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Introduction to the Special Issue on "ICT in Everyday Life: Home and Personal Environments"

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Although nobody can pinpoint exactly the date when the first computer entered the home, it is safe to say that the current diffusion cycle can be traced back to the early 1980s. The first 10 to 15 years might be described as a period of anticipation as well as one of development in fits and starts. But the next decade appears to be one of greater promise. That the Internet is at the center of this qualitative change should come as no surprise (Hoffman et al., 2004). More importantly, researchers have recognized two sets of forces that are worthy of consideration when examining information and communication technology (ICT) at home. First, there is the recognition that the household is a rather complex social system, and standard theories of diffusion and adoption may not fully explain household adoption behaviors. One needs to go into the dynamics of household structure, the generational and gender issues, and the network of activities within the household as well as those external to it. Thus we need well-informed analytical schemes that shed light on household use patterns. Second, the producers of technology have come to the realization that technologies for the household cannot be mere modifications or less advanced versions of products designed for industrial use, but should be tailored to the needs of the family. This special issue seeks to understand how these factors will shape the adoption and use of ICT in home and personal environments.

Before we go into the specific themes that are captured in this special issue, some preliminary thoughts are in order.

First, on a theoretical level, the exclusive focus on adoption in the standard diffusion theory is limiting because in the case of complex technologies, the reasons for adoption of new technologies are not necessarily the same as patterns of ultimate or actual use (Shih & Venkatesh, 2004). In addition, the standard questions in diffusion theory refer to adoption patterns in a given population, the profiles of adopters, and the reasons for adoption. While they yield some interesting insights, they say very little about usage patterns and user experiences, for it is the ensuing use dynamics that are foundational for understanding the household-technology landscape. Since this necessarily implies the availability of hard data and empirical evidence, we can say with some confidence that such data are indeed available now and we are able to discern some trends and gain valuable insights.

Second, as technologies are integrated into family life, we can affirm that there is an underlying process of "domestication," a term that can be applied uniquely to the home setting. The process of domestication involves a sustained use of technology for managing various household activities by different actors. One consequence of this is that patterns of use change as families transition from one life-cycle stage to the other. In addition, there are both gender and generational dynamics. For example, in households where women are present, typically, they act as managers of the household and become the primary users of computers at home. A second development in the context of the household is the intense involvement of children as users of new technologies, a development that was unforeseen about 15 years ago. An important outcome of this is that children are not only the primary users, but are also the experts in the technology game.

Finally, a new dimension is introduced by a totally different paradigm that regards the home as an intelligent environment. The industry focus attempts to exploit this perspective in as much as it presents opportunities for introducing new technologies into the home.

We next describe the contributions to the special issue under three themes: household use patterns, children as agents of change, and home as living space.

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HOUSEHOLD USE PATTERNS

Although the notion of domestication and domesticity can be traced to the early work of Catherine Beecher (1840) in her seminal *A Treatise on Domestic Economy*, it has been resurfacing again and again throughout the last century in various contexts concerning home management. In the context of technology in the home, some early discussion can be found in the writings of Ogburn and Nimkoff (1955), who undertook one of the first systematic studies of the impact of modern technology on domestic life. Using a panel of experts, they identified eight major familial changes that had occurred in the decade prior to their study. The changes were: a growing emphasis on romance, earlier marriages, smaller families, fewer functions for the family, increasing proportion of working wives, diminished parental authority, child-centered family orientation, and a greater incidence of marital separation and divorce. These changes were then traced back to specific technological innovations. For example, the weakening of kinship ties in the modern family is presumed to be the result of rural–urban migration, leading to spatial as well as a psychological separation among household members. However, according to Ogburn and Nimkoff, such migration was possible only because of the innovations in transportation, that is, the automobile.

