and the background of attention; this area can be as a repository of information that changes and that come to the foreground when it becomes relevant for the individual. Peripheral awareness offers several advantages: it does not irritate, it fuses with the environment, and the user is not distracted from other activities while he can rapidly switch his attention. Mark Weiser has introduced peripheral awareness and calm technologies in the early 90s as design paradigms to manage attention as a finite source. Ambient Information Systems have been using the expression of these tenets, providing context-sensitive data in a non-obtrusive way. Visual displays, auditory but also tactile devices have been adopted in mobility [21], learning [16], GPS based social networking [1], healthcare [39], rehabilitation [43], and sport [38] settings. Tasks execution, physical context, wellbeing, leisure are just few of the possible applications, which can be taken from. The expressive and aesthetic potential of peripheral awareness rises from their implications for attentive processes. Ambiguity, as a device for design, facilitates the perceptual activity of searching for balance and continuity. This in turn can foster aesthetic experience. Aesthetics of Interaction [32] is a relational property between the user and the system emerging from ambiguity by triggering reflection, imagination and sense making.

6. The gestalt cognition

The dynamics implied in notification are also related with the theoretical construct of “Tacit Dimension” of Polanyi [33], which is given by a set of perceptual cues that provide elements for the perceiver to build sense. The Tacit Dimension is made by single elements, which together provide coherent information but cannot be discerned as separate from their whole. These cues remain implicit to perception; through the principles perceptually organizing them, they signify a whole entity that has an arbitrary relationship of sense with them, and emerge in the foreground of the attention when they have a conservative value for the individual. The perceptual cues move between background and foreground in order to enrich the perceived environment with meaningful information. This consciousness interpreted as felt life enfolded through the engagement with the world is simultaneously sensual, emotional and intellectual, and consists in a constructive/creative process in which the self engages with the cues from the environment (the foreground) about the possibility, plausibility, consequences and explanations of the available actions ([27] p.87). The well-known

figure of the Gestalt vase can be an example of this. The perceiver can't avoid switching from seeing either a vase or human profile in the picture. He can't see them at the same time. Two hypotheses rise from this picture: that attention is a discrete phenomenon, and that the foreground and the background of attention mutually define each other. Peripheral Awareness is the area where information is available to become meaningful and therefore to be picked-up. Meaningfulness arises from the personal sphere of the individual (e.g. history, previous knowledge, values, feelings, narratives), and has a complex relationship with the context. Technologies can provide a support in acknowledging this existing, ongoing engagement of the individual manipulating sense while moving among tacit knowledge and affordance in the environment sensed during motion.

7. Design guidelines for notification in motion

Accordingly, notification in motion, by making use of peripheral awareness can become an expressive mean for exploring the potentialities of the cognitive span across the background and the foreground of attention. Following are some possible guidelines in order to frame the design of the experience involving calm technologies for providing peripheral consciousness when crossed with mobility.

