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## Reconsidering HCI in the Age of Social, Ubiquitous and Domestic Computing

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**Abstract.** Human Computer Interaction has been largely focused on the design, implementation and evaluation of productivity software. Yet many recent ‘killer apps’ are not about productivity, but arise from an amorphous area somewhat characterized as social, ubiquitous and / or domestic computing. The problem is that the methods developed within HCI do not fit this new genre. We need to develop new ways to do requirements analysis, design, and evaluation. We need new generations of tools and infrastructures to create and deploy unorthodox systems and interaction techniques. A first step is to achieve this is by reflecting on the practices used in the (relatively few) successes we have had in social, ubiquitous and domestic computing.

Over the last several decades, the discipline of Human Computer Interaction (HCI) largely focused on the design, implementation and evaluation of *task-oriented productivity software*. This software genre tends to be task, work and/or business oriented, where people use it to achieve well-defined goals for particular purposes. HCI has been largely successful at addressing these kinds of systems, with much of its lore having moved from academia into practice. Examples include (but are not limited to):

- desktop computing for *personal information creation and management* (e.g., word processing, accounting, presentation preparation)
- *browsing and searching systems* that allow people to discover and locate products (e.g., eBay, Amazon, digital libraries) or make sense of related information (e.g., information visualization);
- *transactions-oriented systems* that are part of the underlying business model of many web sites (virtually all web-based storefronts fit here);
- *supervisory control systems* where operators monitor and control a semi-automated process (e.g., pipeline and power plant control);
- *selection systems* where people choose from a set of options (e.g., item selection from menus, list selection such as music selection on an mp3 player);
- *information specification* where people fill in information required by some process (e.g., online tax forms);

Yet things are changing dramatically. In the last 10 years, many of our ‘killer apps’ are *not* in the domain of productivity software. Rather, they fall within an amorphous area somewhat characterized as social, ubiquitous and / or domestic com-

puting. These include things like instant messaging, music sharing, physical and domestic appliances, ambient displays, information appliances, personal communicators, blogs, wikis, and so on. They typically share one or more of the following properties.

- They are *socially-oriented*, where they promote interaction between either a small group of intimates or a larger group of people motivated by a common agenda [19,6].
- They are situated within our *everyday world*, where they exploit the everyday routines, behaviors and relationships of people [6,10].
- They are *cultural artifacts*, where their power derives primarily by how people have constructed a world of meaning and practice around its use [8].
- They are *emotional products*; while they must function well enough for people to actually accomplish their interactions, their appeal depends largely on people's visceral reactions to them (e.g., form and content), and how they can reflect over their use of it [18].
- They may have *tangible properties*, where they attempt to bridge information and interaction between the physical and electronic realm [13,6].
- Their use is *discretionary*; people elect to interact with these products because they want to (perhaps as an impromptu response to events in their current situation) rather than because they have to.
- They are *ubiquitously available*, where people can interact with them anywhere, anytime, and usually in a very lightweight manner; little setup is required and they are often device-independent [20].

In contrast to traditional HCI practices, we are poorly equipped to handle this new genre of computing. Several issues are outlined below.

**Requirements analysis and specification.** For productivity software, there are now many practical methods that help designers uncover and articulate the basic processes behind people's tasks, [e.g., 3,5]. Yet these methods are ill-equipped to help us define the requirements behind our new systems. First, we are seeing new cultural practices emerge that, by definition, are difficult to define *a priori*. Second, while there are methods that help us articulate existing cultural practices that can perhaps be supported by software (e.g., contextual inquiry [2], ethnographies [7]), they tend to be expensive and difficult to translate into design [7].

**Design.** There is a myriad of 'how-to' books describing basic aspects of GUI and Web design for productivity systems [e.g.,14,16]. While there are several books within the HCI world for (say) emotional products [18], information appliances [1], and social on-line communities [19], they mostly provide an intellectual argument for these kinds of systems rather than a practitioner's guide for how to actually build them well. While other fields (e.g., Industrial Design) do know something about particular niche areas, their work is largely unknown to HCI.

**Tools.** We have excellent tools for building GUIs and web-based systems. Yet they do not suffice for our new generation of products. This stifles creativity [11]. For example, building tangible user interfaces was, until fairly recently, the domain of

electrical engineers and a few select groups. While new products such as Phidgets ([www.phidgets.com](http://www.phidgets.com)) [12] now make tangible design possible for ‘the rest of us’, they are still primarily oriented towards prototyping rather than production. The same argument applies to other domains within social, ubiquitous and domestic computing.

**Interaction Techniques.** We see a plethora of academic articles in venues such as the ACM CHI conference concerned with fine-tuning interaction techniques, with the goal of making people slightly more efficient when doing repetitive low-level actions. For example, there are many papers now concerned with improving people’s target selection accuracy and speed within GUIs. Yet interaction techniques for our new generation of devices are largely exploratory, with very little systematic study of how people can efficiently interact with these new devices.

**Infrastructure.** Productivity software has largely exploited our existing infrastructures: the desktop computer as the ubiquitous input/output machine, and the Internet as a delivery network. While the same is true of some of our new products (e.g., blogs), others demand more resilience than conventional infrastructures can supply: easy wireless access, ad hoc networking, cross-device access, within-home networks, rapid device discovery, contextual information delivery, sensor networks, and so on.

**Evaluation.** Many well-established usability engineering methods help practitioners uncover design flaws and usability bugs as people do their tasks [e.g., 9,17]. Yet these are inadequate for our new products. It is hard to measure how people do things when what they do is discretionary and occasional. It is difficult to evaluate products in the laboratory when their use depends on every day situations and practices. It is tricky to assume how products will be used when their actual uses evolve as a cultural practice over time [8]. It is challenging to know if people will begin to use something if its primary appeal is emotional and visceral.

As a community, we cannot play a strong role in the development of social, ubiquitous and domestic computing until we recognize limitations in our existing processes, and reflect on alternate methods that better fit this new genre. Fortunately this is now happening, albeit in a relatively isolated way. For example, challenges to existing methodologies are now appearing [e.g., 7]. Many people are developing and applying new methods to particular product niches, such information coordination within the home [4,10,15]. We can reflect on these and other successes, and perhaps create new processes that move into this exciting new age of Human Computer Interaction.

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