

An Empirical Study of Human Web Assistants: Implications for User Support in Web Information Systems

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ABSTRACT

User support is an important element in reaching the goal of universal usability for web information systems. Recent developments indicate that human involvement in user support is a step towards this goal. However, most such efforts are currently being pursued on a purely intuitive basis. Thus, empirical findings about the role of human assistants are important. In this paper we present the findings from a field study of a general user support model for web information systems. We show that integrating human assistants into web systems is a way to provide efficient user support. Further, this integration makes a web site more fun to use and increases the user's trust in the site. The support also improves the site atmosphere. Our findings are summarised as recommendations and design guidelines for decision-makers and developers of web systems.

Keywords

User support, web information systems, universal usability, attitude, efficiency, field study, design guidelines

INTRODUCTION

An important challenge for universal usability is to bridge the gap between what users know and what they need to know to successfully interact with a computer system [19]. Different users have different needs and skills, especially for web information systems (WISs) [8]. WISs often serve an international user community aiding people with various backgrounds. Therefore, there is a strong need to provide support for the whole range of users. Ben Shneiderman identified online help and customer service as two important approaches in dealing with this challenge and called for evaluations and design guidelines [19]. Earlier, Carroll and McKendree urged that empirical studies on advice giving systems be done [6]. Online help means online support for the user tasks that the WIS is intended for. We use the term customer service as the specialisation of online help to the

task of online shopping. In this paper we use the term *user support* for these two approaches.

It has been shown that user support has an influence on WISs such as electronic commerce sites. For example, the study by Vijaysarathy and Jones [21] suggests that customer service for the pre-order part of the shopping process has a positive influence on user attitudes toward Internet catalog shopping.

Still, the current state of practice in user support for WISs is limited and in need of improvements. In a study of consumer reactions to electronic commerce by Jarvenpaa and Todd [9], it is shown that user support is limited in electronic commerce systems. In the study by Spiller and Lohse [20] several aspects of customer service were analysed. The result was that the customer service in the stores studied was limited. As further motivation for studying user support for WISs, we consider the Home Net field trial. The results from this study showed that much user support is needed for Internet usage in general [13].

In our previous work we have introduced a general model for user support [1]. The model features a combination of computer-based support and human assistants. Aspects of universal usability such as technology variety and user diversity [19] are considered in the model. The model proposes a flexible user interface where users can select how they want to interact with the support system. For example, users can choose whether they only want computer-based support or would prefer to chat with human assistants via text chat, voice chat, or other means of interaction. Our approach to dealing with user diversity is based on user modelling, allowing personalised support.

We have studied our proposed model in a two-step project. In step 1 we conducted an exploratory usability study based on a limited prototype implementation designed for communication between a user and an assistant. We employed the REAL (relevance, efficiency, attitude, and learnability) model of usability [16]. Each aspect of usability was evaluated based on a questionnaire following a controlled experiment with nine subjects and one assistant.

In step 2, our main aim was to test the technical feasibility of the support model. To do this we implemented an instance of the full model and deployed it at an existing WIS for a three-

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SIGCHI'01, March 31-April 4, 2001, Seattle, WA, USA.

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week period. The focus of this paper is on the usability study that was part of step 2. In this usability study we tested some of the indications from step 1. We hypothesised that our support system would have a positive influence on user attitudes towards the WIS. We also hypothesised that efficient support would be provided. Furthermore, we wanted to study the work situation of human assistants in a real-world setting, which was impossible to do in step 1 (due to the nature of controlled experiments in general). In summary, our focus in this paper is on the following questions: How does our support system affect users' attitudes toward a WIS? Can our system provide efficient user support? What is the work situation for human assistants like?

When it comes to user attitude, we consider the issues of trust, fun-factor, and atmosphere. Trust is an aspect of attitude that has recently received much attention in the literature. Evidence on the importance of trust for electronic commerce is presented in [7, 14, 17], and is discussed in the context of groupware in [18]. While the effect of trust on customer loyalty has been studied previously, it is important to also study how trust can actually be improved. Thus it is interesting to study how human assistants affect users' trust for a WIS.