7.1. Tertiary

Bertelsen [2] takes the taxonomy of Wartofsky [46] in analyzing the possible functions of the artifacts. Primary artifacts are those allowing a direct apprehension to the environment (e.g. a hammer). Secondary artifacts provide the know-how to make use of primary artifacts (e.g. manuals). Tertiary artifacts are those providing the environment with new sense, and involve new ways of describe the world. Tertiary artifacts modify the way we perceive the world. Notification in motion provides clues affording the manipulation of sense and the connotation of the elements of the environment, thus allowing a synthesis between the states and the personal history of the users and the state of the world. Therefore notification in motion provides novel tools to foster the dialectical relationship of apprehension and sense making between the subject and the world. This in turn produces new knowledge and new conceptions that transcend the existing. This creative process makes the ground for continuously producing novel relationships between the real world and the imaginary world. Therefore the clues of notification in motion can be considered a crystallization of the vision of the designer, trying to diachronically relate to the user, along with the environment, in order to produce new ways to perceive the world. This connotative matching between attribution of sense, personal story, environment and inner life of the individual is characterized by the processes of sense making, which brings, in turn, the unfolding of consciousness. This reflexive stance is homologous to artistic enquiry, when the perceiver interrogates a tertiary artifact making it resonate throughout his own senses and history. The designer provides the user with elements for unpredictable gestalt matching that create finite visions filling the gaps with his own cognitive and historical resources. This is basically a culturally mediating operation while providing a mean for the designer and the user to communicate in an on a phenomenological level in order to reframe the existing. Accordingly, Activity Theory has an exquisite materialization in the theory of tertiary artifacts. Artistic enquiry and creative hermeneutics are materialized into artifacts allowing poetic manipulation of sense and imaginative interpretation into the contingency. From the Pragmatics Aesthetics perspective [27] meaning emerges form a dialectical experience of the individual with the artifact, which embodies socio-historical instances that resonate on the personal history and sensibility of the user in order to trigger new meanings, feelings, imagination, and the aesthetic experience as an engaging, ongoing result. In this sense Bertelsen [2] correctly indicates Human-Computer Interaction as an aesthetic discipline. And in this context, notification in motion can be framed as an expressive tool to realize tertiary artifacts as a crystallization of culture, visions and perception of the designer in order to provoke emerging possible worlds from the user by means of the co-occurring coupling with the world and its recreation through artistic enquiry.

7.2. Enchanting

McCarthy et al. [29] make the point on a state of mind they name as enchantment. “We view enchantment as an experience of being caught up and carried away, in which, although we are disoriented, perception and attention are heightened to the extent that it awakens us to wonder and to the wonder of life, it is enlivening” ([29] p.370). Starting from the sensuousness of the apprehension with the world [27], properties like vagueness, mystery, ambiguity, and irreducibility, provide a close, intimate coupling with the elements of the environment, and that in turn provokes a pleasure of a whole (gestaltic) experience of constructing knowledge by giving a coherent sense to the elements of the existing with past feelings, cognition and thought. Accordingly, a possible point can be the translating of the ordinary to the extraordinary, the creating of a sense of attachment from the pleasure of this sensory experience, which is continuous, irreducible, and unfinished. Other elements of this state of mind the authors put the accent on is the syncretism of the sensual with the affective, the emotional, and the cognitive as creating depth for a unique, whole experience of enchantment which continuously reproduces itself, in the sense that the individual knows that he can only obtain provisional results, that this experience of knowledge can never be considered definitive and that cultural and historical variations will continuously expand the experience at different times and places. This quality is obtained through ambiguity, contradiction, paradoxes, surprise, and wonder. Notification in motion can validate the use of enchantment as a device for obtaining a gestalt, sensuous aesthetic experience of augmentation. The personal qualities of the individual are put at stake, providing the substrate for enchantment. “Enchantment engages with the whole intellectual, emotional, and sensual person, acknowledging and recognizing their anxieties and aspirations” ([29] p.373). Playfulness as a device for knowledge is as important as the same. “Enchanting is playful, engaging with each object as both a means and ends and exploring its qualities and the possible descriptions of it” (p.373). Paradox, openness and ambiguity are the connectives fostering enchantment (p.373). Finally, transformation is a crucial process and a continuous result of enchantment. The sensuous, irreducible, playful, coupling with the world transforms the individual and the environment through human experience. Notification in motion is a possible chance to plan enchantment as a frame of mind, trying to enquire of the user with possible connotations of the environment and providing heterogeneous elements, building blocks of a whole, unique, novel experience with the real.

