The Associative PDA: An organic user interface for mobile personal information management

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ABSTRACT
In this paper, we describe the ongoing design process of the Associative PDA, a ubiquitous device for personal information management (PIM) in an associative network. We present the results of a contextual study, we have conducted, indicating several problems of current PIM systems, and then explain why the Associative PDA can avoid them. Finally, we give a brief outlook of our design ideas and future work.

Keywords
Personal information management, ubiquitous device, user study, ethnography

INTRODUCTION
Personal information management is a highly individual and creative task. Information is arranged in multiple hierarchies [1] and scattered and isolated across applications, formats, and devices. Further, the user is often forced to sort information immediately upon storage into ambiguous classification systems, which is a difficult task [2]. We believe a good solution is to unify the personal information space in a ubiquitous device, we call the Associative PDA, where information is stored in a network of associations, connecting related items. To find information, the network is simply traversed or a search is performed in the shared neighborhoods of relevant items.

To better support PIM tasks, we need to know what these tasks are and how they are solved in the field. Therefore, two key questions of our design are: what are recurring examples of PIM activities and what specific strategies are employed to support them. While there have been many efforts of describing PIM activities in general, for instance in [3], the actual observation of such activities in the field is usually limited to a very narrow scope, like the observation of search behavior in [4]. To capture a broader spectrum of PIM behavior we have observed users in their natural work environment, using the contextual inquiry technique introduced in [5].

The Associative PDA is also an example of an Organic User Interface (OUI) [6]. OUIs respect and are inspired by the natural laws of physics, biology, and human cognition. The movement of a school of fish, a highly complex structure, appears calm, continuous, and fluid; it is 'organic'. Likewise, ubiquitous devices should seamlessly blend into their environment. A system based on associations is a good premise for the realization of an OUI because a viable model of human memory, the semantic network, is also based on associations [7]. The interface of such a system can draw on an intuitive understanding of the underlying model by the user.

OBSERVATION OF PIM ACTIVITIES
We have observed ten users in the field: a university professor, several PhD students, a shopkeeper, a lawyer, a clinic director, a staff manager, a field test coordinator, and a technical supervisor. Ages range from 28 to 60, and of the ten participants two were female. All participants are experienced computer users and have a long-established PIM system in place.

The focus of the contextual inquiry was to identify common PIM tasks and strategies, and how they are supported by the employed system. In addition, the users were asked to give a tour, similar to that described in [1, 3], of all information items in both their physical and digital office.

KEY FINDINGS

Activities
Workers need to respond to external requests and sometimes delegate tasks to others. They need to coordinate with others, schedule appointments, and share information. Further, they need to store and retrieve ideas, decisions, and activities, as well as documents. Filing of new information happens during storage, later, or never.

Strategies
Every task is planned and processed in a queue according to subjective importance, which depends on personal importance, urgency, and complexity of the task. Planning is done immediately upon the arrival of a new task. Unstructured piles are used to explicitly remind of future activities. The classification system is unified across the whole system and respects and visualizes all useful relationships between any two information items. When

items are encountered, which relationship is not reflected, the classification system is extended.

Problems

Requests cannot always be pursued or even recorded properly upon retrieval, especially in a mobile setting. Classification hierarchies are ambiguous and evolve over time. Compromising strategies, like spatial arrangement, are used to overcome insufficiencies of classification systems.

DISCUSSION

The findings of our study have opened several entry points for new design ideas. We want to pursue especially the challenge of supporting a mobile setting, and the problem of ambiguity and evolution of classification hierarchies. The Associative PDA is a prime candidate for the following reasons: (1) as a ubiquitous device, unifying all the personal information of the user, it is always present when PIM activities are happening; and (2) with the associative network information can be organized in an unambiguous and extremely flexible way.

For several participants of our study, we have found that their PIM systems break down when new requests are encountered that cannot be processed or stored immediately. Consequently, these requests are either remembered too late or entirely forgotten. If, on the other hand, the user is able to carry her PIM system with her at all times, she can handle incoming requests independent of her physical location. This can be achieved by unifying the entire information space into one portable device.

We found also that classification by keyword has several problems: (1) keywords are ambiguous, which can lead to inconsistency in the hierarchy and increased effort in search activities; (2) the hierarchy needs to evolve to the same degree as the information space grows; and (3) related items cannot be linked directly. By using associations instead, these problems can be circumvented, because associations are never ambiguous, the associative network evolves naturally, and related items can be connected directly.

DESIGN AND FUTURE WORK

As a next step, we will conduct a user evaluation using storyboards to investigate whether our idea of how the Associative PDA will work is feasible. Subsequently, we will create a series of prototypes of increasing complexity and test them with potential users. In conclusion, we will conduct an extensive user evaluation with our final prototype to prove the usefulness of our approach.

Figure 1 shows an early design idea. The device is the size of a normal PDA with a high-resolution touch-screen and an attached keyboard. The screen contains a tabbed view with a history of visited items at the bottom. A new default view can be opened at any time by touching the asterisk symbol. The selected information item is in the center, surrounded by related items, which size depends on their importance. The "dial" can be browsed in discrete rotations to reveal more related items, which can be selected by touching them. The keyboard is used to perform a search in the open view or to enter data.

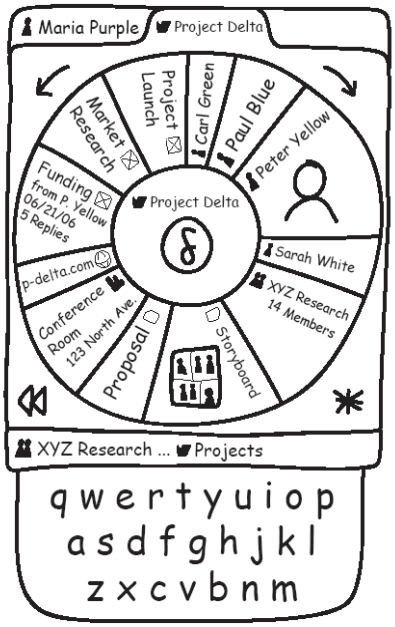

Figure 1. Sketch of the Dial Design

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