Fun-factor and the atmosphere of a WIS are highlighted in [9]. The study by Jarvenpaa and Todd shows that users of online shops miss the fun and store atmosphere of shopping in traditional stores. Thus it would be of interest to improve these attitude factors.

Regarding efficiency, we consider issues such as flexibility, quality of support, feasibility of textual chat, and the feasibility of having users waiting in a queue for human assistance. Knowledge gained about these issues is important for the successful deployment of this kind of support system.

It is also necessary to consider the work situation of assistants in order to know how to support them in the best way, and to know what is required of an assistant.

User Support System

Our implemented user support system is a question-answering system. A user is routed through an initial step where the natural language question is matched against a frequently asked question file (FAQ). Closely-matching FAQ items are returned as potential answers to the user's question [2]. If this step is not satisfactory, the user can request a help chat with a human assistant that has expertise in the particular area of the question. The system computes a set of the assistants that best match the question type based on assistant expertise profiles. If all the best-matching assistants are currently busy, the user is offered the option of waiting in a queue. Once an assistant is available the user and the assistant are connected via textual chat, and can have a help conversation.

A user model tool is used by the assistants in order to provide personalised support for the users. The user model contains personal information and skill-related information. Assistants take an active role in acquiring data for user models from

help conversations by collecting relevant information and storing it in the user models. The assistants are also responsible for continuously updating the FAQ as users come with new kinds of questions.

Figure 1 illustrates the process of a user asking a question of the system. The system is illustrated from an assistant's point of view by showing an example of system usage in Figure 2.

Figure 1. An example of possible question-answering sessions illustrated from a user's point of view.

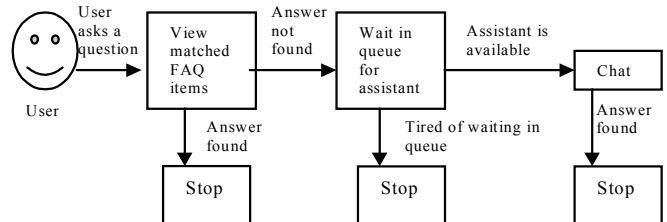
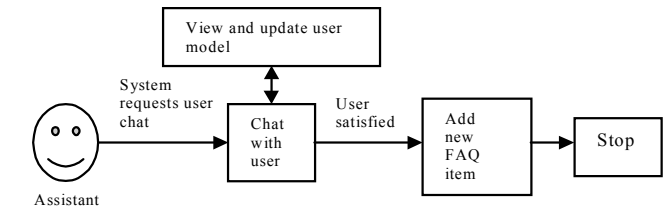


Figure 2. An example of a question-answering session illustrated from an assistant's point of view.



Related Work

Since the initiation of our work, there have been commercial moves in the directions discussed in this paper. Companies such as LivePerson (www.liveperson.com) and FaceTime (www.facetime.org) now offer commercial systems for human assistance in WISs. This trend increases the importance of the kind of studies reported in this paper. While the efforts by FaceTime and LivePerson are well motivated, little is known about how users interact with these kinds of systems, and how the most benefit can be derived from the human assistants.

The systems currently offered by LivePerson and FaceTime are clearly similar in spirit to the system we have implemented. Still, there are some important differences. First, user modelling seems to play a limited part in the commercial systems when compared to our system. Second, the user support provided is completely centered on the human support agents. Our approach with routing users through a computer-based question-answering system before connecting users with human assistants seems to be a better use of resources [2].

In [12] two applications for web-based collaborative customer service are described. The applications are for a banking kiosk setting and for home banking over Internet. The banking kiosk application uses a shared browser approach with ink annotation for communication. The home banking application also uses a shared browser approach and has support for voice chat. The two applications are related to

our approach. They are, however, limited when it comes to providing personalised support. The descriptions of the systems are on an architectural level, and no evaluation is presented.