7.3 Affording

Starting from affordance and perception in action, as emerging qualities of interaction, we borrow the quality of being “*irresistible*” for an artifact. Overbeeke & Wensveen [32] thought about physical interfaces when isolating this state of mind. “Interfaces should be surprising, seductive, smart, rewarding, tempting, ever moody, and thereby exhilarating to use. The interaction with the product should contribute to the overall pleasure found in the function of the product itself” ([32] p.94). They present as an example an alarm clock that can be manipulated during the times of sleeping and arousing, in order to produce personalized patterns for the design space/time of awakening. Affordances (both physical and related to notification over the context) involve not only perceptual and motor, but also emotional and cognitive skills. “By emotionally rich interaction [the individual] understands interaction that heavily relies on emotion expressed through behavior” (p.94).

7.4 Implicit

This paragraph is about implicit motor instruction and its benefits for physical activity and rehabilitation. Basically implicit learning appears to be more effective than explicit, or declarative, ones [45]. Both of them are involved in motor learning, especially if adopted concurrently. Declarative knowledge affects the conscious experience and can be recalled for recollection. It affects the high-level cognition. It can be useful for complex rules and articulate information. However explicit knowledge can be ineffective or even obtrusive for motor learning. On the contrary, implicit (procedural) learning is tightly related to physical practice and “is not directly accessible to conscious recollection of facts or data. The development of procedural knowledge occurs incrementally, and with practice, over a period of time and exposure” ([45] p.146). Implicit knowledge, with its inaccessibility to the conscious sphere of the individual and its related strengths for motor acquisition, make it result as an effective design agenda for situated cues while the individual is immersed in the environment. By using the peripheral resources of attention, the human implicit elaboration of information, the gestalt

stance as an automatic reflection of integration and appropriation motivates the notational cues in motion as a design space with potentialities for supporting motor cognition.

7.5 Metonymic

Analyzing the practices of two musicians operating with electronic equipment and their ways to engage creatively with them, Bertelsen, Breinbjerg & Pold [3] make the point on some design guidelines that can be adopted in order to better support computer mediated inventiveness. While metaphor operates with substitution, metonymy works by isolating a quality of the domain and presenting the first for the second with a device stressing the contiguity of the semantic space. Metonymy is more resilient than metaphor and therefore is prone to be stretched and adapted to more of the possible actions. “Metaphors have been successful but also problematic in the sense that a good metaphor closes the software and locks users unless they are creative people who feel stimulated and provoked to try to break a too perfect metaphor. [...] Especially when making software for creativity, the metonymic possibilities as argued become important for inspiration, for finding original artistic solutions, precision and atmosphere, and for the pleasurable playability of the software” ([3] p.240). Bertelsen, Breinbjerg & Pold therefore make the point on these possible qualities of tertiary artifacts and the expressive potential of metonymy. In particular, it fosters the dialectic relationship between the subject and the notification as a crystallization of the designer intention, given to the world with an overall emerging result.

7.6 Unremarkable

What does it make technology invisible to use mean? Tolmie et al. [41] isolate a quality of calm technology, which is to deploy one's routines, preferences, emotions and places in order to embody implicit knowledge in the artifacts. They describe some observations in the domestic and work settings, for example that a knock on the door can be a prompt to meet someone outside according to a previously fixed appointment. Their ethnographic analysis states how routines are already embedded in the existing tools and activities and in the context of people's own life. In many cases, the existence of notification provides knowledge, trigger activities, and facilitate coordination. The authors make explicit reference to Weiser's Calm Technologies. “Many routines [...] are nodal occurrences that are implicative for things that follow” ([41] p.405). Their plea is for “recognizing the suitable character of often complex yet unremarkable, details that surround our everyday routines and place powerful requirements on any technology that might become embedded in such activities” (p.406). Unremarkable computing, as a design quality, lies in the same area of notification in motion, with its issues of implicit knowledge, peripheral awareness and centrality of the context. Routines are “mutually available and mutually accountable for those involved [...]”. In this way, artifacts that are implicated in routines can be perceptually available yet practically invisible to use” (ibid. p.402). Also, the authors underline the “user semantics” implicated in this part of HCI theory. “User semantics is [...] what the user makes of the computational resources (primitives, combinations, constraints etc.), and includes any accounts or representation the computational systems gives of itself” (p.405). Notification in motion can have different meanings across the routines, the physical space and the times of the day. Notification in motion takes sense from the people using it and their relationships and environment. Often the knowledge shared among familiars (or friends), their routines, contexts, preferences, and places allow fine grain levels of knowledge associated with unremarkable notifications while fostering coordination and mutually tacit understanding (p.401). Even a small cue can embody contextual and relational elements of sense, so that it is progressively embedded in daily life, and becomes part of the personal history of the individual. Finally, unremarkable computing takes a very positive shade while associating it with mobility. Tacit knowledge in motion can be a prolific design paradigm while creating relationships among people, their routines, places, emotions, timetables, and working, family and leisure times. And this point is particularly important for the role that can have notification in motion for social networking, especially if based on location.