In this special issue, Leslie Haddon, a leading European researcher, provides a comprehensive review of domestication research in the context of new media and technologies and outlines a research agenda for this line of research. Similar to the just cited work by Ogburn and Nimkoff on automobile diffusion and its impact on home life, Silverstone and Hirsch (1992) undertook a social analysis of home computing and new media in an edited volume to which Haddon (1992) also contributed. In his article in this special issue, Haddon first provides a historical account of domestication work with reference to ICT starting from the early 1990s. Of particular interest to the readers will be his analysis of "social shaping of technology and domestication traditions." He highlights his analysis with a number of examples that future researchers may wish to take note of. Reminding us how developed European thinking is on domestication issues concerning new technologies and the lead taken by European scholars, he covers a wide range of topics, including the world of commerce. The examples provided by the author are particularly noteworthy.

A question that often arises in the context of home computing is, how can we predict computer use and what variables will be most useful in such a prediction process? The diffusion theory would suggest that new technologies will diffuse based on user innovation characteristics. In the current issue, Brown et al. argue that the best predictor of computer use is the attitudinal belief structure. From a theoretical and practical point of view, what this means is that positive attitudes are linked to positive behaviors. The authors come up with the notion of belief structures as the basis for their analytical position. The context of their work is household life cycle, which has not been used in the literature as effectively as the authors have done. This certainly adds to the richness of their analysis and introduces a new context for studying use diffusion within the household.

One of the central and persisting themes in the literature on computing is related to gender issues, and this becomes even more critical in the context of family life where women manage various household activities. The article by Ruby Dholakia is a systematic attempt to address these issues. Using Pew data primarily, she demonstrates not only that over the years the gender divide has narrowed, but that more recent statistics show that there has been a reversal in usage patterns at home, with women accounting for greater use—in terms of both the hours spent on the computer and the variety of applications. Thus we have an example of both domestication and feminization of computing in the home occurring simultaneously. This new dynamic is a significant development and worthy of further exploration cross-culturally and cross-nationally. Clearly, the policy implications are that as new technologies are introduced into the home and in families where both genders are present, the key users may not be male but rather the female heads of the household.

CHILDREN AS AGENTS OF CHANGE

It is now a well-established fact that children, or the younger users, are the true innovators of technologies. Children in a technological environment have traditionally been viewed as passive participants; since children are adults-in-the-making and not quite ready to make important decisions in life, it was assumed that they would need much guidance in the use of technologies from adults. However, the technological reality took a different turn and in many instances proved to be quite the reverse. Much research in this area shows that children are truly at the helm when it comes to technology use and are indeed shaping technology while technology is also shaping them. In fact, with little exaggeration, one can say that this is the first time in the history of modernity that children have outperformed adults in their use of advanced technology. Since it is the first time that we are seeing children with more technological savvy than the average adult, the lessons from history are not much help here. For example, in the case of TV watching at home, children's use of TV was regulated by their parents, for they would decide which programs were appropriate and how long their children should be allowed to watch. If there were any technologies where children were given a free hand to gain a certain level of

mastery, they were mainly game related, and children were supposed to outgrow them as they approached adulthood. Who thought that children would be the ones to gain mastery over computers and would end up teaching the adults a lesson or two?

In a series of articles spanning the last few years, Sonia Livingstone has produced an impressive body of research that provides numerous insights into involvement of children with new media and the Internet. In this issue, she discusses a range of possibilities concerning children's "engagement, interactivity, and participation" at micro and macro levels, with particular reference to the context of the home. Drawing on her recent research project, *UK Children Go Online* (Livingstone & Bober, 2005), her approach is one of integrating the technological, social, and political and economic factors while locating information and communication technologies in the social context. The lessons learned from this study are numerous, but in particular our attention is drawn to the use of technologies by children and parents and how the comparisons reveal their relative skill levels, usage patterns, and different kinds of engagement under different conditions of family structure and life. Of additional interest to readers will be gender differences among young users.

HOME AS LIVING SPACE

In our earlier work, we proposed the notion of home as a living space in which technologies are embedded (Venkatesh et al., 2003). We argued that the living space can be conceptualized at three levels: the physical space, the social space, and the technological space. The social space includes the members of the family, their interaction patterns, and the relationship between them. The physical space refers to the configuration of the living area—its layout, size, and other material and architectural properties. The physical space has both a functional and symbolic value. The technological space refers to the density of technologies in the home, the deployment of different technologies for home management, entertainment, and other activities. The greater the density of technologies, the greater is the dependence on them; one can say therefore that the greater the density, the greater are the application possibilities. The living space has to be considered as an intersection point for these subcategories of spaces. In positioning the web-TV, Lee (2000) found some interesting conflicting situations between these spatial categories in the placement and use of technologies. Similarly, Salazar (2001) found that social boundaries are established around the living space concept in the use of computer in the home. We also found that the very placement of computers in the home was a challenging decision for some households. When trying to identify where the computer was located in the home, our study revealed a wide range of possibilities (Table 1), indicating a certain ambivalence in the living space.

