

## **Designing The Family Portal for Home Networking**

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## Abstract

The main purpose of the study is to design an interface for family use, the Family Portal, that would address the specific needs of families in the context of their domestic activities and routines. Data were gathered from a select group of families in two stages. First, we gathered information on families' current use of computers. Second, we presented some basic ideas regarding the Family Portal and its characteristics, and obtained detailed reactions and inputs from families as part of our concept testing. As a result of in-depth interviewing, we were able to identify several family-oriented themes concerning computer use. The extensive nature of computer use attests to its growing domestication and integration into the family life. Bearing this in mind, we asked our respondents to consider the Family Portal as an aid to manage various activities that are performed in the family context. There seems to be support for the idea on the basis of a family calendar, event organizer, and other key features. It is also viewed as both reducing and complementing paper-based activity, although families are not willing to give up paper entirely. This suggests some resistance to a total virtual environment in the home. The Family Portal is also viewed as a useful tool for organizing home finances and maintaining financial records. One area of concern is that the families need to be convinced that the Family Portal is in any way better or superior to some existing devices. This will be one main challenge as the concept is put into practice.

## Introduction

The use of information technology at home is a promising area of inquiry among scholars and practitioners (Kraut et al., 1999; Frolich & Kraut, 2002; Harper, 2002; Lally, 2002, Turow & Kavanaugh, 2003). Since about 1998, products such as home Internet appliances, intelligent refrigerators, and WebTV consoles have been released into the market with much promise but somewhat limited success (Bergmann, 2000; Edwards et al., 2003). Despite slow adoption of these home-oriented technologies, commercial interest in introducing information technologies into the home is quite intense. This study reports preliminary findings on ways that the Internet and computer technology could be integrated into the family life. We used a prototype that we call The Family Portal as a tool to help families explore the usability and applicability of home-based information technology. The prototype helped us materialize the concept and define a focal point on which to base our discussion with families. This exercise resulted in findings that we believe clarify the role of information technology in servicing the needs of the home.

## Background and Study Purpose

With the widespread diffusion of the Internet there is a growing sense of indispensability among its many users (Kiesler, 1997; Hoffman, Novak, & Venkatesh, 2004). There is also an increasing use of the home computer as a link between the home and external networks, such as workplace, schools, health organizations, and commercial sites (Papert, 1996; Magid, 2000; Ruhling, 2000; *Business Week*, 2001; Miyake, 2002; Venkatesh, Kruse, & Shih, 2003). As computing technology diffuses and gradually becomes domesticated (Harper, 2000; Cummings & Kraut, 2002), we need to supplement traditional evaluation metrics, such as productivity and efficiency, with those that take into consideration aesthetics, convenience, family dynamics, and the social and emotional needs of household members (Di Leonardo, 1987; Frohlich & Kraut, 2002; Turow & Nir, 2003; Livingstone, 2003). Thus the home setting affords an opportunity for a unique form of design, which both considers the perspective of family members and goes beyond a mere utilitarian point of view.

In this chapter, we describe how we designed the Family Portal: an information infrastructure that uses Internet technologies for home management and external networking, as well as meeting the emotional needs of the family. Our research objective was to devise a home-based information, communication, and management tool that is usable, friendly, and efficient, and at the same time, will satisfy family emotional and social needs? The chapter will not attempt to demonstrate the implementation of such a system, but will present some initial analysis of the factors that lead to the design of such a system. In the development our ideas, our work is similar to some recent work on the design of home-based technologies and terminals (Lee, 2000; Hindus et al., 2001; Mainwaring, 2002; Harper, 2002; Baillie et al., 2003).

The current study builds on our own previous work on home as living space (Venkatesh, 1996; Venkatesh & Mazumdar, 1999). In this chapter, we sometimes use the term *domestic space* to emphasize the domestic character of the living space. Recently, Frolich and Kraut (2002) elaborated the notion of domestic space along with *domestic time* within the context of home computing. Their work offers a clear analysis of how the concepts of space and time constitute the basic elements in the use of domestic

technologies. Following their work, we use the notion of domestic space as a way to position the Family Portal within the spatial configuration of the home.

### Home as Domestic Space: Preliminary Considerations

The idea of the home as domestic space has primarily been considered in the fields of architecture (Lawson, 2001); anthropology of space (Cierard, 1999); human computer interaction (Hakos & Redish, 1998; Lee 2000), and other design-oriented specialties. The notion of family as a socially-oriented domestic unit has received attention in the fields of sociology and social/cultural anthropology (Bott, 1957; Scott, 1991; Milardo & Allan, 1997; Szinovacz, 1988).

Typically, these spatial models approach a domestic environment from a spatial planning view: how space is used for different family activities, how families designate space for ritualized functions, and various other practices. However, our domesticity-oriented approach pays more attention to family social structure, power relationships, control issues, household division of labor, family dynamics, and parental and spousal concerns and relationships. Since one approach examines how family life is organized in the home and the other examines the content of interactions and sociological motivations behind behaviors, both are closely related and are critical to our study. Some recent work on home-based technologies seem to meet these dual objectives (Frolich & Kraut, 2002; Bell et al., 2003).

Historically, in designing home-based technologies, we might say—at the risk of simplification—that designers have taken an approach that is closer to the living space model: using activity schedules and time budget information at the expense of more domestically-oriented interactions. For example, most early household technologies were targeted toward improving the efficiency of specific household maintenance activities, such as cleaning, meal preparation, washing clothes, etc., where labor or time could be saved. With the introduction of television in the late 1950s and early 1960s, the role of domestic technology expanded to become a tool for family entertainment. In the 1980s, with the arrival of computers in the home, it became possible for people to work at home, and we see the beginnings of the home as an extension of the place of work (Ruhling, 2000). In the 1990s, new media and information technologies—and the Internet in particular—transformed the home even more dramatically. These new technologies have given rise to the perception of the home as a *shopping center*, as in home shopping, a *communication center*, enhancing networking among people in the family and between the family and the outside world, an *information center*, and a *learning center*. These new developments have contributed significantly to reconceptualizing the domestic space.

### **A Model of Domestic Space and the Family Portal**

We present a model (Figure 1) adapted from our previous work (Venkatesh, 1996) of home as domestic space. Broadly speaking, the domestic space can be described in terms of three main elements: social space, technological space, and physical space.

(Figure 1 about here)

The *social space* consists of the members of the household, the activities performed by them in the home, the time spent on those activities, and the interactions between household members. The *physical space* refers to the physical layout of the home and its constituent parts (kitchen, bedrooms, bathrooms, etc.). The *technological space* consists of the household technologies that are embedded in the physical space and that are used by the members of the family as part of the social space.

This technological space consists of artifacts, such as refrigerator, table, and stove, that make the kitchen a place for meal preparation and consumption. Technological space has gained particular importance recently because of the emerging notion of the “smart home.” For an interaction between the three spatial categories in the context of technology use (e.g., Web TV), we refer to the recent work by Lee (2000) which illustrates how the notion of domestic space was used to situate Internet terminals within a family context. Here is an excerpt from his research report that elucidates how spatial concerns affect the positioning of technology in the home.

