The proliferation of telecommunication networks, like Internet and Bitnet, has promoted electronic mail (e-mail) into a viable business communication tool with widespread use that traverses all levels of management. In some organizations, e-mail users are being overwhelmed with a barrage of useless messages or “electronic junk” mail. This interferes with a user’s information processing capability and causes a negative effect on usefulness of this communication tool. This paper addresses the issue of time management by reducing information overload in e-mail. A knowledge-based agent, called AIMS, was developed to prioritize e-mail messages. AIMS is different from other systems in three ways: 1) it does not burden users with the task of creating or maintaining message prioritizing rules, 2) it uses a user’s personal knowledge (or preferences) with organizational considerations for prioritizing messages, and 3) it was evaluated at an academic institution with a group of 46 e-mail users who found the prioritized list generated by AIMS highly accurate.

The proliferation of computers and telecommunication networks has encouraged a rampant use of electronic mail (e-mail) in organizations. For example, Travelers Insurance Corp. has over 30,000 e-mail users worldwide. Similarly, several studies report that e-mail usage has spread to all levels of the organization, including top-management (Markus, 1988). The popularity of e-mail has soared because it provides the flexibility to communicate from any place, at any time, and to any person without worrying about their physical location and presence. In addition, the cost of sending messages via telecommunication networks, like Internet, is less than two cents a page, compared with $2 for a fax, and 29 cents for a letter. (de Llosa, 1993).

Although organizations welcome the increased use of this new communication medium, e-mail has its limitations. A meta analysis study on the usage of all electronic media (Rice & Shook, 1990) placed e-mail at the middle of the information richness/social presence scale because it transmits very few non-verbal cues. This characteristic makes e-mail attractive mainly for exchanging routine information (Crawford, 1982; Sumner, 1988), such as announcements and for-your-information type messages, that require quick and massive distribution. It also explains the increase in demand for message distribution lists (Mackay, 1990) which provide an easy mechanism for disseminating electronic junk (Denning, 1982).

In organizations where e-mail has matured extensively, users are being overwhelmed with a barrage of electronic junk mail (Malone et al., 1987a). This has resulted in stretching the human information processing capability (message screening skills) to a point where users experience message overload (Hiltz & Turoff, 1981). Users experiencing overload either filter or ignore their messages randomly (Miller, 1984) often missing useful information. Some organizations have even issued specific guidelines to restrict electronic junk mail (Redding, 1984).
Consequently, the widespread use of e-mail has increased the work load of e-mail users. A recent case study (Mackay, 1990) on people using e-mail under the condition of information overload identifies three different work patterns utilized by users to manage their messages. First, there are “prioritizers” who are interested mainly in managing time by identifying and prioritizing important messages on certain criteria before reading. Second, there are “archivers” who are interested mainly in managing information by archiving the messages into folders to read at a later date. Finally, there are “requesters and performers” interested mainly in managing tasks by delegating the actions (such as remind me, for your information, please reply to) to their subordinates. Thus future e-mail systems should address the three issues time management, information management, and task management to help users in managing message overload (Mackay, 1990).

This paper addresses the issue of time management by providing a knowledge-based agent to prioritize messages using each user’s personal preferences for several reasons. First, users from the Mackay, et al. 1990, rated time management as more important than managing information or task. Second, the scope of AIMS was limited to decision support using expert systems application. A solution to information management problem is more appropriate for intelligent DBMS. While task management is a complex problem which can be addressed in the future. However, all three are important issues in managing information overload and should be integrated into a single system in the future.

There is some consensus among researchers developing systems for managing user’s time (Malone, et al., 1987a; Boyle & Clark, 1985; Chang & Leung, 1987; Pollack, 1988). All of them have addressed the issue of time management by providing mechanisms to assist users in filtering or prioritizing e-mail messages through knowledge-based (or expert system) approaches. However, none of these systems have been adequately evaluated from a user’s perspective, that is, does a user agree or disagree with the filtering decisions of the system? This research addresses this problem by comparing the prioritized message list generated by our system with the prioritized message list generated manually by a user.

The next section reviews relevant research on intelligent e-mail filtering systems addressing the issue of time management through prioritization of messages. The third section discusses the methodology employed for design, development, and evaluation of An Intelligent Mail System (AIMS). The final section concludes the paper with a discussion on implication of AIMS on time management and future research directions.

Previous Research

The issue of time management in e-mail is still at an infancy stage, therefore only a few research systems have addressed this issue. Motiwalla and Aiken (1993) found 14 intelligent mail systems that have attempted to provide systems to assist users in a combination of time and information management tasks. Four of these systems have specifically addressed the issue of time management through intelligent systems to filter and prioritize messages which is also the focus of our system. Hence, this section reviews these systems in detail to identify some common trends which can be compared and contrasted with our system later.

The first system is an Intelligent Mail Filter (IMAIL) system (Boyle & Clark, 1985). This system provided an information filtering mechanism to prioritize messages. It created active and passive user profiles which were matched with the keywords extracted from messages on an electronic bulletin board to compute a total score for each message which was used to prioritize messages. Each user profile consisted of keywords, relations between keywords, and numeric weights for each keyword. Active user profiles were created by explicitly asking each subject for the criteria they used for prioritizing and filtering messages, while passive profiles were created by implicit observation of user action on their messages. This system was built as a stand-alone prototype in the Prolog programming language. It was not linked to an e-mail system nor was it evaluated by the users. Nonetheless, this system provided some good ideas for message filtering. For example, the authors suggested that a future system should provide rules to show messages scoring above a certain threshold to the user or sort messages by the score and present all the messages in a sorted order to the user.

The second system was the Information Lens system (Malone, et al., 1987a). This system allowed a user to compose messages in semi-structured templates. These templates were distributed on a network to receivers who specified rules to automatically filter and classify the templates according to their preferences. Although the Lens system provided several features for message filtering, our focus was on how it helped users in prioritizing messages. In order to prioritize messages users were required to create rules, via template editors, which were used to classify a message as important. Messages classified as “important” were then moved to an “urgent” folder. Users overloaded with messages can read their important messages from this urgent folder. The evaluation of this system was done with a research group of five members for a year.

The third system was the Knowledge-based Message Management System (Chang & Leung, 1987) or KMMS which used a linguistic message filter and an expert system to automatically process mail messages. The linguistic filter used message frequency, length, relevance (determined from message and user profiles), and network traffic patterns to classify messages into one of three categories: J for junk messages, G for general processing mail, and I for messages requiring immediate action. This classification was used by an expert system consisting of personal rules to trigger actions, such as performing database retrievals, office and filing activi-
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