Personalization of PIM Functionality within Mobile Devices

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Introduction

There has been considerable discussion of the problem of information overload (e.g., Wurman, 1989), where there is simply too much information to be assimilated. People also suffer from communication overload, where they are expected to deal with possibly hundreds of communication events in a day, using a confusing array of devices, media, and modalities, such as mobile phones, pagers, fax machines, and email. Overly intense communication activity is stressful and can amplify the effects of information overload and lead to decreased productivity as the worker becomes distracted from performance of the most critical tasks.

The result of the increasing level of electronic communication and associated information and deliverables is a situation where people need to store increasing amounts of personal information. This information relates to the tasks they perform, the meetings they need to attend, their business and social contacts, and the deliverables that they are involved with. This places a particularly severe load on prospective memory, i.e., remembering what has to be done and what events are scheduled to occur in the future.

As a result, Personal Information Management systems (PIMs) are increasingly important in managing people's lives. PIMs are being built into handheld devices (e.g., Palm Pilot, mobile phones) and are available on desktop computers (e.g., Microsoft Outlook). However, people tend to differ widely in their preferences and needs for different types of information management, and groups of people may also have specific needs and requirements. Thus, there is considerable opportunity to enhance the usability and effectiveness of PIMs on mobile devices through personalization both at the level of the individual user, and for groups. Personalization of mobile devices can be achieved by customizing user interfaces or by employing user agents, acting on behalf of people. User agents become of special importance for mobile devices with limited user interface real estate.

Personalization can be researched and designed through the use of transaction logging, user profiling, machine reasoning, and user-centered design of communication services. New methods of user modeling and profiling will be required to gather data about mobile users.

Key research questions include:

1. how personalization of mobile devices is different from personalization of non-mobile devices
We suggest that mobile devices have a characteristic set of features than can be personalized. That set is typical of mobile devices and differs from those features that are characteristic of other systems (e.g. desktops). Table 1 shows some of the contrasting personalization features that are relevant to mobile and non-mobile devices respectively.

<table>
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<tr>
<th>Personalization features</th>
<th>Mobile device</th>
<th>Non-mobile devices</th>
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<tbody>
<tr>
<td></td>
<td>Urgency</td>
<td>Visual Layout and formatting</td>
</tr>
<tr>
<td></td>
<td>Use of environment context (location, proximity, co-presence),</td>
<td>Classification and sorting</td>
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<tr>
<td></td>
<td>Use of work context (e.g. tasks at hand; continuity of communication with co-workers)</td>
<td>Ergonomic design and adaptation of furniture and fixtures</td>
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<tr>
<td></td>
<td>The physical ergonomics of the device itself: shape, size, etc.</td>
<td>Design of environment (lighting, heating, sound, etc.)</td>
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<td></td>
<td>Application tailoring</td>
<td></td>
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<td></td>
<td>Input/output modalities (less manual input, less visual display)</td>
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**Table 1. Personalization in the context of mobile devices**

People are probably less patient when mobile and may want to handle only urgent communication. There is also considerable scope for personalizing mobile applications, since mobile devices can be tailored to do almost anything (e.g. inventory, day trading, telecommunications, etc.).

1. how user profiles and relationship rules required for personalization of mobile devices are to be collected,

2. In the remainder of this position paper we focus on PIM applications on mobile devices and how they can be tailored. An important aspect of PIM tools is their use to support different types of personal memory. In fact, all PIM operations can be classified in terms of different types of memory use. We have a particular interest in personalization of PIM functionality with respect to maintaining awareness of tasks and supporting different types of personal memory. We recently carried out a number of interviews to assess how people use PIMs in general and more specifically how PIMs were used to support prospective memory, as well as other types of memory (Gwizdka, 1999).

**Definition:** Prospective information is characterized by its reference to a specific time in the future, for example, to a future meeting. Prospective information retains value as time passes, eventually becoming information about past events (i.e., retrospective information).