“I report on a field study of introducing Internet terminals into the home. This study revealed that the acceptance of an Internet terminal such as the WebTV set-top box is dependent upon the existing social, physical, and technological spaces of the home, their interaction with each other, and their interaction with the world. Analysis of the findings showed how the new technology changes the dynamics and the relationships in and between these spaces and how the home in turn reconstructs itself as part of the process of appropriation. Analysis of the findings also suggests that theoretical conceptualization of the uptake of technologies in the home needs to consider not only the spaces within the home but also the larger social space in which the home is embedded. I conclude by drawing out some near term implications for the design of Internet terminals in the context of the home.” (p. 25)

The intersection of social and technological spaces creates electronic networking opportunities within the domestic unit. At this point, one can see the emergence of the networked home. We define the networked home<sup>1</sup> (see Figure 1, A2) in terms of two major components: an internal household network, which consists primarily of relationships with family, friends, and social circles, and an external network, which connects the home to outside agencies, such as schools, shopping centers, work/office, and other civic/community centers. Intuitively, one can appreciate the use of Family Portal as a tool for home networking because of its communication capabilities.

### **The Family Portal: A Description of the Concept and Applications**

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<sup>1</sup> For a fuller version of our paper on the Networked Home, please refer to Venkatesh, Kruse, and Shih 2003.

The Family Portal is introduced into the domestic space to facilitate various family-related activities. Its introduction rests on some key developments. Household computer use has been on the rise, especially since the introduction of the Internet. Currently, the computer is used for a variety of family-related activities, including family networking. The Family Portal can become a means by which family members can employ the technology for domestic use. In Figure 1 we have shown that the Family Portal can link the social and technological spaces in the home.

Current information and communications technologies (ICT), with some exceptions, are designed under the assumption that they will be mainly used in workplace scenarios. Metaphors like “desktop,” “files,” or “personal assistant” are products of this workplace orientation. Within this context, the place and role of ICT at home will be based on how much they serve as an extension of office duties. Consequently, the shaping of ICT to serve workplace needs makes it very difficult to appreciate and understand what is the real value of ICT in the home, and how researchers and practitioners might design products that truly serve the needs of the family. We need new approaches to reorient ICT that combine what we know about families and how they function, and how we can envision appropriate technologies.

This research is based on how prototypes of appropriate ICT applications might serve these emerging family- and home-based technology needs. Prototyping allows quick testing of design concepts by potential users and helps refine our understanding of the users’ needs once they are supported by technology (Beyer & Holtzblatt, 1998).

Specifically, in this research we explore how a shared repository of information and messages—a Family Portal—supports the domestic environment of the home and its associated activities and how it helps family members. The main method is to test design ideas against scenarios of use that describe typical activities (Carroll, 2000).

Most portals on the Internet are oriented towards the individual. They provide services for a single user, such as weather reports, finance, news, instant messaging, email, etc. These portals are not oriented towards a family. Some of them provide so-called “community features” such as photo albums or discussion groups. Even here, however, interface elements and functionality are directed toward a single user. They are designed with the aim of personalizing the access and interface for an individual. In contrast, the aim of the Family Portal is to provide family access, where all members can have access to a repository with a common interface and shared functionalities.

There have been some recent efforts to develop technologies specifically for family use, especially in the context of family communication. Some interesting examples that use what is currently known as *design ethnography* include the Casablanca project (Hindus et al., 2001), shared devices for the home (Mainwaring, 2002) and cross-cultural media applications (Frolich & Prabhu, 2003). In all these cases, the motivation behind developing family-based technologies is to move beyond current technologies’ *individual* orientation, towards an orientation of family context and dynamics.

Two results of the Casablanca project are noteworthy. The digitized communication board helps families keep track of communications to make interactions more flexible. Families stay in touch more closely via a shared message board that is easy to use, expressive, and aesthetic. The results also revealed that women are the “primary household communicators”; this should therefore be taken into account while designing the technology. In another study titled “Design of Family Technology,” Mainwaring (2002) proposed the notion of sharing technologies at home. He developed a four-fold typology that consists of shared devices, shared infrastructure, shared spaces, and shared activities. These were cross-tabulated against four categories: same system, same time, same space, and joint activity. Although we do not follow his system of sharing, we concur with his argument that the next step in developing home-based technology is to position it within the context of collective use without necessarily sacrificing private access by individual members. In other words, the Family Portal that we are proposing in this chapter has features both for family and for the individual.

In the following account, we have identified some key features of the Family Portal as an initial conception. Once we test the concept and collect results from our respondents, we will update our conceptualization to reflect the users’ input.

#### *The Family Portal as a Shared mailbox*

Every family has a mailbox that contains the postal mail addressed to any member of the family. The Family Portal will use the mailbox metaphor as the base for its construction. It will be implemented as a web-based application to provide accessibility from any location or platform.

The Family Portal can serve as a way to integrate home-related information. The Family Portal includes links to utility companies (such as electricity, trash, cable, phone), where the links also provide due dates for payments and alerts to family members, potentially even historical records of past payments. Rather than replacing any existing payment websites, it is important to note that the Family Portal will serve as a gateway to those services. However some functionality like reminders of payment will be part of the Family Portal.

#### *The Family Portal as a Lightweight Communication Tool*

The Family Portal can be understood as a communications tool for family members. Here we will use another metaphor, the kitchen refrigerator. Many families use a refrigerator’s surface to attach notes for other household members about errands, reminders of appointments, telephone numbers, etc. The Family Portal can serve this purpose especially when family members are not at home. Mom can check a note from Dad while he is at work; Mom can remind Dad to bring a bottle of milk on his way home. Thus the Family Portal will be a kind of lightweight communication infrastructure. We also envision integrating the household answering machine with the Family Portal in such a way that family members can be aware of messages waiting for them.

### *The Family Portal as a Common Calendar*

Many families use a calendar (usually located in the kitchen) where they register family events: birthdays, medical appointments, etc. The Family Portal can also include this kind of functionality. Here the trick is to discover what are the best ways to update it. It may just be easier to write down a family activity on the paper-based kitchen calendar. It is possible to envision an electronic calendar (touch screen) in the kitchen. In this case the device will automatically update the family calendar in the Family Portal. Technology to do that is available (for example, Smart Board), but we might want to leave the kitchen calendar in the realm of paper. In that case we have to look for ways to facilitate users keeping the calendar updated.

### *The Family Portal as a Financial Organizer*

An interesting application for the Family Portal is to serve as a financial organizer. Family members can use the Portal to record personal expenses; this information can then be rolled up for tax purposes. In this line we can also include direct links to banks' web sites, so family members (mainly parents) can access their accounts from the Portal. In a similar way to its interaction with utility companies, we see the Family Portal as a gateway to banking or other financial services. In this case the Family Portal may provide a way to record checking balances, checks to be paid, or investments.

### *The Family Portal as a Window to the Shopping World*

As a window to the outside world, the Family Portal can help to present information such as the catalogs of departmental stores like J.C. Penney, Sears, Mervyns, etc. We envision a scenario where family members configure their Family Portal and subscribe to specific department stores to receive notification of their products in the portal, as opposed to by mail. One might ask, what is the difference between this feature versus email? What are the advantages? The difference is that with this Family Portal mechanism, information is more customized and targeted to the family.

As with other portals, the Family Portal can include information about local, national, or international news, weather, links to informational sites such as driving directions, online dictionaries, etc. These information "gadgets" can all be integrated in the interface of Family Portal.

Another aim of the Family Portal is to support archival records. Photo albums, videos, and audio recordings can easily be stored and retrieved.

