Association for Information Systems
AIS Electronic Library (AISeL)

AMCIS 2005 Proceedings

Americas Conference on Information Systems (AMCIS)

2005

The Use of Interface Agents for eMail in Critical Incidents

Alexander Serenko
Lakehead University, aserenko@lakeheadu.ca

The Use of Interface Agents for Email in Critical Incidents

Alexander Serenko
Lakehead University
aserenko@lakeheadu.ca

ABSTRACT

This study reports on several typical scenarios of the use of email interface agents under the influence of critical incidents. The critical incident technique was employed to survey the actual users of an interface agent-based email notification application. Respondents were asked to provide the last most significant either positive or negative incident of the usage of interface agents in their email application, and sixty critical incidents were obtained. With regards to positive-outcome situations, one representative scenario was constructed. With respect to the negative-outcome events, three distinct scenarios were identified. Overall, it is concluded that users acknowledge the quality of an agent when it acts reliably, marketers should advertise only realistic agent capabilities, an agent's intrusive behavior results in an immediate agent usage termination, operability issues sometimes force people to reject the technology, and users attempt to preserve the employment of an agent under the negative impacts of external factors.

Keywords

Interface agents, human-agent interaction, email notification, critical incident technique.

INTRODUCTION

The purpose of this paper is to investigate how individuals use interface agents in their electronic mail applications under the influence of critical incidents. An interface agent is a reactive (adapts its behavior under the changes in the external environment), continuous (long-lived), collaborative (collaborates with other agents or electronic processes), and autonomous (independent) visual computational system that acts on a user's behalf by communicating directly with a person offering assistance in performing computer-related tasks. An interface agent is in charge of interacting with the user; it should directly communicate with the person through the input and output of the user interface (Lieberman and Selker, 2003). The goal of an interface agent is to accept user requests, direct them to computer devices or other agents, monitor task execution, and report back to the user. Agents add graphics or animation to the interface, use speech input and output, and communicate via other sensory devices. They may be employed in virtually any kind of software system including email applications (Maes, 1994).

One of the most salient reasons for incorporating interface agents in email systems is their ability to transform the way people utilize this text-based computer telecommunications medium. As reflected by the extensive number of research projects in this area, there has been a strong interest in incorporating interface agents in email applications in the last years (Bergman, Griss and Staelin, 2002). At the root of this interest is the vision that agents will become a long-term solution for providing user assistance in tackling the currently challenging task of email management.

The specific interest in interface agents as electronic communication support tools lies in their ability to offer a new model of human-system interaction. In fact, interface agents possess many capabilities that may be successfully employed in email. For instance, they may: **reduce information overload** associated with electronic communication (Segal and Kephart, 1999); **speed up information exchange** by serving as intelligent information acceleration tools (Karnouskos and Vasilakos, 2002); **connect together different parts of distributed messaging systems** in a heterogeneous network (Sekiba, Kitagata, Suganuma, Kinoshita, Okada and Shiratori, 1998); and, **serve as intelligent and personalizable interfaces** (Kautz, Selman and Coen, 1994). It is these potential benefits for both end users and organizations that raise awareness and interest in email interface agents.

Despite this potential, there seems to be a gap between the expected user adoption of interface agents and their actual acceptance in both electronic messaging systems and other applications. Many projects have been **technology-focused** rather than **problem-focused**. These studies tend to look at the technical characteristics and capabilities of interface agents and value technical realizations of agent-based systems over that of user testing. The literature fails to provide clear evidence of the benefits of utilizing interface agents, and the results of past empirical studies on the usefulness and user adoption of interface agent technologies appear to be mixed and inconsistent (Dehn and van Mulken, 2000).

One of the factors that lie in the root of this issue is that most prior investigations were conducted in laboratory settings. On the one hand, the applicability of laboratory experiments has been successfully addressed in several MIS areas, for example, in usability studies (Rubin, 1994). For instance, the laboratory experiment may produce statistically valid and generalizable results with respect to a new computer interface because the perceptions of its usefulness and ease of use may be established during a brief tutorial or an experiment with this technology (Davis, 1989). On the other hand, laboratory investigations may not produce results generalizable to the entire population of interface agent users. As hypothesized by Dehn and van Mulken (2000), in contrast to other information technologies, adequate perceptions of interface agents may take some time to establish. For example, the usage behavior towards an interface agent of a person who explored it during a few-hour experiment may differ from that of an individual who utilized this agent for several weeks or months. More research is needed to bridge the gap between unconvincing and conflicting conclusions of past experiments. With respect to email interface agents, the majority of recent projects were published in the form of technical reports rather than journal articles. Those technical reports explore technological aspects of a system leaving out user experience, perception, satisfaction, and adoption of the application (Helfman and Isbell, 1995, Bergman et al., 2002). More importantly, the extant literature does not report on how actual users employ interface agents in various software environments including electronic mail systems.

As one of the first attempts to fill that void, this study reports on how actual users employ interface agents in their email applications. Particularly, given that it is relatively difficult to analyze all possible usage forms and circumstances in a single project, this investigation offers a detailed description of email interface agent usage in cases of positive and negative critical incidents. A critical incident is an event that a user perceives highly significant because it lead to either success or failure. For example, a positive incident might be when an interface agent helped a person to complete an email-related task effectively, efficiently, or enjoyably. A negative incident might be when an interface agent hindered the completion of an email task. It is believed that the awareness of researchers and practitioners with this information may potentially shed some light on actual user behavior that may lead to the creation of really useful email interface agents accepted by end-users. The following research question is suggested:

> What are the typical scenarios of behaviors of email interface agent users under the influence of positive and negative critical incidents?

In order to answer this research question, the critical incident technique is utilized. The following section of this paper describes this approach in detail.