Mobile devices are used to record phone numbers for retrospective memory; record future meetings for prospective memory; and keep information on current project and related communication for working memory. Later this information needs to be efficiently accessed.
Type of access depends on personal preferences. Table 2 shows how email and different PIM tools support various types of memory. Note that certain email messages may have only passing interest (such as "postcard" or "Hi, how are you?" type messages) which will be retained only briefly as an ephemeral type of information. Table 2 shows how Email serves many different memory and information management functions, whereas different PIM tools tend to relate to particular types of information/memory.

<table>
<thead>
<tr>
<th>Information type</th>
<th>Email</th>
<th>PIM tools</th>
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<tbody>
<tr>
<td></td>
<td>date book</td>
<td>to-do</td>
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<tr>
<td>prospective</td>
<td>V</td>
<td>V</td>
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<tr>
<td>working</td>
<td>V</td>
<td></td>
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<tr>
<td>ephemeral</td>
<td>V</td>
<td></td>
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<tr>
<td>retrospective</td>
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Table 2. PIM tools use for different information types.

**Need for personalization**

Personalized technologies are beneficial in domains with complex tasks, routine tasks, complex devices, and complex interfaces (and particularly where there is rapid change and integration among them) – these attributes are all characteristic of both mobile devices and PIM applications. Moreover, personalization addresses differences among users and groups of users who each have special preferences, requirements, and abilities. Personalization guides the agents responsible for performing routine tasks on behalf of the users they represent, and it allows for the creation of customized, adaptive user interfaces.

In order to customize applications and services to individual needs, it is necessary to build a user model upon which interface adaptation will be based or upon which agents will act. User models represent the apparent regularities and consistencies of individual behaviour and intentions over time, and are used to predict reactions and future behaviour. Thus, a user model serves as an inference mechanism to differentiate between users (Allen, 1997). The complex domains of mobile devices and PIMs are ideal for the creation and application of user models.

**Personalizing PIMs**

Based on various focus groups, informal interviews, and anecdotal evidence, we have identified aspects of mobile PIMs that are amenable to personalization. It is apparent that there are many types of PIM users, each with different styles, preferences, and requirements. Users differ in terms of their application use: some use only the contact manager; others use only calendar functionality. Users differ in their locations of PIM use: some are regularly mobile, while others only use their PIMs in a few places. Some users are very hands-on, requiring understanding and control over the system, while others prefer to be oblivious to the mechanics of their PIMs and not be overwhelmed by a variety of options. As found in our recent study (Gwizdka, 1999), people also differ greatly in their preferences for reminding about events (activated by
prospective information). Some people routinely check their date books every morning to remind themselves about upcoming meetings while others need to set alarms in their mobile devices as active reminder functions.

Because PIMs represent different aspects of an individual’s life (e.g. contacts, schedules, communications), there is a natural desire among users for an integration of these facets. Given the many different reasons for and styles of PIM use, there is no single standard method of integrating these aspects. In fact, users often complain about the lack of integration among features of PIMs. Moreover, users have different notions of what should be (if at all) the central function of a PIM; some users are contact/communication-oriented, while others are schedule-oriented. Possible approaches to personalizing mobile PIM devices include providing different:

- interfaces for applications
- combinations of applications and services
- levels of integration between applications/services
- levels of integration with desktop and Web-based applications
- amounts of terseness or summarization in interaction dialogues

Conclusions

Personalization of mobile devices is one of a number of areas of research and development for increasing the functionality of mobile devices. Based on various interviews and focus groups that we have conducted we suggest that personalization needs to be contextually defined in terms of the tasks and situations in which a device is to be used. Personalization of PIM tools for instance, is highly dependent on the tasks that a person performs and the contexts in which those tasks are performed.

Our discussion of personalization of mobile devices has focused on personal information management services. We have found that an examination of different memory types is critical to understand how to personalize PIM functions. Approaches to personalization should also be extended to other services, where further research will be required to determine what the relevant foci or targets of personalization should be.

Implementing personalized PIM functionality on mobile devices will influence interoperability of mobile and other (non-mobile) devices. In our studies, for instance, we have been looking at the interaction between mobile PIM devices and desktop PIMs. In many cases, the best architectural solution may involve having the information archived on the Web with multiple views of that information available through a range of different clients including various mobile devices and desktop machines. Personalization will then supplement the information formatting and tailoring that will be required to fit it to the various devices that a specific user works with at different times.

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Bibliography