From this brief presentation of ideas, it should be clear that the goal of Family Portal is not to substitute but rather to complement existing communication and information infrastructure components, including email and instant messaging, which can still be used by family members.

To summarize, the Family Portal is a combination of the following features available for family use electronically.

?? A shared electronic "mailbox."

- ?? An internal communication tool.
- ?? A family calendar, with reminder tool and event planner.
- ?? An information center.
- ?? A financial organizer, budget tool, and a gateway for bank accounts and other financial services.
- ?? A gateway for shops, retailers and other information providers to access the homes.

### **Methodology: Empirical Investigation**

The data collected for this study included two main parts: in-depth interviews in the homes of ten families, followed by concept testing of the Family Portal to elicit family responses. The families were intentionally selected to ensure that the majority has children at home. This permits us to gather information on a wider range of activities within the home than would normally be possible in families without children. It seemed reasonable to assume that families with both spouses and children would more likely provide a more comprehensive baseline data set from which to proceed, since there are more related household members—hence, more complex communication needs. For comparison purposes, we included one household consisting of an unmarried male to provide contrast. Because of the ethnographic nature of the study, we have to use small samples to pursue in-depth analysis. While no generalization of the results to the larger population is attempted or warranted, the insights gained from the study will be useful in designing a major study to explore specific issues.

The whole process of interviewing and observing lasted on average approximately 120-150 minutes. The key respondent in each household (in most cases a female adult) was extensively questioned about the household's management and current computer usage. After the general purpose interview, the respondent was presented a paper prototype showing the façade of what we called "the Family Portal." This façade was used to encourage users to talk in detail about how they used the Internet for surfing the Web, communicating through email, shopping online, getting news, etc. This was followed by the introduction of a more realistic version of the Family Portal.

The following is a representative list of questions used as our protocol in the first part of the interview.

- ?? Do you keep a personal agenda? A calendar? A diary?
- ?? Do you have a family organizer/calendar?
- ?? Paper mail processing:
  - Please describe for us what you do with your postal mail, where you put it, how you organize it, etc.
- ?? Do you save coupons for products? Where do you keep them? What about recipes?
- ?? Do you read the newspaper? Which sections you read?
- ?? Do you watch TV? What programs you like most?
- ?? Use of technology at home:
  - Do you have computers at home? How you use them? Where do you have the computer?

- Do you have any portable devices? How and why do you use them?
- Do you use the computer for your home budget?
- ?? Internet:
  - Do you check the Web very often? What web sites you usually visit?
  - Do you send e-mail to family members?
  - Do you shop online? Do you pay your bills online?
- ?? Do you or does any member of your family use a cell phone or pager?
- ?? Do you leave paper notes to communicate with other members of your family?

In addition, the interview addressed several demographic and lifestyle questions.

### *Presentation of the Family Portal Concept*

We introduced the Family Portal (Figure 2) through a combination of words, an illustration board, and a laptop demonstration. The illustration board served as a quick method of visually communicating the Family Portal concept to participants. One side of the board displayed two pictures: one of a mailbox; one of a refrigerator door—the two conceptual bases we referred to in the framework. We explained the rationale behind the conceptual bases to our participants, and asked them to keep the idea of the mailbox and refrigerator in mind when we presented the Family Portal software. On the other side of the board, we displayed three scenarios of possible usage for the Family Portal (Figure 3). The first showed an entrance model, where a user can check the Portal for messages upon entering the home. The second scenario showed a woman eating breakfast on the kitchen table while using the Portal. The third scenario illustrated a portable version of the Portal located in the living room. In this particular scene we wanted to show people that they can access the Portal in any part of the home.

(Figures 2 and 3 about here)

A small laptop was used to demonstrate the Family Portal. We explained the capabilities of the system to the participants and did a quick walk-through of each section in the Portal. After the walk-through, participants explored the system themselves. As we did with our participants, we will quickly summarize below the elements and features of the Family Portal.

General Overview: One of the first things we told participants is that the version of the Family Portal they were seeing is the “Thompson Family” version of the Family Portal. Because we envision the Portal as a system that is adaptable and customizable to unique household needs, we developed the fictional Thompson family as a narrative device to deliver the concept and to facilitate respondents adding their own feedback (cultural probing). So henceforth, the Portal is understood to be the Thompson version, with categories that reflect Thompson interests.

The Family Portal demo is divided into eight sections: Organizer, Directory, Children, Finances, Entertainment, Vacation, Transportation, and Jobs. Each of these sections had categories of their own. We will briefly examine these below:

Organizer: This section simulates capabilities of a paper organizer. There are separate areas where the user can self-input appointments and errands.

There is a Shopping area where out-of-home agencies can feed the Family Portal with service notices, news, and information. The nature of these info-feeds would be systematic (e.g. occurs on a regular, semi-predictable basis) and customized to unique household needs. This is of course a throwback to our first conceptual basis, the mailbox. The user can edit, add, or delete agencies through a menu accessed by clicking the radio button under the “Shopping” column. We envision the list to be a global list of vendors, agencies, and organizations. Unlike junk mail, the user can custom-filter the information that goes into the Family Portal.

On the bottom of the Organizer, there were two boxes, one for “Messages” and the other for “Reminders.” These are the *common elements*, which appear in every section of the Family Portal. The Reminders section is a simple, self-input area where users can execute the simple reminders for that section. “Messages” is an intra-family communication center where one member can leave a message for another member(s).

Directory: The Directory is an alphabetical list of individuals and commercial services, which functions like a directory in an organizer or phone book.

Children: The Children section features a mix of both user- and agency-fed information. In the Thompson Portal the sub-categories were School, Health, Clothes, and Activities. School, Health, and Clothes are areas where out-of-home agencies, such as the kids’ school administration or pediatrician could feed the Family Portal with updates regarding children’s school activities, behavior, doctor’s appointments, and kids’ clothing sales. The Activities area is a self-input area.

Finances: This section is largely agency-fed information. Banks and creditors will remind the Family Portal when bills and deadlines are coming up. Quick links to the family’s various financial and insurance accounts are also provided for ease of access.

Entertainment: We developed the Entertainment section with a focus on local area news, updates, and events. The Family Portal delivers information such as local movie show times, local television guides, as well as local concert, drama, or sporting events.

Under the Vacation, Transportation, and Job sections, we explored the idea of agency-fed information in more depth. Imagine receiving, through the Family Portal, information from Travelocity, or one of the many job-search websites. Commercial firms like airlines and employment services already provide this type of information through electronic mail. However, with Transportation we examine an information-relationship that is more local and neighbor-friendly. Your auto mechanic would alert the Portal when your car needs servicing. This approach updates the rustic model of the small town where everyone knew one another and the grocers knew your name and your buying habits, and recasts it in a new form. In addition, under Transportation the user can also self-log car information such as mileage.

## Findings

### *Household Computer Use*

The grounded theory method of analyzing qualitative data permits us to extract key themes from the in-depth interviews. In analyzing the qualitative interview data on home computer use employing grounded theory, we identified fifteen themes as listed below. We will call them *first order themes* (FOT).