The Answer Garden (AG) system by Ackerman [3] is a question-answering system related to our work. Still, there are some important differences. There is no form of support for personalisation in AG similar to our user modelling system. Further, where our system supports synchronous communication between users and assistants via textual chat, question answering by an expert in AG consists of two asynchronous messages, the question and the answer.

The AG system was later extended to a second version called Answer Garden 2 (AG2) [4]. AG2 features mainly two new functions consisting of an automatic escalation of help sources and a form of collaborative refinement of the system database taking sources other than user questions into consideration. These features could very well be incorporated into our system, and would be interesting subjects for future work.

FIELD STUDY

As mentioned previously, our overall research objective in step 2 was to test the technical feasibility of the support model. Therefore a field study, where the system is tested in a real environment, is a natural research method. In this paper we focus on two aspects of usability, namely attitude and efficiency. We also consider the work situation of human assistants.

Environment

The user support system has been attached to an existing WIS for a period of three weeks. The WIS, called Elfwood, is a non-profit WIS in the art and literature domain, where amateur artists and writers can exhibit their material. At the time of this writing around 6700 artists and 1300 writers exhibit their work in the fantasy and science fiction genre. The artists and writers are members of the site, and have access to an extranet for updating their own exhibition areas. A part of the site is devoted to teaching art, and includes a large number of feature articles on different topics.

Elfwood has around 14,500 daily visitor sessions (many of these are by non-members), where each session averages approximately 35 minutes. About 60% of the sessions are by users from the US. The remaining users are mainly from Europe and Canada.

There were three main user tasks that we intended to support.

- 1) Member activities, such as uploading new art and literature, and the management of each member's exhibition area.
- 2) Searching for interesting art and literature at Elfwood.
- 3) Learning how to create fantasy and science-fiction related art and literature.

We chose Elfwood as the environment for our study for two reasons. First, we wanted a site with a reasonable number of users and user traffic, and with a user community that would allow the recruitment of suitable assistants. Second, we

wanted to test our system in a low risk environment where unexpected system problems would not have large financial consequences. Based on these requirements we considered Elfwood to be a good environment for the field study.

Participants

Voluntary assistants participated in the study (without payment) from their home or work environment. They were recruited some months before the field study began, and they were all Elfwood members. A recruiting message was posted on the site with a description of the role and requirements of an assistant. In the end 35 people with proper expertise participated actively as assistants throughout the period of the field study, and 30 of these helped users (the other 5 were only online at times when not so many users needed support). A schedule with the online times of the assistants for the entire field study period was established and published at the site.

Before the field study started we advertised the existence of the support system at Elfwood in a message column on the main page, and by sending an email to all members. During the field study 636 users registered with the support system, and 129 of these users worked through the system to have help conversations with assistants. Once the study started, we had an eye-catching icon on the main page that worked as a link to the help system page. To further facilitate the use of the online help system, we also had icons that linked to the help system from every page at the site.

Data Collection

We chose to use questionnaires as our evaluation tool. We saw questionnaires as appropriate for our focus on the subjective opinions of assistants and users. The use of alternative evaluation tools such as interviews and think-aloud evaluations [11] were considered to be difficult, due to the wide geographical distribution of the users and assistants.

We used three questionnaires, and in the design of these we considered the guidelines in [5].

User Questionnaire 1

The first user questionnaire considered users' subjective opinions on aspects of attitude and efficiency. In order to get a reasonably high response rate we limited the number of statements and questions as much as possible. Regarding attitude, we considered trust, fun-factor, and atmosphere. All three aspects of attitude are mentioned as relevant in related literature (as discussed in the introduction). We also considered how users would react if there were no assistants available when they needed it. While our study of efficiency in step 1 was limited to the issue of flexibility, we now take a more detailed approach. We consider ease of use, quality of support, the users' view upon queuing for human support, the feasibility of textual chat as a communication means, users' usage purpose, and general system flexibility.