7.7 Calm

Calm [48][47] is a quality related to the periphery of attention. Something at the boundaries between the foreground and the background, moving between the two and extending the capability of attention, and therefore bringing a feeling of control and awareness of the environment. Periphery is the place where clues from the environment are available to be picked up according to their changes and to the modification of the related events. This in turn produces a calming effect, for the individual gain control over the environment with this. Employing peripheral awareness therefore means to increase the bandwidth of awareness, but it gives also the pleasing and calming feeling of being into one's own things while remaining attuned to the environment. Any solution for increasing peripheral awareness of the physical space, of one's own interests, people, or feelings, can trigger pleasurable effects, particularly if created with an explicit poetic stance. Calm technologies can be considered a cognitive but also an expressive device, and their potential is far from having been completely explored, in particular by means of multidisciplinary approaches that could research on this design space overlapping between psychology of perception, ecological psychology, artistic inquiry, poetry and ICT.

7.8 Ambiguous

Notification in motion can take great expressive power by enhancing ambiguity into the system individual/context/device. Many variables are at stake, therefore to play with unexpected and unusual combinations of the different sources of information can trigger interpretation and sense making by allowing connotative processes of thought. The result should be a set of novel and creative ways to construct the real. Gaver, Beaver & Benford [12] state clearly and in depth the potentials of ambiguity, bringing taxonomies, examples and methods for producing this device as a cognitive source for producing and manipulating sense. They put the accent on the aesthetic stance ambiguity offers, and mark the bias between the needs of coherence in work or safety critical contexts and the private life. Also attachment is a further result of ambiguity: the constructive processes which give combinations of memories, clues, environment and feelings, developing intimate connections into the system made by the individual, the environment and the level of technology, therefore producing personal combinations that become part of the individual's history. Here the accent is put on the chief gestalt processes of interpretation that ambiguity brings with it. The perceiver has to make choices in order to extract coherence from what is offered to his senses, therefore "[...] has to find a conceptual focus, which harmonizes all the elements" ([12] p.3). The aesthetic value is also enriched by a tone of bewildering which can have a precise poetic purpose. So, ambiguity is "evocative rather than didactic and mysterious rather than obvious". Further, ambiguity, by allowing interpretations and reinterpretations can also bring the connotative processes to a re-appropriation, which is *co-optation* [24] of a system for new uses. As a conclusion for ambiguity, it can be said that it comprehends a set of ways to make the user conscious of the processes of apprehension with the world, and this ongoing coupling, embodying breakdown in its declared intentions has a functional meaning, which therefore brings a reflexive stance from the designer to the user.

7.9 Multiple

Sengers & Gaver [37] offer a slightly different perspective from ambiguity. It is a design agenda describing the quality of a system to fuse with the context of use and providing multiple possibilities of interpretation. The authors bring, between the others, the example of mobile phone text messages that can be used for prompt communication in the work setting as a tool for teen-agers to get in touch with the peers. Here, multiplicity is offered as a design guideline which is prone to be explored, while bringing values already described here, like: appropriation, sense making, new attributions of meaning, and situated semiotics. In the same way as ambiguity, multiplicity can inspire tools to be imbued with sense from the user and have new roles in his surrounding environment according to the theory of the *ratchet effect* and being an element of his *ecological niche* [42]. Finally multiplicity, different from ambiguity, has the virtue of potentially embracing complex settings and providing a wide range of contextually sensitive information, which can be effective in some areas of safety critical environment systems.

