Integration 

integration

An integrated world

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Like a rock dropped into a pond, a successful new technology creates an immediate splash, but its ripples continue to affect the pond long after the initial splash. And the effects are often felt in unpredictable ways.

The electric motor created such ripples. First, it enabled a technological revolution in domestic life by automating difficult, labor-intensive activities like washing clothes and mixing dough. Then, as the motor's waves spread throughout the household, engineers and designers created entirely new tools, such as the refrigerator and the vacuum cleaner, tools that did things that no previous device or method were ever able to do, such as keeping food fresh year-round and removing dust from all surfaces. However, technological ripples are unexpected. People's expectations for their home, and for each other, changed in response to the possibilities. Their definition of 'fresh' changed; their expectation for 'clean' changed. Society changed.

Much as electric motors paved the way for the invention of life-transforming appliances, computers and networks allow today's designers to reinvent and re-imagine the ways people do things. Smaller electronic components, wireless communication, and new display technologies create new seas of possibility. The mobile phone boom of the 90s demonstrated that computers do much more than simply replace calculators, typewriters, and interoffice memos. The cellular phone isn't just a cordless version of the old wired phone. It's a specialized computer. It has changed the way society communicates by enabling drastically different patterns of use. But it's just the first splash of specialized, embedded computing. The many ripples of this new revolution are only now taking form.

Two new fields, *ubiquitous computing* and *interaction design,* are guiding this revolution. *Ubiquitous computing*, a term coined by scientist Marc Weiser, is a way of thinking about this complicated relationship between society, computers, information, and design. Specifically, ubiquitous computing refers to the philosophy that computers and networks used in everyday objects should make life easier, not create extra work. Instead of creating computer-based tools that requires extra learning and new ways of working, ubiquitous computing treats information as a design material like metal, plastic, and glass, so it is naturally included in the product, extending and supporting our activities.

The new field of *interaction design* fuses social research with industrial design to understand how people accomplish tasks and then create tools that match. Coupled with the possibilities of ubiquitous computing, interaction design allows designers to envision a

new generation of tools and environments. For example, when designers applied specialized computers and networks to the process of recording television shows, the digital personal video recorder was born. These devices are much easier to use than videocassette recorders because computers, which are very good at organizing and structuring information, now retrieve and manage schedules rather than requiring users to do so. The users of PVRs can focus on watching their favorite shows, rather than making schedules and programming their VCRs. The goal of ubiquitous computing and interaction design is to use well-placed software assistance to help people live their lives without distraction from their tools.

We are just on the edge of the splash, but a new vision of technology is becoming a reality, and the patterns of home life are already changing accordingly. Mobile phones, Blackberries, and laptops blur the line between home, work, and entertainment. For homemakers who have grown up with computers, the living room workstation is a sophisticated household communication and management system, not a technical toy. Their kids – today's teenagers – are some of the most enthusiastic users of new technologies. Teenagers' lives no longer just exist in the school, at home, or down at the town square or mall; instead, teens socialize over mobile phones, blogs, instant messaging, and online games. Their lives are based on what scientist Linda Stone calls *continual partial attention*, meaning that they're natives in an adaptable, personalized world of overlapping media. For teenagers, life in a rapidly changing information environment is as natural as breathing. Ubiquitous computing matches their need to stitch the pieces of their world together with communication and information. As with the electric motor, the capabilities of these technologies reach beyond automation or creating new chores, and are changing how people think about their lives and each other.

In the home, these shifts in the way people communicate impact the roles of the rooms themselves, especially the living room, the dining room, and the kitchen (the domains a typical family shares most). By introducing information processing technologies into everyday objects, the home becomes an integrated, dynamic environment. From hour to hour and from person to person, surroundings can be personalized support each individual's habits, expectations, and needs. For example, as busy schedules pull household members away from the traditional shared meal at the dinner table, sets of smaller, highly specialized meals become the norm. And as people personalize their diets with functional foods, convenience foods, and nutraceuticals, their relationship to the kitchen changes. Likewise, as media choices and socializing options multiply, living rooms provide a site for multiple simultaneous activities. As a result, privacy becomes an issue, while at the same time it becomes more important to schedule activities that involve the whole family.

All these factors and possibilities point to a household family structure that is swiftly flying apart in pursuit of individual interests, thereby creating a growing need for mutual experiences. Making and eating a meal together, watching a movie as a family, or even doing dishes by hand with a loved one become rare and cherished moments. Tailoring technology for this kind of environment is a particular challenge. Designers must be aware of the unexpected ripples that major shifts in technology can create, and remember that while the electric motor made washing clothes and cleaning floors easier, it created the expectation that clothes and carpets would be cleaner than ever before, and that a single person would be able to do all the housework by herself. In many cases, the expectations created by yesterday's laborsaving devices created as much work as they replaced. Today's technology designers don't want to repeat this mistake. They want to use technology only when it's needed, and only when it doesn't require significant additional labor. And they want to do more than simply automate tasks, they want to use technology to support people's goals and create new possibilities in their lives.

Ubiquitous computing, interaction design, and life-pattern research are the cornerstones of the future of home-environment design. These new environments will be flexible and individualized, allowing people to coexist side-by-side or fully integrate together, letting them live their lives the way they want, when they want to.