- Household communication (HHComm)
- Calendar/organizer(HHCalendar/Events)
- Household finances (HHFin)
- Entertainment/hobbies(HHEnt)
- Job/work related(HHWork)
- Information/news (HHInfo)
- School related (HHSchool)
- Social interaction(HHSoc)
- Online shopping (includes vacation/travel/leisure items) (HHSShop)
- Home-based services (HHSservice)
- Learning (HHLearning)
- Community information (HHCmty)
- Parenting/children/family (HHPCF)
- Medical information (HHMed)
- Everyday routines (HHRoutine)

These themes reflect the relative frequency with which they occurred in all the interviews and refer to how the computer is currently used by the families. The variety and range of themes indicate that computers have become an integral part of the family life and are now domesticated. Table 1 provides the distribution of the themes across different households.

(Table 1 about here)

It must be noted here that while the themes are conceptually distinct, they can also be related depending on the context. For example, household communication (HHComm) and social interaction (HHSoc) are considered distinct in terms of the categories of computer use, but they are related because when a family member uses the computer to contact friends or family on certain matters, we can also conclude that social interaction has taken place.

As the table shows, not every household uses the computer in the same fashion. That is, use patterns vary according to family priorities and needs. Most published literature on at-home computer use cites three major uses for the computer: communications, information search, and entertainment. Our study certainly confirms these results (Table 1). However, there are other uses which point to the fact that computer use is more complex or diverse; as the technology becomes more domesticated and integrated into the

family life, other uses become more prevalent. Thus, families with children use the computers as part of their parenting responsibilities (HHPCF) and child-oriented activities including school (HHSchool).

In a larger sense, many household activities involve several themes. For example, when families communicate with family members, friends, shops, service agencies, banks etc., one way to describe this is simply to say that the computer is used for communication (HHComm)—which suppresses a lot of finer details. This is because each act of communication has its own distinct quality and content that should be meticulously uncovered. For example, communication with family can mean family interactions on various matters (HHSoc) or organizing family events (HHCcalendar/events). Communicating with children implies some parenting activities (HHPCF) or following everyday routines (HHRoutine). Communications can also occur between parents and schools (HHSchool). Similarly, online shopping (HHShop) may involve communicating with stores (online or physical). Communication may involve seeking information (HHInfo) from community agencies (HHCmty) or medical sources (HHMed).

If we consider organizing family events such as birthdays (HHCcalendar/events) as a key activity, it may involve several other activities, including event planning, sending invitations, shopping for the event, preparing a list of guests including their email addresses and telephone numbers, and additional, related organizing functions.

At the second stage of analysis of these themes, we go to a deeper level to see if these discrete themes represent some fundamental aspects of family life. The logic here is that in uncovering these various themes, we reveal more fundamental processes or sets of activities. Thus we identify the following meta-processes that underlie the specific computer related activities. Here is a list of such processes. To distinguish these from the first order themes, we label them *core themes of family life* (CTFL).

- ?? Social networking (e.g. keeping in touch with family/friends/other contacts).
- ?? Home management.
- ?? Household consumption/production.
- ?? Shopping for goods and services.
- ?? Childcare/education and parenting.
- ?? Balancing work and home life.
- ?? Spatial aesthetics and comfortable living.
- ?? Civic life and community participation.
- ?? Keeping in touch with the outside world (other than the community).
- ?? Family events and special occasions.
- ?? Family well-being/stress management.
- ?? Family entertainment/leisure/outside interests.
- ?? Travel/vacation.
- ?? Physical/financial security and safety.

While many of the terms in the core activities (CTFL) list are labeled differently from FOT, some of the nomenclature is the same. These CTFL activities can be classified in

terms of four categories: maintenance activities, planning activities, expressive activities, and developmental activities. Each core activity has some element of these four categories but the emphasis may vary depending on the context. For example, online banking (HHFin under FOT) (Home management under CTFL) may be more of a maintenance activity and may even involve some planning, but it might not have a high expressive or developmental content.

In a similar fashion to the way we classify family activities, we can also describe technologies as an embodiment of these four categories in varying degrees. For example, one can use a refrigerator to store food (maintenance), to make sure enough food is available at the right time for children (planning and expressive), and also perhaps to store healthy food (developmental). We can extend this type of analytical scheme for other home-based technologies. Clearly, in the design of the Family Portal one should consider how this mapping fits into this complex scheme.

Finally, to conclude this section, how are these results significant to the Family Portal? The Portal role in this complex set of activities is as an interface that facilitates families planning events, contacting friends, relatives and outside agencies; keeping family records, following news, and performing various activities for which the computer is suitable. The Family Portal has the potential to become a central unit that systemizes family computer use, both collectively and individually. It is a meeting point for the family members and shared virtual space. At a very rudimentary level, the family portal is an information or communication portal. At another level, it provides the means to meet different family members' organizing needs. We will now bring out these issues in some detail by presenting some key reactions of our respondents to the design considerations of the portal.

### **Analysis of Respondent Reactions to the Family Portal**

In presenting the respondents' reactions we analyze them at two levels. In each sub-heading, where necessary, we identify the particular feature of the Family Portal and the corresponding core theme(s) of family life (CTFL).

#### **A calendar-based interface (CTFL: Home management, childcare, and parenting)**

A calendar-based interface unifies the appointments, errands, reminders, and messages sections. In the current incarnation of the Family Portal, these sections are separated. Respondents' feedback strongly encourages a move to create an interface that resembles an interactive calendar, where a user can input and organize information into a daily, weekly, or monthly schema. They described this new calendar-based system through words and hand-drawn pictures (Figure 4). In addition, we will uncover some underlying family processes in their narratives.

(Figure 4 about here)

In the following quote, CB implies that she likes to plan family activities in advance and the calendar as a way to organize and make sense of her anticipated time commitment to certain activities. Thus the planning ahead of a week is important to her.

CB. Something like a calendar will be helpful because, basically it will probably be like an automatic calendar. So I can say like ok, on a given day I can look and see [you know] the week at a glance, I can see the appointments for the whole week that can be automatically updated. Because otherwise it is almost like keeping two calendars....

JD has similar concerns but she is more visual and wants to see everything at glance.

JD. See, I like this because it's all right there and it's pretty easy to access. I don't like anything that I can't type into and I like the fact that I can see everything. I see appointments and errands and reminders and I see everything on one screen. I don't like not being able to see, that's what I like. I like to open my [calendar] and I can see what I have on any day, you know, I would like to see like what I have tomorrow.

SF uses the calendar not only to plan her schedules but as a way of caring for and controlling her children. The calendar becomes a tool in her parenting responsibilities.

SF. Because I would rather just have them in one board, that's what I was saying, with the children ...rather have all the appointments in one section and all the reminders. If it's an errand or something it should be all in the errand section. It seems like those are two places to have errands and I would just rather have it in one. I would rather have it look like a calendar, so that I can see you know, tomorrow or Friday or the next week. I would like there to be like a link up here...then click on it and have the whole calendar of the month.

### CTFL: Social Networking

Respondents reacted positively to the possibility of having family, extended family, and friends access the calendar. In other words, the Family Portal will act as a networking tool for contacting family and friends.

JD. The directory is great because... especially if you are able to use it to print out address labels...I don't know if you are able to do filtering, print out labels for Christmas cards so if you even have to write your Christmas card, your directory can sort that. What I want... maybe like what would be cool is to have a calendar that is accessible to your family. Not just your family at home but your friends and your brothers and sisters... for example I know my mom helps babysit my daughter and my brother's son so she can put it up on the schedule...

### CTFL: Childcare and Parenting

Some mothers suggested having a unique section for each child, rather than the generic "Children" section that is currently on the Portal.

