Supporting Human Memory in Personal Information Management

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Abstract

In their daily lives people constantly interact with a wide range of electronically stored information objects; email messages, web pages, digital images, video samples, etc.. These objects come from different sources, are in different formats and can be stored in different locations, including on distributed devices such as mobile phones, PDAs and MP3 players. The wealth and diversity of digital information that people access and use makes it incredibly difficult for an individual to organise his / her information in such a way that it can be re-accessed and re-used when it is needed in the future. Personal information management (PIM) as a research field covers attempts to understand PIM behaviour and develop systems to help people manage and re-find their information effectively.

Our research investigates PIM from the perspective of the psychology of memory. Re-finding information is different from finding information that has not been accessed before and involves different psychological processes. Whereas ***finding*** involves understanding an information need and recognising information that is relevant, ***re-finding*** relies on memory. When re-finding information, the user knows that the information they are looking for exists because they have seen it before. The details remembered are clues to help re-access the information, while the details forgotten represent the barrier to re-finding. However, current PIM tools require specific attributes of information objects to be remembered and consequently make it difficult to re-access and re-use information. This means that the problems associated with managing and re-finding personal information are related both to the limitations of human memory and to the failure of PIM tools to account for these limitations.

Our research is based on the premise that PIM tools should support the function of memory and has three objectives: 1) To develop an increased understanding of the role memory plays in the management of personal information. What do people remember about their information objects, how do they use these recollections when re-finding, and what factors influence what people remember and use? 2) To design, implement and evaluate PIM tools that have been specifically designed to support characteristics of human memory. 3) To address the difficulties involved in performing PIM evaluations.

The work is grounded by the theoretical understanding of how memory works. A review of appropriate cognitive psychology literature offers a means to critique existing PIM tools and a basis from which to start designing novel tools that support the function of memory. Building on this, our early experimental work compares PIM behaviour to everyday memory problems, examining the problems people encounter and the strategies they employ to prevent and recover from memory lapses. We uncover a range of memory problems and solutions and relate these to the memory difficulties experienced in a PIM context. By combining the psychology findings with the particpants' explanations for the behavioural changes they make to prevent and recover from memory lapses, we develop a set of design principles for PIM tools that are hypothesized to assist the user when re-finding. Using these principles we develop two novel re-finding interfaces - one for personal photographs and one for personal email messages and evaluate these using current tools as benchmarks.

The evaluation work not only allows the interfaces themselves to be evaluated, but also offers the chance to learn about what the experimental participants remember about the information they

need to re-find. In this respect, we discover that for both email messages and personal photographs, what people tend to remember is the context surrounding previous interactions with the sought after photograph(s) / email message(s). However, our findings suggest that people tend to have fuller recollections of the emails they need to re-find, with recollections for photographs being more fragmented. Another important finding from the email study is that people tend to remember different attributes of email messages in different situations and that the attributes remembered will depend on a number of factors, including the time that has elapsed since the information was last accessed, the amount of experience the participant has with re-finding, the number of email messages in their collection, the way that they file their email messages, and their preferred means of re-finding.

The evaluation of the interfaces also allows several discoveries to be made regarding which features of the evaluated interfaces are supportive and which are restrictive, as well as the reasons why. The main finding, however, is that, like recollections, the interface features that help participants re-find change in different situations. Therefore, flexibility is crucial to PIM interfaces. It is important that PIM interfaces support multiple varieties of memory so that different memories can be used in different situations. The evaluations also highlight the usefulness of supporting visual memory, which few existing PIM tools and research prototypes support. Another finding is that it can be helpful when PIM interfaces supply cues to help people remember more about the information they need to find. However, again the evaluations reveal that different types of memory cues are useful in different situations. Therefore, it is important that the PIM tool designers consider the factors that our studies show to affect this: the type of information object being re-found, the tasks that cause people to re-find this type of object, and re-finding strategies that the participants may already have.

The method of evaluation used is in itself a contribution to the field of PIM. A major limitation of the PIM research performed to date is that few tool evaluations have been performed. Several scholars have proposed that this situation stems from the difficulties involved in conducting evaluations. The difficulties include incorporating the personal connections people have with their own information in evaluations, creating balanced experimental designs, preparing experimental tasks, and protecting the privacy of participants. Based on a study of the types of task that cause people to re-find email messages and web pages, we propose, evaluate and then use a methodology for performing PIM evaluations that overcomes difficulties outlined above.

Our work, therefore, offers contributions associated with each of our three objectives. We offer an increased understanding of the role of memory in PIM, provide insight into how PIM tools can be designed to support human memory, and propose a method of evaluation that allows PIM behaviour and interfaces to be studied with a laboratory-based approach.