THE CRITICAL INCIDENT TECHNIQUE

The critical incident technique (CIT) (Flanagan, 1954) is a flexible set of principles for gathering certain important facts concerning behavior in defined situations to facilitate the potential usefulness of obtained information in solving practical problems and developing broad psychological principles. An incident is "any observable human activity that is sufficiently complete in itself to permit inferences and predictions to be made about the person performing the act" (Flanagan, 1954, p. 327). Each incident should have a high degree of significance; a critical incident is considered effective (or positive) if it helps to solve a problem, or ineffective (or negative) if it fails to solve a problem, creates new problems or facilitates the need for further actions. The technique is based on the assumption that people can report critical incidents on their own (Koenemann-Belliveau, Carroll, Rosson and Singley, 1994).

The key goal of the employment of the critical incident technique is to build several typical scenarios of email interface agents usage under the influence of positive or negative critical events. These scenarios may be presented graphically as a set of constructs and their relationships. The purpose of these scenarios is to form an understanding of user behavior in cases of positive and negative critical incidents. It is expected to discover significant differences in user actions, feelings, and behavior changes in cases of positive and negative incidents.

The critical incident technique produces reliable, valid, and generalizable results (Ronan and Latham, 1974). Data may be analyzed qualitatively by using a variety of methods. Mailed questionnaires produce the same results as those obtained by interview methods given that respondents are motivated to read the instructions and answer consciously (Andersson and Nilsson, 1964). Especially, self-administered surveys are acceptable for open-ended, self-reported items (Wang, Hsieh and Huan, 2000).

The CIT minimum sample size requirements depend on the nature of the phenomenon of interest. If an activity is relatively simple, it may be sufficient to collect only 50 incidents; most recent studies examined 50 to 100 incidents (Urquhart, Light, Thomas, Barker, Yeoman, Cooper, Armstrong, Fenton, Lonsdale and Spink, 2003). CIT was applied in various business administration fields, for example, organizational behavior (Cowie, Naylor, Rivers, Smith and Pereira, 2002), marketing (Jones, 1999), and information technology (Muylle, Moenaert and Despontin, 2004, Tay and Ang, 1994). The technique is

particularly appropriate when the field is new and the goals of research include practical managerial problems and theory development (Keaveney, 1995).

Overall, it is believed that the use of the critical incident technique may provide an adequate and realistic description of behaviors of interface agent users.

METHODOLOGY

In order to answer the study's research question, an online self-administered survey of the actual users of email interface agents was conducted. The following subsections describe the methodology in detail.

Interface Agent Email Notification Applications

An exhaustive online search for interface agent-based email applications demonstrates that there are at least eleven products available on the market. All of them are referred to as 'email notification systems.' Their purpose is to inform users about incoming messages, to provide an intelligent interface between human users and other parts of a system, and to offer a variety of communicative, entertaining, and information management functions. Out of these applications, Email Announcer developed by Blind Bat Software (http://www.blindbat.com) was randomly chosen by the researcher. Figure 1 offers the screenshots of an agent's interface and configuration environment.

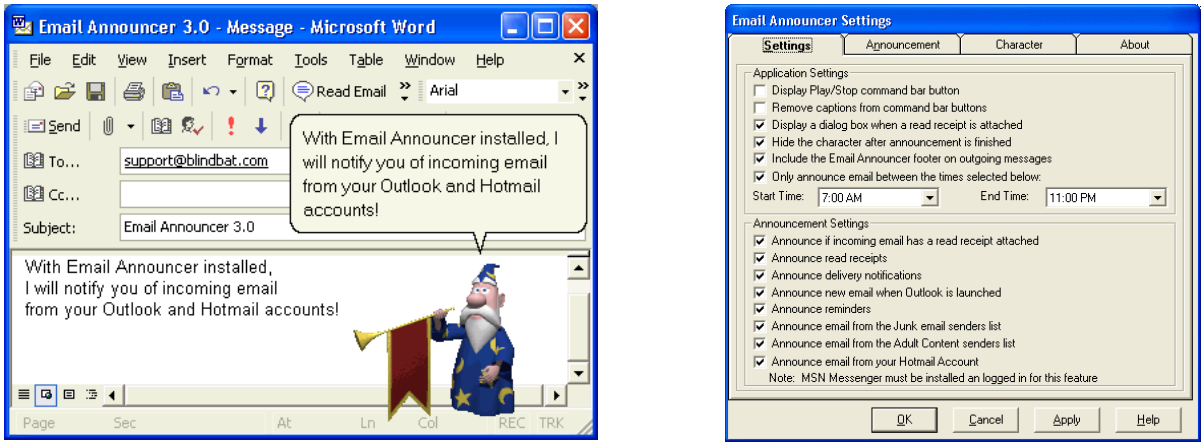

Figure 1: Email Announcer Developed by Blind Bat Software – Agent Interface and Configuration Environment

Questionnaire Design and Implementation

By drawing upon previous investigations that utilized CIT (Johnson and Fauske, 2000, Wang et al., 2000), the study's participants were asked to provide either one positive or one negative critical incident covering the following points (see Table 1).

A list of potential respondents to the survey was randomly formed by the researcher from the company customer database. In order to reduce self-selection bias (Dillman, 1999), all potential respondents were emailed an initial participation request and three follow-up reminders. Demographic data were also obtained. The data were collected as part of a larger project.

Instructions	
Please answer the eight questions below with respect to the last most significant **POSITIVE** or **NEGATIVE** incident of usage of interface agents in an email application (e.g., a positive incident might be when an interface agent helped you to complete a task in your email application effectively, efficiently, or enjoyably. A negative incident might be when an interface agent hindered the completion of a task in your email application).	
N	**Question**
Was this incident positive or negative? (positive / negative checkboxes)	
1	Provide a complete and detailed description of this incident and indicate how long ago (e.g., days, weeks, months) it took place.
2	What was the outcome of this incident?
3	Why do you consider this incident critical?
4	What were you feelings and perceptions of this situation?
5	What actions did you take during the incident?
6	Did you change the way you use interface agents after that? If yes, please specify.
7	How often does a similar situation occur(ed) when you use(d) interface agents in your email applications (e.g., days, weeks, months, never again)?

Table 1: The Questionnaire

RESULTS

During the survey, an acceptable response rate was achieved that compares favorably to those of other similar studies. Note that the actual response rate may not be revealed as per the non-disclosure agreement with Blind Bat Software. Sixty critical incidents were provided, 30 of them were positive and 30 negative.