JP. That's neat. I would not change anything like that. Maybe if you have more than one child, would like to customize it... now I have two kids at school. I mean, if I am able to categorize in each child's name that way you don't have to read through everything. Because eventually I would have three kids in school and I know my sister has five kids in school. ... OK, this is for Ashley, not for Christina. It would be Ashley's under instead Christina's name. About the item Health, that is... I would not change anything about

that. The only thing I would change is to categorize in each child's name.  
Clothing...clothes, that's cool.

### Reminders and notification of new events (CTFL: Family events and special occasions)

Participants suggested including indicators on the calendar-based Family Portal to signal new events, and alarms or visuals to indicate when an appointment or errand needs to be run. There were no reminder systems in the demonstrated Family Portal.

DG's husband: It's just your organizer? Because I see something that you click on the monthly calendar and it gets bigger and then you see the item....

DG. Oh, I know what you are saying. Yes, it's like what an Outlook calendar is now. You know you have the months and it's bolded where you have an event.

DG's husband: Also in Reminders, my Phone has that little thing that pops up and starts beeping if it's something like the doctor's appointment or something.

DG. Like a dialog box ...

### Planning and check things off (CTFL: Family events and special occasions, home management)

In addition to reminders, there was considerable demand for being able to check things off upon completion, such as calendar events, errands, appointments, and bill payments. In checking things off, respondents said it gives them a sense of completion, productivity, and closure.

DG. It would be nice because like I said we do it manually by just checking off to make sure we have all the bills paid by a given date, say the 10<sup>th</sup> of every month. This could be done automatically?

JD. I'll put it even on a piece of paper and I'll stick it on my organizer under notes. Make a note in one section that I do for "date" stuff and one section for the "month"... like she's getting baptized in few weeks and so I can get the invitations out... make a list of people that I'm going to invite you know. And then being able to check things off, that gives me a sense of closure and productivity.

### Support systems for paperwork and paper artifacts (CTFL: Time/labor saving, civic life and community participation, child care/education/parenting)

Paperwork includes bills, paper notes, mail, and documents from work or school. People had an aversion for paperwork because there's too much of it, it causes too much clutter, and requires too much maintenance.

JP. Because I lose the paper. I hate when kids get sent home tons of papers. That's what I like about \*\*\* life [the Wired community where the participant lives and has its own Intranet] because I can read everything on a Web page, instead of having everything mailed to you... So much goes on in our community and I would like to keep up with it at a glance.

DG. Yes, these are all bills. This is my soccer schedule that has to go in there. This is my folder I walk around with all the time. This is a folder where I have stuff like a phone call that I have to make and a bill that I have to call about. Most of the things are like kids' things like the school application I forgot to type up, some immediate thing I have to work on like my projects. And this is all calendar stuff which I haven't done yet.... These are for filing....

Despite their “annoyance” with too much paperwork, people still use paper to accomplish a number of daily tasks. Paperwork is still a major part of their life, and is reflected in the physical landscape of their homes. For instance, we witnessed scenarios where people would put notes around areas of high activity—around the telephone, around the computer area, and on the refrigerator (Figure 5).

(Figure 5 About here).

#### CTFL: Home management, time and labor saving

Respondents cited portability, speed, convenience, and the ability to visualize things as primary adoption factors. Paper complements household activities, like shopping (lists), home management (calendar, organizer), and finances (receipts, bill stubs) so it is still an important and viable medium. Instead of trying to replace paper with technology, some ways to augment the Portal to support the flow of paper can be investigated—systems where paper and technology can work in harmony. Below is an example of a task that requires the tandem contributions of paper and technology:

Q. When you use Quicken what kind of things do you put together to use Quicken?

AB. Well, I just have it on my desktop, so it's a matter of clicking on it and opening it... I don't keep the checkbook register so any time I go shopping or anything I just take my receipts and when I come home and I put the receipts in there and then every few days or whenever I feel like it, I check all the receipts and just input into Quicken under receipts ... Depending on if it is something that I should save or not you know, I throw the receipt away or file the receipt or whatever.

Respondents suggested enabling the Family Portal to print out content like calendar events, tasks, appointments, and address labels from the directory.

CB. Like things you can print out of your calendar...

AB. Ok. It would be neat if you can somehow hook this up to your computer so that's almost like a PDA where you can download ... Let's say you have a calendar in your computer and you can download your appointments. It would also be neat if you can print this because I'm always writing lists of things to do... crossing them and rewriting them so it would be neat just to be able to do this and delete things as I go and change things, so I like that.

JD: The directory is great especially if you are able to use it to print out the address labels... I don't know if you are able to do like filtering, print out labels for Christmas cards so if you even have to write your Christmas card, you directory can sort that out.

#### Finances (CTFL: Home management)

Under the Finance section, Family Portal users can take a quick look at their bank accounts, credit cards, insurance, and taxes. The Family Portal records all financial activities, and when a deadline for a bill approaches, the Portal will alert the user by displaying the date in red. Participants' remarks were lukewarm. Most already had established ways to manage bill paying. Some saw the integrated Family Portal as something that they could use. And some saw that the home finances should be treated like a calendar event, and consolidated with appointments, errands, and messages under a calendar format.

CB. Uh, I think... not as much for paying the bills. Paying the bills I do twice a month, that's is just easier for me. I can just do it, what I was telling you earlier like the electronic funds transfer, that is automatic.

JP.. About Finance... and bank account that's neat because you add links to your accounts. [As for] the bills I wouldn't change it. I mean it tells you exactly how much it is and when it's due. That is so neat because half of the time I forget when things are due and I don't pay them on time. I guess it piles up on the table. I just forget about them, or my husband comes home, he works 12 or 13 hours and he's too tired to look at them. That's cool, I like that! Because I can tell him and I know when it's due so like we have to go in here and pay them. Because they are right next to each other, so you can look it's due and just go here and get your card, click it and bam! It's paid. Insurance... that would be out for me because everything is taken care of. And the taxes... we have our taxes done. Maybe it would be neat if they remind you... maybe reminder when you have your tax accountant scheduling an appointment with you and a reminder that your appointment is coming up, don't forget to bring this or that, what papers to bring, so you don't forget anything.

### Where people would put the family portal (CTFL: Spatial aesthetics and comfortable living)

When asked where they would use the Family Portal, respondents suggested high traffic areas and activity hotspots, such as the kitchen counter. Some suggested that the Portal be portable, like a cordless telephone.

JD. Downstairs. You have like... it's funny that you have people do their mail things, right there [pointing to the location next to the kitchen]. I thought it would be great to have it there, if I could because I'm always in my kitchen you know, there's where my phone is, there's where my mail is. It is just where I do a lot of stuff.

JP. I wouldn't want to have to go and stand somewhere and just have to look at everything... I mean it's convenient by the door I think is great. I would probably use the mobile one that you can bring around with you. If you want to do something you know, finding something when you are at bed or laying on the couch or eating dinner. I guess the second is cool but it would be attached to a table which I would be very worried about because a lot of people might spill things on it. Maybe at the counter top will be cool, that way it's... doesn't have access to liquids and doesn't damage. Food... we spill everyday here. So I would like that maybe on the counter top or like hang somewhere, you know maybe like on the wall by the counter.