7.10 Sense making

Pre-reflectively sense making, having place through emotions as the result of the dialogical relationship of the individual with technology and environment is proposed by McCarthy & Wright [28] as a design agenda of HCI as the paradigm of felt-life. Emotions, as an event grounded on the physicality of the individual [8] trigger attunement and, secondly, the ability to sort the overall information from the outside, take conservative choices, prioritize goals, evaluate risks, advance failures, and act cogently. McCarthy & Wright [28] provide a model according to which consciousness reproduces itself by the apprehension with the environment. Emotions direct us toward what understanding goals mean to users in terms of their ongoing relationships with the system and related object and activities. They direct us toward what users construe as valuable and important to them ([28] p.246). Emotions are therefore addressed as cognitive devices to evaluate chances and take action. Notification in motion, while making use of the peripheral cues, with its non-invasive role fuses with the individual's perception. The human being and the devices are both surrounded by the environment, which is filtered through the senses and mediated by the device. Hence notification in motion can take great expressive potential by triggering the dimension of felt-life.

7.11 Emphatic

To design means to leave one's stereotypes in order to relate with the irreducibility of the users and enter in a dialogic frame of mind, which is made of guessing, enquiring, identifying, playing, and with an emphatic movement towards them. Empathy as a quality of the design process [49] makes use of the reflexivity of the enquirer. Empathy, as a cognitive/reflexive device, involves the designer in all his humanity. Several HCI methodologies are described in this setting; each addressing the different facets empathy can take. Empathy as a driving propeller of design can take source from participant observation, with accents on practice, experience, and the socio-cultural framework: "For many ethnographers, understanding what members of another culture experience as they go about their daily activities requires embodied, intellectual participation in those activities, conversation with the members of the culture about the activities and what they mean to them, and an expression of what they feels like and means in a way that has integrity for the members and communicates the experience to others' ([49] pp.639-640). The authors also name mainly HCI grounded methodologies for qualitative studies like the Technology Biographies [4] and the cultural probes [13]. They describe the artistic work of Jayne Wallace, seeking with an emphatic engagement through which "she gains a sense of the felt-life of that person, their personal meaning, making aesthetic values, and material fragments and objects that have come to be important to them" ([49] p.64). Narrative methods like personas (e.g. [30]) or scenarios (e.g. [34]) imply the reflective work of writing, while triggering "dialogue, sympathy, identification and empathy' ([49] p.642). Finally role-playing and empathic design make levers on the personal experience of the designer as a way to access the felt life of people as a rich, complex and largely inaccessible inner world. The motivation of including empathy in this categorization lies more in its general effectiveness in the design processes rather than a specific addressing to notification in motion. Anyway to design for personal experience, private context, or embodiment means a stronger focus on the inner life of the individual and his cultural context, shaping his feelings, perception and choices.

8. Conclusions

From the described guidelines it follows that notification in motion requires novel sensibilities for making design. Mobile phones and smartphones can be considered as companions of life, and to design for them means not only taking in account their being used in motion, but also their being entangled with the private life, the intimacy, the relationships and the feelings of the individual. Also relevant are the perceptive requirements for the design of the mobiles. The lesson of Gibson teaches us that notification in motion has distinct requirements and frees novel opportunities for design. But it is not only a matter of effectiveness and good design. Mobility can be deployed also in its expressive features. Ambiguity, sense making, poetic stances can offer new ways to feel the environment as imbued with human traces. Therefore mobile HCI can take a role into build tools for novel ways to shape consciousness, and inventing new forms of being into the world.

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