The questionnaire contained a number of statements and questions related to the mentioned aspects of efficiency and attitude. The respondents were asked to express their

agreement or disagreement with each statement by giving a rating on a scale of 1 to 10. The questions had alternative answers that the users were told to choose from. The respondents were asked to explain their answers to all statements and questions.

The respondents were asked to consider the concept of the support system in general and not focus on the actual implementation. The questionnaire was sent out to the 129 users who had had help conversations with assistants. It was sent via email just after the field study was finished. We received 53 questionnaires that were properly filled out (response rate of 41%).

The respondents had a distribution of 51% female and 49% male, 74% came from North America, 19% were from different European countries, and the rest came from Australia, Israel, and Honduras. The age distribution was: 10-19 (66%), 20-29 (23%), 30-39 (9%), and 40-49 (2%). The respondents had 1.55 help conversations on average. Note that these data are not quite complete as 5 respondents are missing in the figures, due to loss of data.

User Questionnaire 2

During the course of the field study we noticed that many users had registered with the support system but never had a help conversation with an assistant. In order to investigate the reasons for this behavior, we designed a second questionnaire directed towards these users. Several possible reasons were provided together with the option of creating alternative reasons. The questionnaire was sent out to all 507 users who had registered but not participated in a help conversation. It was sent out directly after the field study ended. We received 175 answers, a response rate of 35%. A slight majority of the respondents were female (56%). The majority came from North America (75%), followed by Europe (17%) and Oceania (4%). The remaining 4% came from Africa, South America, and Asia. The age distribution was: 10-19 (60%), 20-29 (28%), 30-39 (8%), 40-49 (3%), and 50-59 (1%). Due

to loss of data, the demographics represent 98% of the respondents.

Assistant Questionnaire

The questionnaire that was sent out to the assistants considered the work situation for assistants. Several open-ended questions were used to address this issue. We chose to use open-ended questions for two reasons. First, we believed that the assistants would be likely to spend the extra time needed for these questions compared to, for example, rating statements. Second, we were looking for as much detailed information as possible, making open-ended questions a good alternative [11].

The questionnaire was sent out to the 30 assistants who had been involved in helping users via email directly after the field study period had ended. We received 21 properly filled out questionnaires (response rate of 70%).

In addition, the questionnaire also contained some questions of a demographic nature. From these questions we found that the assistants were mainly from North America (62%) and Europe (29%). Asia and Oceania shared the remaining 9%. The assistants were from different age groups: 10-19 (38%), 20-29 (38%), 30-39 (14%), 40-49 (10%). The gender distribution was rather even: 43% male, and 57% female. All assistants had at least two years of Internet experience, with one exception in which the assistant had half a year of Internet experience. Most assistants used a traditional dial-up modem to access Internet (67%), while some used cable modem (19%), and the rest had direct cable access. On average, a responding assistant participated in 6.7 help conversations.

FINDINGS

User Questionnaire 1

The results for the statements in the questionnaire are presented in Table 1. Apart from the statements, the questionnaire also contained two questions. The results from these questions are shown in Table 2 and Table 3. Notice that

Table 1. Results from statements in user questionnaire 1

Questionnaire statements regarding efficiency	Mean	S. Dev.
To get help from this kind of assistant system is (1=complex, 10=straightforward)	7.42	1.94
The flexibility of this kind of assistant system is (1=low, 10=high)	7.40	1.68
Waiting in a queue for a human assistant is (1=useless, 10=worthwhile)	7.42	2.28
The time I would be willing to wait in a queue for an assistant is (1=short (e.g. max 1 minute), 10=long (e.g. max 20 minutes))	5.51	2.33
The quality of support given by assistants in general is (1=bad, 10=good)	7.91	1.83
Having a dialog with an assistant via a textual chat is (1=cumbersome, 10=straightforward)	8.32	1.85
Questionnaire statements regarding attitude		
Getting support from this kind of assistant system is (1=boring, 10=fun)	8.04	1.90
My trust in the provided support is (1=low, 10=high)	8.58	1.56
The effect that human assistants have on my trust for a web site is (1=negative, 10=positive)	8.83	1.45
The effect that human assistants have on the atmosphere of a web site is (1=negative, 10=positive)	9.08	1.37