Eighty and twenty percent of the surveyed users were male and female respectively. User age ranged from 20 to 65 years old. Over 65% of all users were between 31 and 50 years old. The 46 – 50 age category was the most frequent user group. Fifty-five percent of the respondents were occupied in the information technology sector, eight percent in the engineering industry, and 37% in other professions. The majority of users were well-educated; 81% of them had a college/university degree. Sixty-three percent of respondents resided in the USA, 12% in the European Union countries, followed by Canada, Australia, and New Zealand. They were very heavy email users, and were financially well-off. Overall, it was concluded that this user population corresponded to innovators (Rogers, 1995), who constitute 2.5% of all people that adopt a particular product.

Every incident was analyzed along the following dimensions: 1) incident cause (why the incident took place); 2) user actions (what actions a user took during the incident); 3) user feelings (what a user felt about this situation); 4) behavior change (whether and how a user changed the way he/she used email interface agents after the incident). Positive and negative incidents were analyzed separately.

Three independent coders analyzed the open-ended items and achieved an acceptable level of agreement (see Table 2). The classical content analysis approach (Budd and Thorp, 1963) was used. The same codebook was utilized by all coders. If coders failed to agree on an item's classification, the response was labeled as 'Other.' Several subjects left a few questions blank, therefore, totals sometimes do not add to 30.

Coder Agreement	Incident Cause	User Feelings	User Actions	Behavior Change
Positive Incidents	0.93	0.81	0.81	0.80
Negative Incidents	0.87	0.85	0.91	0.81

Table 2. The Krippendorff's (1980) Agreement Coefficient

Positive Critical Incidents

The results indicated that all users reported positive critical events that happened very recently, for example, during the last incident of agent usage, today, or within a few weeks, and that similar events occurred very frequently, for instance, during every incident of agent use, daily, or weekly.

Regarding the **incident cause**, 24 incidents related to an event when an agent notified a user about the state of an email system. For instance, the agent presented an important incoming message event in a timely manner:

"I use agents to monitor various mail folders in Outlook and either announce or read the mail based on set criteria. I have unattended processes that report failures or problems encountered that spawn emails to me. Three days ago my process emailed me that one of our databases was approaching its transaction log maximum size and this was announced by an agent. [In the result,] I was able to clear the log before it caused the database to stop processing due to a full drive error. Obviously it would have halted one of our critical business processes."

Six incidents corresponded to the fact that the agent performed highly reliably over a certain period of time, for example:

"Yesterday 18/5 - software performed as usual, stable, did not cause problems. [It] finished as usual, nothing happened."

Figure 2 offers **user feelings**. Most users had positive feelings towards the incident, such as satisfaction and enjoyment.

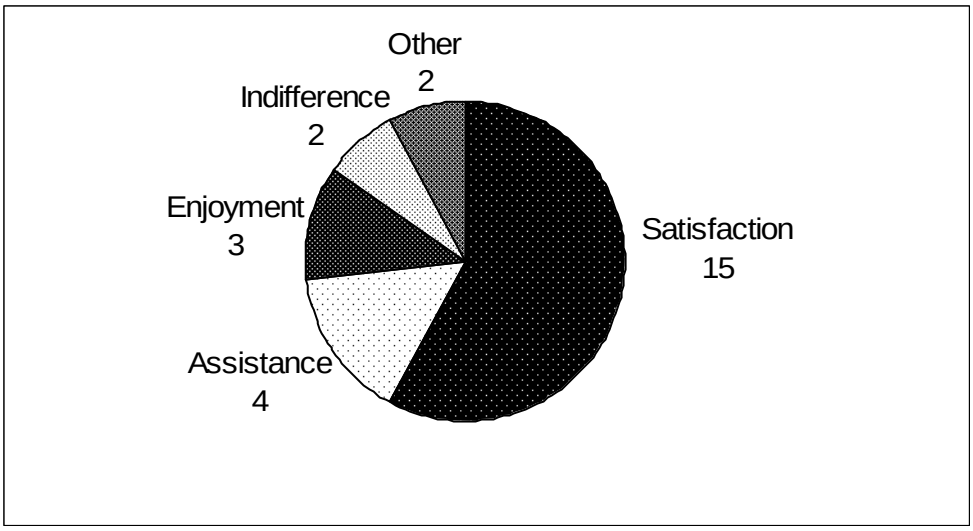

Figure 2. Positive Critical Incidents – User Feelings

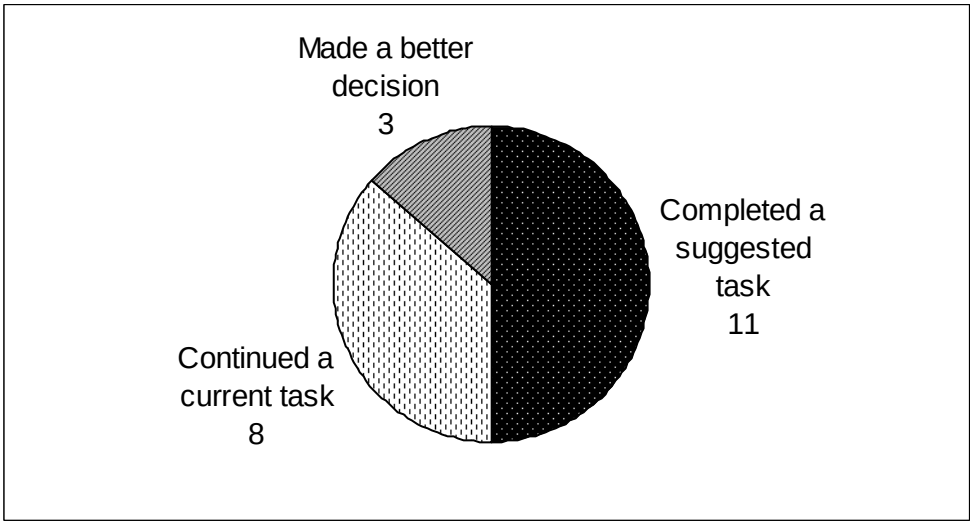

Figure 3. Positive Critical Incidents – User Actions

With regards to **user actions** during the incident, 11 individuals said they immediately completed a task suggested by an agent, eight people continued doing a task they were doing before an agent's interference, and three users made a better, more informative decision on a task they were working on (Figure 3).