### Information from outside agencies (CTFL: Keeping in touch with the outside world, entertainment, civic life and community participation, social networking)

People had mixed feelings about incoming information from outside agencies. There was rather low interest for information of commercial nature, which people instantly associated with e-mail spam. However, people did not mind receiving confirmation e-mails for purchases they made online. Likewise, local information for potential family events, especially movie information, was a point of interest.

JP. ...area code and then you pull the theater information and then you just click on that certain theater and it would tell you what is going. I have one [theatre] just down the street. But a lot of times people don't want to go to that one. I go to that one because it's close. Some people like to go to the big ones you know like the (theater name), I don't like to go there, it's too crowded.... well, that's neat too if you look at the movie it tells you what is playing and what times.

On the other hand, there was positive feedback on receiving community-based information such as notices from schools and community clubs. Some respondents noted how they would normally toss, ignore, or forget to read school and community notices when mailed in paper form.

JP. Right, maybe reminders of when reports are due. That's a big thing for my kids. Can't tell you how many times I do last minute things because I don't get the paper signed you know, like my daughter brings the paper home and Oh, your Dolphins project [referring to a science project on Dolphins] is due next week. It would be nice to have the teachers send things to you through this instead of sending a little sheet that half the time parents don't see because kids lose it ...maybe reminders of what's happening with the school menu, what they are serving. I usually post it on the refrigerator and half the time just don't look at it. It is too confusing... they interchange things on menu anyway because they don't have it or they don't get the supply or whatever. I have older children and rely a lot on the school communicating more with me about things or fifteen papers for me to read. That's what I do, every single day. Of course people have other activities like sports, they got... my children go to Girl Scouts, a lot of Girl Scout activities we have. So that way I would like to see reminders of those things.

Q. What's the good thing about \*\*\* Life [a community website] and iVillage? Maybe you can tell us something about those.

SF. iVillage is just for women and since I'm pregnant I got a lot of information from that. Normally I wouldn't be on it if I wasn't pregnant but I go on it just to see what's going on you know weekly in my pregnancy so it's kind of cool. \*\*\* Life: I belong to a club, a moms' group, and I go there. We have a message board where you can go on and communicate with other women in the group and find out what's going on in the community. You know, I mean it tells me about what's going on.

Q. How often do you check the \*\*\* Life site?

SF. I used to check it daily but I just don't have the time and the energy anymore. So I usually try to go on it twice a week. Just to catch up, to see what's going on with everybody.

## *The Family Portal: Some final feature-specific considerations and concerns*

### Total improvement

One respondent said that in order for her to replace the old way of doing things with a new system, the new system would have to offer total improvement. Total improvement means that the new system would have to be better in every way—more convenient, easier, faster, and more accessible.

SF. It has to be quick and totally user friendly. I mean a lot of stuff is so complicated, that's what's deterring me from doing a budget on the computer. It's taking me forever to figure out so something like this would need to just be pretty much done for me and show me how to do it. It would have to a total improvement, make my life totally easier. And it needs to be really quick.

### Input devices

Participants were asked whether or not having to type put them off, and if typing was a deterrent, then what would they suggest as a substitute as an input tool for the Family Portal. Most people did not mind typing, and several people actually preferred typing to writing things down by hand.

JD: I don't like anything that I can't type and I like the fact that I can see everything.

Q. With typing in stuff, does it discourage you? Bother you?

SF. No because I did a similar thing when I was working. I was a personal assistant for the owner of the company and I had to type in his appointments and things what I need to write to him and email to him through Outlook Express I think it was. So, I wouldn't mind typing it in.

A couple of respondents also suggested voice activation, like cellular phones.

MC. Well, I worked for this company and they are launching a product next week called voice portal and... so basically you will be able to talk to it and [it] understands you. It reads back e-mails to you on the phone I'm kind of excited about it because I think that... you should be able to talk to your computer more versus type it in it.

The current model of the Family Portal leaves open the choice of an input device. Although no one has brought it up yet, touch-screen or stylus devices are definitely strong options. A keyboard will probably also be needed to accommodate long text messages.

### Aesthetics and appearance (CTFL: *Spatial aesthetics and comfortable living*)

The respondents made some insightful suggestions on making the Family Portal more aesthetically appealing. One major comment was on enhancing the interface and making it less “business-like” and more of a “household thing.” The addition of picture icons to denote mood or an event was suggested.

JP. No, I think it looks good. I wouldn't know how to change it... it is like something nice and there's like a happy face or like a heart or like a star or something like that. So I think that would be cool, I mean it could be like... not so business like. More like a household thing.

Another suggestion was to improve the interactivity of the interface. This would include check-off boxes, markers to denote new events, and having bigger text.

There were also color and texture suggestions.

JP. I would have it available in multiple colors: black, white, silver, maybe one funky you know for kids in neon colors you know green or pink. Yes! Like they have cell phones now, covers you can buy there are all different weird prints. I personally wouldn't use that but... me myself I would probably get a light one. Because it would blend with everything, the wood is nice... the wood color would be cool too, like a fake looking wood that would be neat to put on the coffee table.

Q. Do you have a favorite color? If you have a dominating color, what color could be?

SF. Like this color blue, the shopping color blue. It's easy on the eyes. The red looks good too.

And finally, people suggested the size of the Family Portal should be no bigger than a laptop, especially if it is to be portable.

SF. If it would be in the size that I can store it over there and could move it around ... Or just a tablet that's totally space saving but would depend on the size.

### Overlap between existing device(s) in use and the Family Portal

Participants made several direct and indirect comments that a computer already does what the Family Portal would do in terms of calendar features, finances, and online local information. It is hard for respondents to justify another electronic device in the home that replicates the functionalities of an existing device.

AB. Yes, because if you could do everything you know, if you have the capability then I just probably wouldn't use my regular online but if it is limited, then I would just prefer to use the computer that could do all of it.

MC: I am set up for reminders in Outlook. Like for work but for personal... I don't have to remind myself about the bills because that's all already set in Quicken and I just every time I go it reminds me of you know, these bills are either need to be paid or they are past.

A big difference between the existing system and the Family Portal is the latter's visibility. There were a lot of remarks on being able to "see" the information all at once, and being able to look at something and get all the visual information they need "at a glance."

Respondents noted that with computers, they had to boot up the machine, and open applications in order to see information, whereas in the Portal, the screens are all information-loaded and ready to go:

DG. I use it [Outlook] at work a lot but I don't use it for home. I've been thinking about maybe starting or trying to move over that but that would mean you have to log on and turn on because the computer is not always on. Switch it on and then it takes like three or four minutes to log on.

Because they are "total vision people," respondents liked seeing everything at once, in one place, and alluded to having a calendar-based interface where all appointments, errands, and tasks can be logged.

AB. No. I guess I could, it's just seems more like easy because you know, if you write there or wherever you can look at it while if it's in the computer I don't see it, I wouldn't be checking it frequently and it just seems like more of hassle I have to go to the program and all the different things to use it.

JO. I like the fact that I can see everything. I see Appointments and Errands and Reminders and I see everything on one screen. I don't like not seeing, that's what I like.

DG. The pro is that they have set up an alarm for me and I look it up and say "Oh my gosh! That's right". And the con is that I'm kind of more like a total vision person, so this allows me to look at the whole month and in the other one you have to scroll.

