All talk and all action: strategies for managing voicemail messages

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ABSTRACT
Voicemail is a pervasive technology, but we know little about how users manage voice messages in executing everyday work. We analyze server logs, user surveys and interviews to identify three problems users experience in managing their voicemail: *scanning, information extraction* and *search.* We also isolate three distinct voicemail processing strategies, and discuss the relative merits of each strategy. We make recommendations about how voicemail might be redesigned to better address these problems and support these strategies.

Keywords
Voicemail, speech archives, workplace communication

INTRODUCTION

Workplace communication is critical to workgroup success: successful interaction contributes to increased productivity whereas breakdowns may lead to project failure [1]. Numerous studies have examined various communication technologies, ranging from basic pen-and-paper to newer technologies such as email, videoconferencing, MUDs and shared workspaces. Despite the fact that voicemail is more pervasive than any of these newer technologies, and is a preferred communication mode for some workgroups even when email is available [2], we lack basic information about how people access and manage voicemail in everyday workplace tasks.

As we discuss below, voicemail messages contain complex information, not simple *"call me back"* requests: *"[a voicemail message] is really like a whole memo, or a huge email message worth of information."* Furthermore, voicemail often substitutes for a series of face-to-face meetings: *"entire transactions or entire tasks are accomplished by exchanging [voicemail] messages. That is, you will never talk to the person in real time."* What problems do users experience in accessing voicemail and what strategies do they adopt to address these problems?

To address these issues, we collected both qualitative and quantitative data about how a typical voicemail system, Audix™, is used, including: (a) server data from 782 active users for 21 days, including # and duration of sessions, # of messages sent/received and amount of information archived (measured in seconds); (b) surveys from 133 high volume users (people receiving > 10 messages/day), including # messages sent/received, access strategies and note-taking behaviors, archiving behaviors, feature use, limitations and potential improvements to the interface; (c) interviews with 15 high volume users addressing the survey issues in more detail. We wanted to identify users' problems and strategies in managing voicemail and make recommendations about how voicemail interfaces could be redesigned. We were also interested in whether message handling strategies observed for email [3] would generalize to voicemail.

USAGE, PROBLEMS AND PROCESSING STRATEGIES

The server data show intensive voicemail use: users accessed the system a mean of 7.1 times each working day, receiving 8.7 messages, and storing 4.8 mins. of messages overnight. The high volume users we surveyed reported accessing voicemail 10.3 times/day, encountering 4.6 new messages each session, receiving 18.3 and sending 14.1 messages per day. They archived 3.7 messages. Voicemail messages also contained significant amounts of information: about half those surveyed reported average message lengths of between 30-60s and about half reported lengths of 1-2 mins.

Users report three main problems in processing voicemail. These are: *scanning* the inbox sequentially to identify urgent incoming messages; *extracting information* from messages; and *searching* the archive of stored messages.

Scanning is important for users accessing the mailbox under time constraints (e.g. during a meeting break). Few users we surveyed use voicemail message headers to recognize urgent messages, reporting they are too slow. Instead they listen to the first few seconds of each message for qualities such as the speaker's tone of voice, to determine whether a message requires immediate action.

When a relevant message is identified, users then have to *extract* critical information from it. This can be a laborious process involving repeatedly listening for verbatim facts such as caller's name and phone number. Multiple listens are also necessary with vague or highly detailed messages. To avoid repetitive processing, 72% of our survey users reported "almost always" taking written notes, and some transcribed the message verbatim onto paper.

Table 1: Strategies for processing voicemail

Strategy	Definition	% users	Mean # sessions	Session length (secs)	Storage used (secs)	# messages received
Do it now	>75% daytime sessions always < 90% full	57	96	140	251	111
Scan & procrastinate	<75% daytime sessions always < 90% full	32	125	256	318	141
Hoard & search	<75% daytime sessions sometimes > 90% full	11	135	277	453	202

Users also have to *search* the archive for saved messages. Most users never build up a detailed model of their archive and 76% of those surveyed report that "listening to each message in sequence" is their standard procedure for finding archived messages. The linear nature of mailbox search makes search onerous when more than a few messages are stored: *"if I've got 20 messages stored … and I want that last message, it's a real pain to get to that last message. And … most of the time I don't even know what message I want to get to."*

User interviews suggest 3 distinct processing strategies: **Do it now** (DIN), **Scan and procrastinate** (SAP); and **Hoard and Search** (HAS). DINs access voicemail as it arrives. They process each message immediately, either responding by voicemail or committing the message to paper, then delete the original. In both cases the message is accessed only once. SAPs also **want** to process messages on arrival, but often access voicemail under time constraints. Thus, their daytime accesses usually consist of scanning for high priority messages and responding to these, then processing the remaining messages in a later clean-up session, often outside working hours. Finally, HASs typically employ their mailboxes as todo lists and archives, in conjunction with sparse notes which they discard when the message is discharged. They save almost all messages and repeatedly access these, often outside working hours. HASs seldom bother to clean out their mailboxes until prompted by the system that they have exceeded their storage quota.

Table 1 shows the server data. User strategies are defined in terms of percent accesses occurring outside working hours, and likelihood of the mailbox being full. These data reveal trade-offs between the different strategies: DIN users have fewer sessions and spend less time overall in voicemail than SAPs and HASs. (All differences discussed are significant at $p<.05$ on one-way ANOVAs). They benefit from processing most messages only once. When needed, archival search is more efficient because of DINs' smaller archives. In contrast both SAPs and DINs incur efficiency costs by accessing larger archives multiple times. Although both SAPs and DINs have equivalent numbers of sessions are of approximately equal length, SAPs spend more time per message than HASs. This may be attributable to their "clean-up" sessions. However, by not cleaning up, HASs risk exceeding their mailbox quota and consequent mail delivery failures. The data also suggest that incoming message volume might lead users to adopt different strategies with DINs receiving fewer messages than SAPs and HASs. Another factor is job type. While DIN appear most efficient, other users may be forced to adopt alternative strategies as time constraints preclude them from completely processing all messages.

REDESIGNING VOICEMAIL TO FIT USER STRATEGIES

How might we change voicemail to overcome technology limitations and better fit user strategies? Four possible techniques might help SAPs and HASs with inbox *scanning*: (a) search of message contents; (b) viewing messages by features such as sender name or phone #; (c) filtering by those features; (d) sampling, where the system plays a short but critical fragment from each message in turn. All users experienced problems with *information extraction.* Possible techniques here are: transcript based indexing - using transcripts from speech recognition as indices to guide user playback of relevant message elements; automatic data field extraction - for key pieces of information (e.g. return phone #). Finally HASs and SAPs have to *search* large voice archives. Again they might benefit from the scanning techniques described above. We might also want support folder systems or to represent the different status of messages (e.g. new, working or archived) in a manner similar to email. Lastly, the striking similarity between voicemail processing strategies and those for email [3] suggests highly general user techniques for message handling.

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