Regarding **behavior change** after the critical incident, 22 and three users indicated that they did not change and changed the way they used interface agents respectively. Out of those who reported behavior change, one person indicted that he/she increased agent usage, and two individuals said they began to promote the agent among friends and colleagues:

"I demonstrated the product to many friends and coworkers who thought they would pursue adding agents to their email."

Negative Critical Incidents

With regards to the negative **incident cause**, 11 distinct categories have emerged. Figure 4 offers these causes grouped on the first level of coding, and Table 3 on the second level of coding.

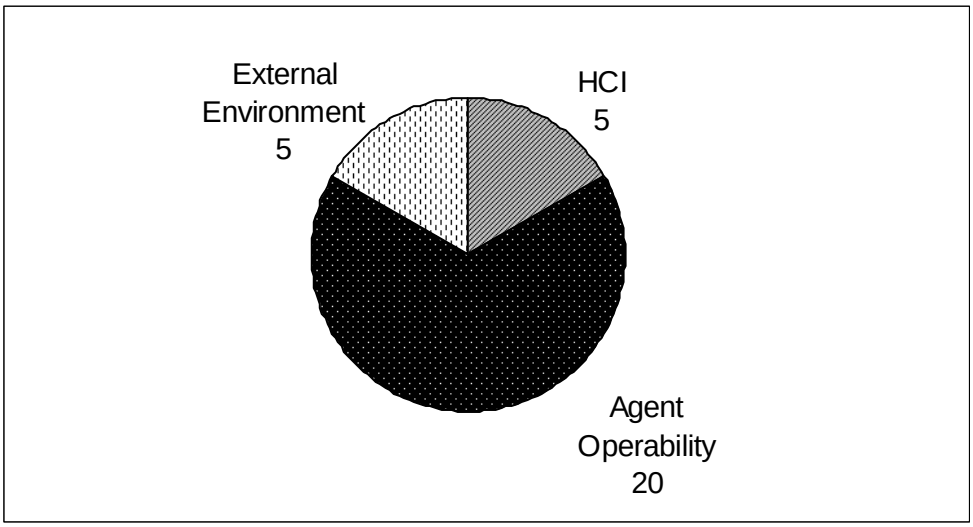

Figure 4. Negative Critical Incidents – Incident Cause (Level 1)

The most frequently cited cause of a critical incident was an agent's incompatibility with other software systems, especially, with email environments. A typical negative incident occurred when a user suddenly realized that the email interface agent might not be used with the email application that he/she just installed or updated:

"[I am] having some trouble getting it to work with my newer version of Office software. [It] worked fine in 2000 version. In my case[,] it is preventing the use of an agent."

Other regular sources of negative incidents were interference, intrusiveness, and unreliability of an agent. Sometimes, an agent interfered with other systems or the entire computer that slowed down the CPU and consumed extra resources. During a particular task, several users found an agent disturbing and annoying that distracted them from other important activities. Three users complained about the event in which an agent behaved unreliably:

"[The agent] gives an error message when forwarding or replying to email and then stops announcing."

Several incidents were caused by other people, who complained about announcements of unnecessary messages, little control over an agent, company policies that did no allow the usage of unauthorized software, unclear agent voice, and the noise that an agent made:

"Other occupants in the house annoyed by the voice announcing new messages, read receipts, etc."

Two people reported cases in which other individuals, who were aware of the fact that someone utilized an email interface agent, abused the user by sending irrelevant, obscene, or hard-to-read messages and made fun of the situation when an agent announced either the subject or the entire message. These messages passed through email filters since senders were known to the recipient:

"My co-workers every now & then send me messages that are read out & amusing or send me all capitalized letters that are spelt out individually & are annoying. [I get] laughter from all."

In one situation, a user realized that an agent was not as intelligent as he/she expected it to be and discontinued using it:

[I] discovered [that the agent is] not intelligent enough for many tasks, needs more automation, [and I] stopped using [it]."

Rank	Code	N
1	An agent's incompatibility with or inextendibility to other agent and/or software applications (e.g., email systems, Outlook XP).	7
2	Interference with the computer (e.g., slows it down, consumes extra resources) or applications (e.g., slows an email system down).	5
3	High intrusiveness or distraction caused by an agent (e.g., annoying, noisy, bad timing of notifications).	5
4	Poor reliability of an agent (e.g., crashes, bugs).	3
5	People, who know that a person utilizes an agent, attempt to abuse the use of this agent by sending irrelevant, obscene, or hard-to-read messages that upset or embarrass the individual (i.e., when the agent loudly pronounces those messages, the user is humiliated).	2
6	There is little functionality that gives a user more control over the agent, e.g., the user cannot stop the agent at any time or act before the agent completes a notification task.	2
7	An agent bothers other people around because it communicates with a user in a natural voice and people around may hear it.	2
8	Policies in the work environment do not allow the use of unauthorized software including email agents.	1
9	The announcement of all incoming messages, including spam (if the filter failed to sort them out).	1
10	An agent is not intelligent enough to perform basic tasks that require some degree of reasoning capabilities.	1
11	Voice capabilities need improvement (e.g., unclear speech).	1
Total:		**30**

Table 3. Negative Critical Incidents – Incident Cause (Level 2)

Most people expressed negative **user feelings** towards the incident, such as frustration and annoyance (Figure 5).