## Conclusion

The main purpose of the study is to design a Family Portal that would address the specific needs of families in the context of their domestic activities and routines. Data were gathered from a select group of families in two stages. First, we gathered information on their current use of computers. Second, we presented some basic ideas regarding the Family Portal and its characteristics, and we obtained detailed reactions and input from families as part of our concept testing. As a result of in-depth interviewing, we were able to identify several family-oriented themes concerning computer use (presented in Table 1). The extensive nature of computer use attests to its growing domestication and integration into the family life. Bearing this in mind, we asked our respondents to consider the Family Portal as an aid for managing various activities performed in the family context. There seems to be support for the idea on the basis of a family calendar and event organizer. It is also viewed as both reducing and complementing paper-based activities, although families are not willing to give up the paper entirely. This suggests some resistance to a total virtual environment in the home. The Family Portal is also viewed as a useful tool for organizing home finances and for maintaining financial records. One of the families' concerns is where to locate the portal. Answers depend on where most home-based activities are performed. We also think that the aesthetics of the portal and its location should be part of the design consideration. There is less enthusiasm for a businesslike appearance; families would want the Portal to blend with the home's current décor. One area of concern is that the families need to be convinced that the Family Portal is in any way better or superior to some existing devices. This will be one main challenge as the concept is put into practice.

Finally, this research is by no means conclusive and must be considered a work in progress. Additional work is needed in exploring the design and implementation of the Family Portal within the larger context of family life. Further investigation would require us to study closely the four-fold classification of activities (maintenance, planning, expressive, and developmental) and locate the portal at the center of this classification scheme.

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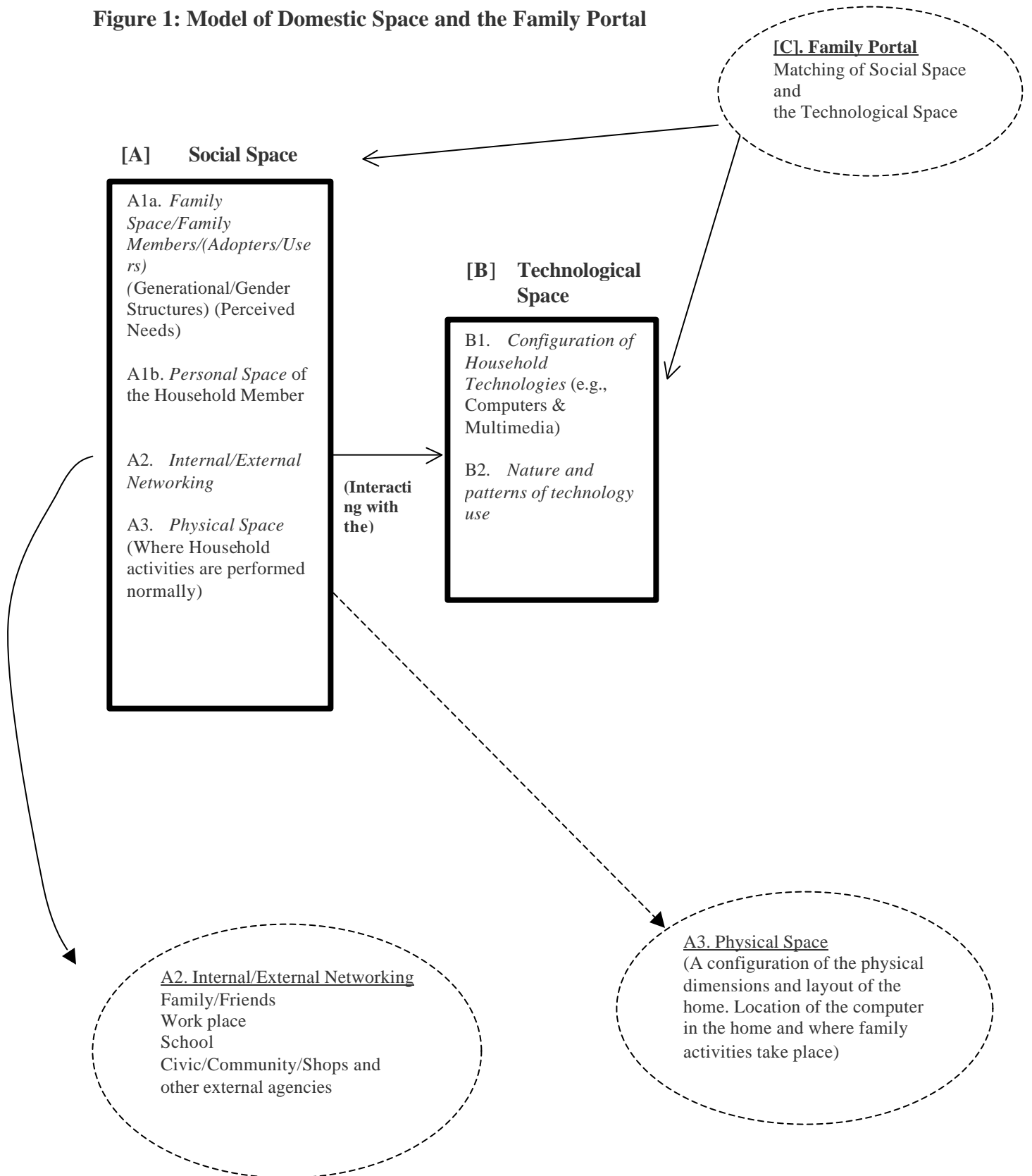
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**Figure 1: Model of Domestic Space and the Family Portal**