TABLE 1
Location of the computer in the home ($n = 972$)

Location	Frequency	%
Family room	119	11
Living room	132	15
Kitchen	33	4
Den/recreation	149	16
Bedroom (adult)	149	16
Bedroom (child)	79	9
Home office	268	29
Near dining area	43	9

Using the living space concept, we can study the introduction of computers in historical terms. Although it is a short history—less than 25 years—the lessons are instructive. We divide the preceding quarter century into four periods: the Pre-Internet period (1980s–early 1990s), the Early Internet period (mid 1990s–1999), the Internet period (2000–2005), and the Post Internet period (2006+). This is sketched out in Table 2. Our main argument is that

TABLE 2
Home as living space: Readiness and evolution of social, physical, and technological spaces and ICT in the home

	Social space	Physical space	Technological space	Comment
Pre-Internet Period, 1980s to mid 1990s	Low	Low	Marginal	Computerization of the domestic • First attempts • Much promise, low impact
Early Internet Period, (mid-1990s–1999)	Marginal	Marginal	Marginal +	Domestication of the computer
Internet Period, 2000–2005	Marginal +	Marginal	High	Beginnings of the virtualization of the home
Post Internet Period, 2006+	High	High	Intense/high	Home ripe for digitalization

the Pre-Internet period was a period of slow growth mainly attributable to the low readiness or limitations of the social, physical, and technological spaces to accommodate new technologies that were coming into the home. Progressively, this has changed, and in the period designated as 2006+, the living space has become very receptive to new technologies. In the course of the last 20 years, the user experiences have advanced and the technology is no longer a novelty. Thus the social space has become much more receptive. There is greater acceptance of new technologies, which means that the technological landscape is changing quite dramatically. This is what Kirsh (2006) refers to as the artifact evolution. That is, what has occurred in this process is the *coevolution* of the artifacts and the users, a very important condition for the diffusion of technologies.

From computers to smart homes might appear to be a logical progression, but it can also be a leap of faith. The general trend in this direction seems to be that smart homes are the emerging intelligent environments and if only the home can behave with some level of intelligence, life can be easier and simpler. Lynn Hammill attacks the issue head-on in her article. She begins with the Turing test and leads us through a number of issues concerning talking computers and then on to questions concerning human/machine interactions. Nobody denies that machines are invented and put to use because they save us from "drudgery, menial and repetitive tasks." The question she poses is whether we should extend the role of machines beyond these tasks to replicate humans in other ways. Not necessarily, according to Hammill, for she comes to the conclusion by positing two principles, both of which must be taken seriously: "Smart domestic devices should put people firmly in control and should as far as possible be unseen and unheard."

The final article in this issue provides an industry perspective. The imperatives of technological realities in the competitive marketplace are different from the reflective analysis that comes from the writings of social scientists trained in academic environments. Companies like Microsoft cannot afford to stand by in the face of rapid technological change. This is the spirit in which Bell and Heath articulate Microsoft's vision of the digital home. Their article is a case study involving the development of two versions of the digital home, which the authors call Version 1 and Version 2 (we are asked to wait more time before Version 3 is made public). The authors present a detailed description of the steps involved as Microsoft proceeds from product concepts to the development of product prototypes. This is indeed a rare glimpse of the internal workings of an organization that has led the world of computing for more than a quarter century and continues to do so.

In sum, the articles appearing in this special issue represent a tension between two visions, the domestication of the virtual and the virtualization of the domestic. Both perspectives are legitimate, and as we move forward to explore the issues further, our task is not to choose between the two visions but to combine them both and produce a unified vision.

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