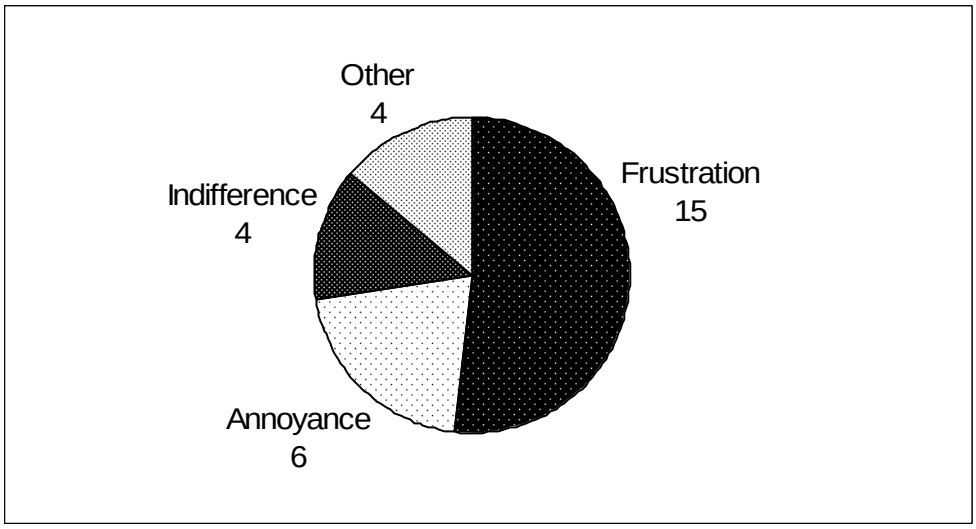

Figure 5. Negative Critical Incidents – User Feelings

Figure 6 and Figure 7 outline user actions during negative-outcome incidents.

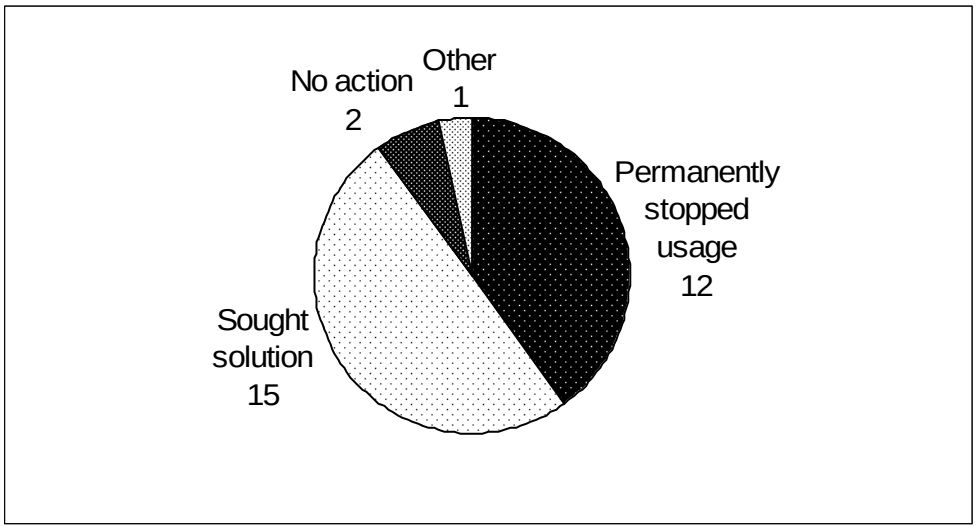

Figure 6. Negative Critical Incidents – User Actions (Level 1)

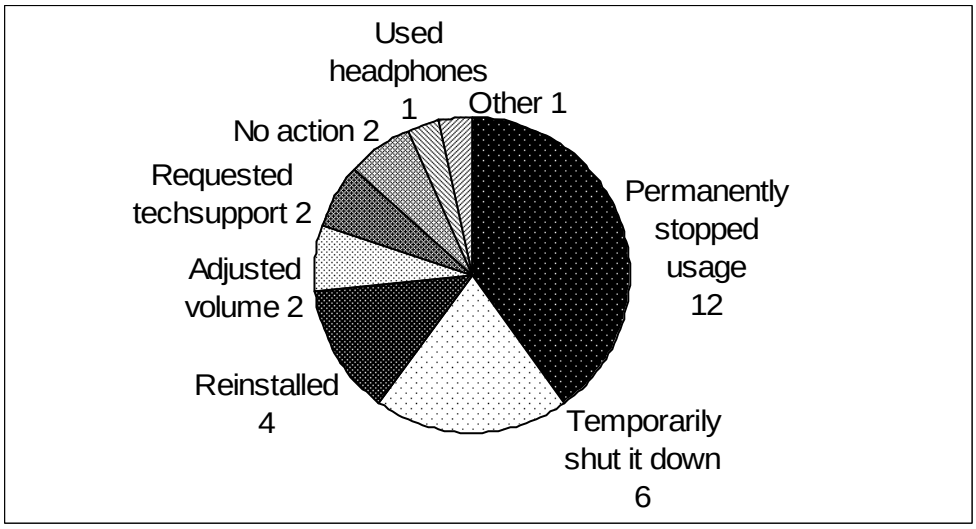

Figure 7. Negative Critical Incidents – User Actions (Level 2)

The analysis shows that those, who chose to temporarily turn off the agent, did so because of the agent's intrusiveness, unreliability, interference with other applications, unclear speech, and limited control over its actions. Out of four people, who reinstalled the agent, three did so because the agent became incompatible with a new email system, and they believed that a reinstallation or an upgrade might fix the problem. One person reinstalled it because of the agent's interference with other applications. Two individuals who received complaints from people nearby reduced the volume, and two users who experienced incompatibility and interference problems requested technical assistance. One person who was a victim of colleagues' abuse ignored the incident, and one individual began to use headphones for privacy.

Figure 8 presents **behavior change** after the critical incident.