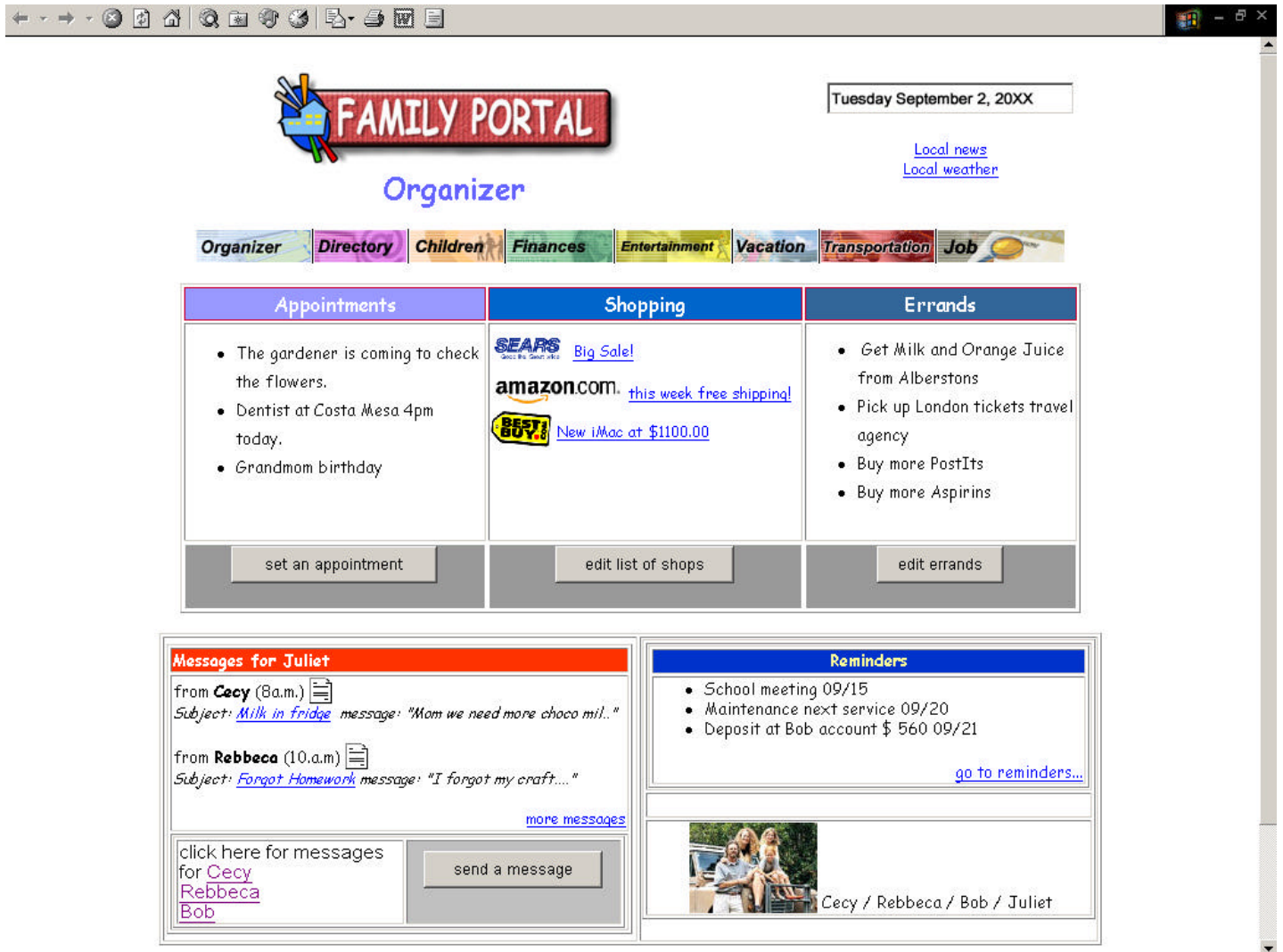


Figure 2.: Screenshot of the Family Portal demo



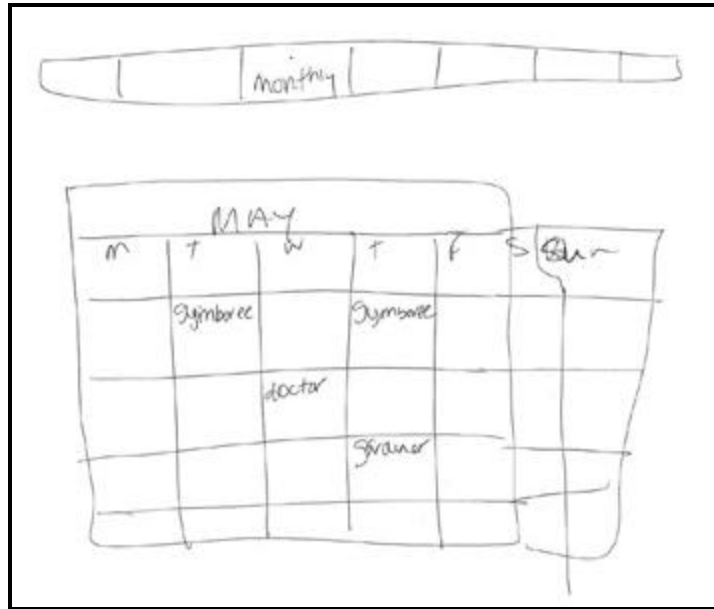
**Figure 3: Three usage scenarios**

**Table 1. Home Codes Summary**

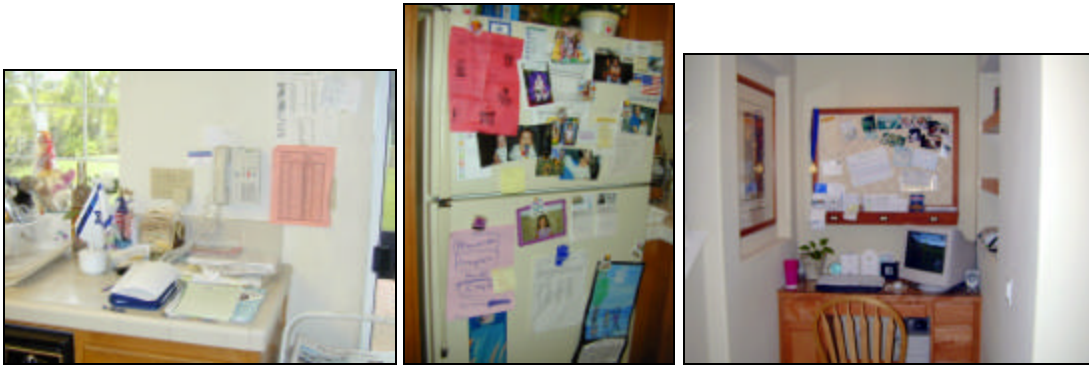
<b>Respondent</b>	<b>Family description</b>	<b>Communication (HHComm)</b>	<b>Home information (HHInfo/News)</b>	<b>Entertainment, fun (HHEnt)</b>	<b>Work (HHWork)</b>	<b>School (HHSchool)</b>	<b>Social interaction (HHSoc)</b>	<b>Home finances (HHFin)</b>
CB.	Female homemaker, two male children ages 8 and 11, three home computers, use of computer is 40% application and 60% Internet.	X	X	X		X	X	X
JP.	Female homemaker, two daughters ages 8 and 10 and a toddler son; one desktop; one laptop for the eldest daughter.	X	X	X		X	X	X
JD.	Female homemaker with infant daughter, 1 computer, used online services.	X		X				
AB.	Female homemaker, one child and pregnant w/ second, one computer, use of community websites.	X	X	X			X	
AMB.	Female, professional, mother of 3 children ranging from age 4-21, more expert at the computer than husband who is intimidated, one computer in the home.	X	X	X	X	X	X	
MC.	Male, private-business, shares house with another person, no children, on cutting edge, work-oriented use of computer, participant in online community club.	X	X		X		X	
DG.	Female, part-time lawyer, married with a teen daughter. Marginal use of technology for home use, used appointment book.	X	X		X	X	X	X
SB.	Female, part-time employed, mother of three children; used computer as a learning device for children.		X	X				X
LB.	Female, part-time self-employed, mother of two children, two computers at home.	X			X	X		
AF.	Male, professional, married, infant child.	X		X	X			

**Table 1. Home Codes Summary (Cont'd)**

<b>Respondent</b>	<b>Shopping (HHShop)</b>	<b>Services (HHServ)</b>	<b>Learning (HHLearn)</b>	<b>Community (HHCmty)</b>	<b>Parenting, children, family (HHPCF)</b>	<b>Family calendar/events (HHCcalendar)</b>	<b>Medical, illness (HHMed)</b>	<b>Everyday routine (HHRoutine)</b>
Carol B.	X	X		X	X	X		
Jennifer P.			X		X	X		
Jenna D.	X	X			X	X		
April B.	X			X	X		X	
Amy B.	X	X	X	X	X		X	X
Matt C.	X	X		X	X	X		X
Debra G.	X	X			X	X	X	X
Sheri B.			X		X			
Laura B.			X		X			
Andrew F.	X		X		X			



**Figure 4: A participant's sketch of a calendar-based interface for the Family Portal**



**Figure 5: Paper artifacts are abundant in these areas. From left to right: DG2's kitchen counter, JP's refrigerator, and SF's computer desk.**