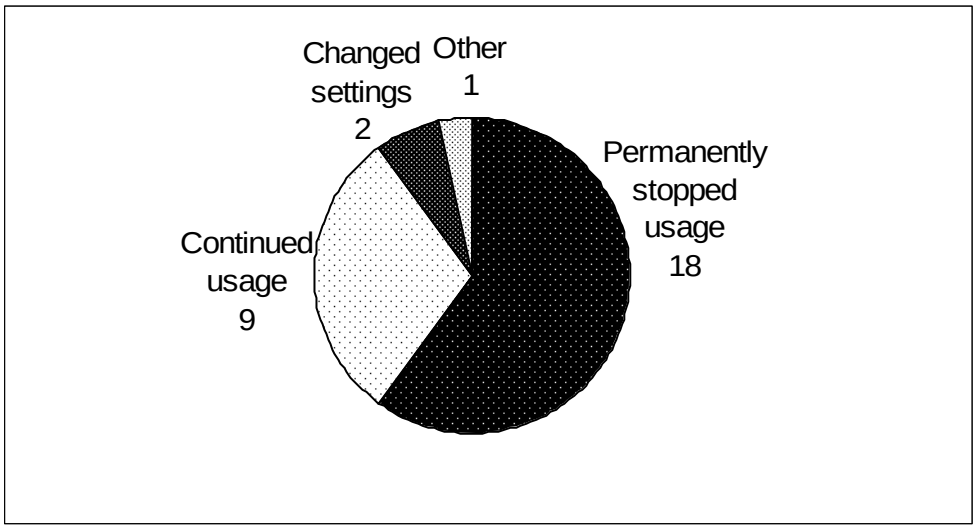

Figure 8. Negative Critical Incidents – Behavior Change

Recall that 20 critical incidents were caused by an agent's operability issues, five by the Human-Computer Interaction process, and five by external factors. In cases that originated from an agent's operability problems, 11 users sought a solution, seven immediately abandoned the agent's employment, and one person took no action. Overall, 11 and eight people out of them discontinued and continued usage respectively.

Out of five people that experienced an incident in which an agent behaved highly intrusively, four immediately terminated the use, and only one person temporarily shut down the agent. In five critical incidents caused by an external environment, three and two individuals terminated and maintained future employment of this technology respectively. In response to these incidents, only one person removed an agent immediately because he/she was forced by the IS department of the company. Out of the other four people, three attempted to find a solution and one ignored the event. For example, to eliminate noise, they tried to utilize headphones or decrease the volume. The user, who was forced to terminate the usage because of noise constraints, indicated that he/she would attempt to use an agent again:

"[I] uninstalled the interface [agent] ... but ... planning on reinstalling it."

The analysis of incident frequency and timeline indicated that two groups of data emerged. The first category pertained to the incidents that occurred in the past, usually, over one year ago, and that had occurred only once or a few times. Typically, a user terminated the employment of an agent after that event. The second group related to the incidents that took place recently, and that appeared more often, for instance, monthly. Generally, users continued using an agent after that incident.

DISCUSSION AND CONCLUSION

Recall the purpose of the study is to develop the typical scenarios of email interface agent user behaviors under the influence of positive and negative critical incidents. For this, a survey of 60 actual users of email interface agents was conducted. With respect to **positive** critical incidents, the following typical scenario of user behavior is constructed (Figure 9).

According to this scenario, a positive incident occurred when an agent presented a user with a notification in a proactive and reliable manner. For example, it read an important message from a colleague, and the user did not have to switch from a currently open application to an email system; this saved time and improved email efficiency. The person enjoyed his/her experience, utilized the information for decision making and continued employing the agent. In some cases, he/she began to promote the agent by demonstrating it to peers.

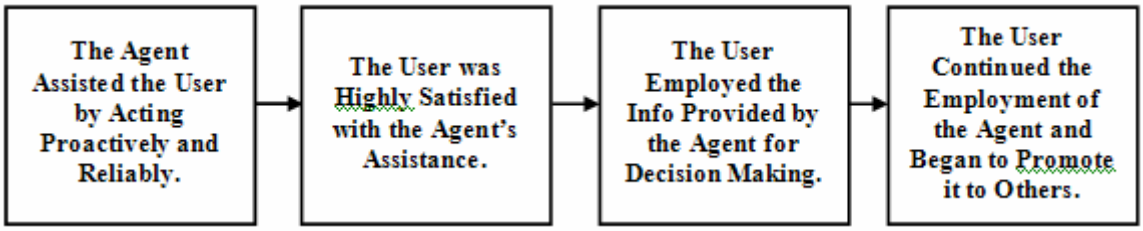

Figure 9. A Typical Scenario of User Behavior – Positive Critical Incidents

In terms of **negative** critical incidents, three distinct scenarios were identified because each situation was caused by a unique type of a critical incident. Figure 10 offers the scenario of user behavior that occurred because of agent operability problems.

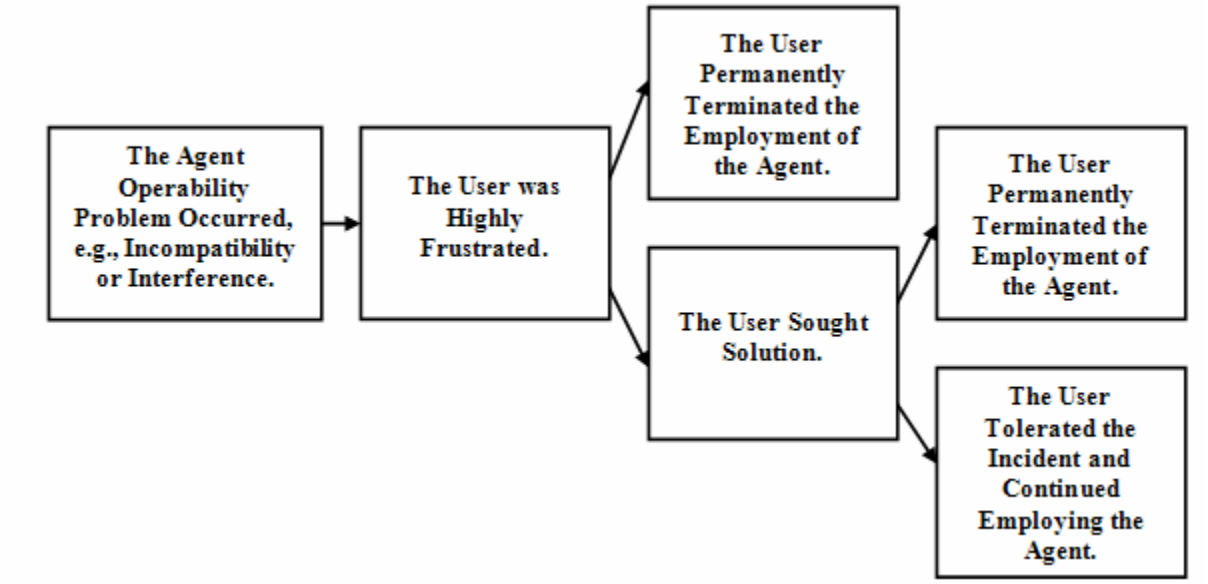

Figure 10. A Typical Scenario of User Behavior – Negative Critical Incidents – Agent Operability

Most such incidents happened because an agent was incompatible with a user's email client, interfered with other applications, or behaved unreliably. Users felt very frustrated; some of them made an immediate decision to terminate agent usage, whereas others tried to find a solution. Those, who tried to solve the problem, either terminated agent usage at a later date or ignored the incident and continued the employment of the agent.

Figure 11 outlines the second scenario of a negative-outcome event that resulted from high perceived intrusiveness of an agent.

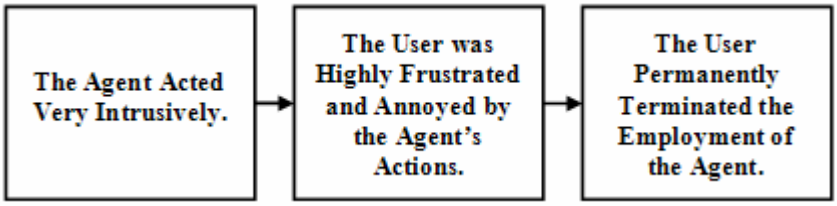

Figure 11. A Typical Scenario of User Behavior – Negative Critical Incidents – Perceived Intrusiveness

According to this scenario, an incident happened because an agent behaved highly intrusively. As a result, a user felt very frustrated and annoyed by the actions of the agent. Immediately, he/she decided to permanently terminate the usage of the agent.

Figure 12 offers the third, last scenario of a negative-outcome incident that took place under the influence of external factors which a user could not control.

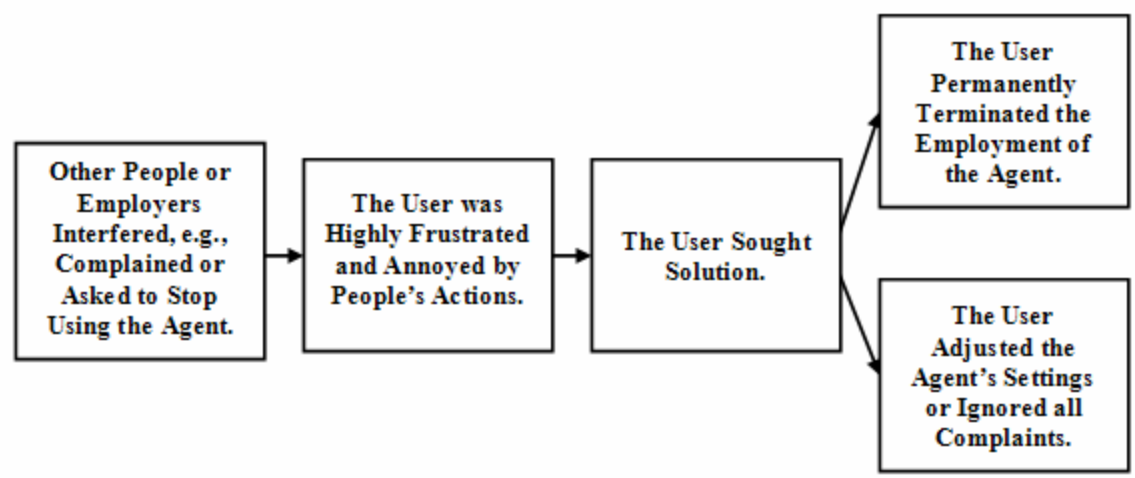

Figure 12. A Typical Scenario of User Behavior – Negative Critical Incidents – External Factors

In terms of this scenario, other people or employers interfered. For example, peers abused the user by sending obscene messages, colleagues complained about noise, or company staff requested that the agent be removed from a computer. An individual was very frustrated and annoyed by the actions of the peers or company personnel. In response to their actions, the user attempted to solve the problem to preserve the usage of the agent, but, in most cases, he/she had to terminate the usage. Rarely, the person found a solution or ignored the incident.

Based on the above discussion, several conclusions are suggested. First, it is believed that the presented scenarios show a realistic picture of user behaviors under the influence of positive and negative critical incidents and provide a reliable description of user feelings, actions towards email interface agents.

Second, agent users acknowledged the quality of an agent when it reliably performed the required tasks, and they considered this event critical. A partial explanation of this phenomenon lies in the imperfection of most contemporary software applications, including agent-based systems (Serenko and Cocosila, 2004). Currently, computer users are so accustomed to bad design, poor usability, increasing complexity, and lack of important functionality of software that they tend not to complain about it (Lieberman, Rosenzweig and Singh, 2001). At the same time, individuals highly appreciate an agent's reliability.

Third, agents were often labeled as novel, smart, or intelligent technologies that might substantially alleviate many problems associated with everyday computer use. Thus, many potential agent users might form unreasonably high pre-purchasing expectations of an agent-based system. However, the actual agent applications available on the market included a limited selection of intelligent features that might potentially disappoint some purchasers.

Fourth, an agent's intrusive behavior results in an immediate agent usage termination, agent operability issues may or may not force people to reject the technology, and users attempt to preserve the employment of an agent under the negative impacts of external factors.

It is believed that the results of this investigation may be of interest to both academics and practitioners. Especially, it is hoped that agent designers and marketers will be able to utilize a number of practical recommendations based on the findings. For example, to improve user acceptance of email interface agents, developers need to reduce the degree of an agent's perceived intrusiveness, make this technology compatible with other software and email systems, eliminate an agent's interference with other applications, and focus on reliability issues. Agent marketers should advertise only realistic features and facets of agents; otherwise many people will be dissatisfied with their actual user experience.

The results of this investigation are constrained by several limitations. Perhaps the most salient is that users of only one interface agent-based email system were surveyed. To strengthen the validity of the findings, a survey of users of an email agent notification application developed by another manufacturer should be conducted. This study is restricted to the reactions of users, and it does not encompass interactions between people and agents. Future researchers may also repeat it by looking at other types of agents, for example, electronic shopping or personal assistance agents, or address two-way interactions. Despite that, it is believed that this study may potentially improve our understanding of the human-agent interaction field and facilitate the creation of useful interface agents.

REFERENCES

1. Andersson, B.-E. and Nilsson, S.-G. (1964) Studies in the reliability and validity of the critical incident technique, *Journal of Applied Psychology,* 48, 6**,** 398-403.
2. Bergman, R., Griss, M. and Staelin, C. (2002) A personal email assistant, Technical Report HPL-2002-236, Hewlett-Packard Company.
3. Budd, R. W. and Thorp, R. K. (1963) *An introduction to content analysis, including annotated bibliography,* University of Iowa School of Journalism, Iowa City, Iowa.
4. Cowie, H., Naylor, P., Rivers, I., Smith, P. K. and Pereira, B. (2002) Measuring workplace bullying, *Aggression and Violent Behavior,* 7, 1**,** 33-51.
5. Davis, F. D. (1989) Perceived usefulness, perceived ease of use and user acceptance of information technology, *MIS Quarterly,* 13, 3**,** 319-340.
6. Dehn, D. M. and van Mulken, S. (2000) The impact of animated interface agents: A review of empirical research, *International Journal of Human-Computer Studies,* 52, 1**,** 1-22.
7. Dillman, D. A. (1999) *Mail and Internet surveys: The Tailored Design Method,* John Wiley & Sons, New York.
8. Flanagan, J. C. (1954) The critical incident technique, *Psychological Bulletin,* 5, 4**,** 327-358.
9. Helfman, J. I. and Isbell, C. L. (1995) Ishmail: Immediate Identification of Important Information, Technical Report, AT&T Bell Laboratories.
10. Johnson, B. L., Jr and Fauske, J. R. (2000) Principals and the political economy of environmental enactment, *Educational Administration Quarterly,* 36, 2**,** 159-185.
11. Jones, M. A. (1999) Entertaining shopping experiences: An exploratory investigation, *Journal of Retailing and Consumer Services,* 6, 3**,** 129-139.
12. Karnouskos, S. and Vasilakos, A. (2002) Neuro-fuzzy applications: Active electronic mail, *Proceedings of the 2002 ACM symposium on applied computing,* New York.
13. Kautz, H. A., Selman, B. and Coen, M. (1994) Bottom-up design of software agents, *Communications of the ACM,* 37, 7**,** 143-146.
14. Keaveney, S. M. (1995) Customer switching behavior in service industries: An exploratory study, *Journal of Marketing,* 59, 2**,** 71-82.
15. Koenemann-Belliveau, J., Carroll, J. M., Rosson, M. B. and Singley, M. K. (1994) Comparative usability evaluation: Critical incidents and critical threads, *Proceedings of the ACM Conference on Human Factors in Computing Systems*, Boston, Massachusetts.
16. Krippendorff, K. (1980) *Content analysis: An introduction to its methodology,* Sage Publications, Beverly Hills, CA.
17. Lieberman, H., Rosenzweig, E. and Singh, P. (2001) Aria: An agent for annotating and retrieving images, *IEEE Computer,* 34, 7**,** 57-62.
18. Lieberman, H. and Selker, T. (2003) Agents for the user interface, In: *Handbook of Agent Technology* (Ed, Bradshaw, J. M.) The MIT Press.
19. Maes, P. (1994) Agents that reduce work and information overload, *Communications of the ACM,* 37, 7**,** 31-40.
20. Muylle, S., Moenaert, R. and Despontin, M. (2004) The conceptualization and empirical validation of web site user satisfaction, *Information & Management,* 41, 5**,** 543-560.
21. Rogers, E. M. (1995) *Diffusion of Innovations,* Free Press, New-York.
22. Ronan, W. W. and Latham, G. P. (1974) The reliability and validity of the Critical Incident Technique: A closer look, *Studies in Personnel Psychology,* 6, 1**,** 53-64.
23. Rubin, J. (1994) *Handbook of usability testing: How to plan, design, and conduct effective tests,* John Wiley & Sons, New York.
24. Segal, R. B. and Kephart, J. O. (1999) MailCat: An intelligent assistant for organizing e-mail, *Proceedings of the Third International Conference on Autonomous Agents*, New York.
25. Sekiba, J., Kitagata, G., Suganuma, T., Kinoshita, T., Okada, K. and Shiratori, N. (1998) Design and implementation of agent-based flexible asynchronous messaging system, *Proceedings of the International Conference on Parallel and Distributed Systems*, Tainan, Taiwan.
26. Serenko, A. and Cocosila, M. (2004) An exploratory investigation of the self-serving biases of interface agent users, *Proceedings of the 10th Americas Conference on Information Systems*, New York.
27. Tay, C. and Ang, S. (1994) User competence in information technology: A critical incident analysis, *Proceedings of the IEEE Region 10's Ninth Annual International Conference,* Singapore.
28. Urquhart, C., Light, A., Thomas, R., Barker, A., Yeoman, A., Cooper, J., Armstrong, C., Fenton, R., Lonsdale, R. and Spink, S. (2003) Critical incident technique and explicitation interviewing in studies of information behavior, *Library & Information Science Research,* 25, 1**,** 63-88.
29. Wang, K.-C., Hsieh, A.-T. and Huan, T.-C. (2000) Critical service features in group package tour: An exploratory research, *Tourism Management,* 21, 2**,** 177-189.