in Table 2 some users saw more than one alternative as appropriate. This is why the percentages sum up to more than 100%. Also, concerning the results in Table 3, two respondents did not find any of the alternatives fitting, which is why the percentages do not quite sum up to 100%.

Table 2. Results on reactions to a system with no assistants logged in

Reactions to a system with no assistants logged in	
A. Try again later	22 (42%)
B. Never come back	3 (6%)
C. Make use of the FAQs	21 (40%)
D. Try to solve the problem on ones own	15 (28%)

Table 3. Results on different usage types

Different kinds of usage	
A. To save time and energy	17 (32%)
B. To get help with something difficult	7 (13%)
C. Both of the alternatives (A and B)	27 (51%)

We summarise the results from user questionnaire 1 in light of the explanations that we received. The following method was used in analysing the respondents' explanations. First, to get a good overview, we created a file for each statement where all explanations were stored verbatim. Second, for each statement we made a summary of all issues that were mentioned in the explanations and noted the number of times that they were mentioned. Third, issues that were closely related were organised into categories with corresponding descriptive terms, keeping track of the number of times that each category was mentioned. Note that this step sometimes required interpretation. Fourth, for the sake of brevity only the most informative categories were selected for the presentation. Still, we attempted to reflect both positive and negative comments and provide as wide variety as possible. In some cases we found that an explanation described a category in an illustrative way. Some of these explanations are presented as quotes. Observe that not all respondents explained their ratings. Slightly less than 50% of the respondents elaborated on their ratings. This means that the explanations offered might not give a complete picture. Still, many interesting issues were raised.

It is mostly straightforward to get help from the support system. The following descriptive terms were used in association with positive rankings: *quick help* (9 users), *ease of use* (5 users). On the negative side, the following descriptive terms were used: *slow system* (3 users), *no help* (2 users). One user giving a low score explained, "First wait for Java to start, then login, wait longer, enter a question, then (after waiting a bit) choose category, then read the FAQ and/or chat with assistant..."

Most users are willing to wait in a queue for human assistance, but not for long. Several descriptive terms were used for unwillingness to wait long: *impatience* (8 users), *online time is expensive* (2 users), *unreliable* (2 users). Three users said that they were willing to wait for a long time since they could do many other things online while waiting.

Human assistants provide mostly good quality support. The following descriptive terms were used in explanations: *sensibility* (10 users), *flexibility* (6 users), *friendliness* (6 users), *making an effort to help* (3 users), *alternative solutions* (1 user).

Textual chat is a viable means for help conversations on most topics. Several descriptive terms were used in explanations: *simple* (8 users), *expressive* (7 users), *real-time* (2 users). On the negative side, the following terms were used: *unstructured* (3 users), *inexpressive* (3 users).

Human assistants make the use of a WIS more fun for most users. The following descriptive terms were used in explanations: *human touch* (12 users), *making an effort to help* (5 users), *sense of humor* (2 users). Three users thought the assistants had no effect on the fun of using a system. Two other users said that the system was too slow to have any effect on the fun.

Most users have a high level of trust in the advice provided by human web assistants. The following descriptive terms were used in explanations: *sensibility* (14 users), *advice is easy to verify* (3 users). Two users commented that they generally wanted to verify pieces of advice before trusting it.

Human web assistants have a positive influence on most users' trust in a WIS. The following descriptive terms were associated with this influence in the explanations: *a message of caring* (8 users), *helpfulness* (6 users), and *accountability* (4 users). Two users said that they neither trust nor distrust a web site.

The presence of human web assistants has a positive influence on the atmosphere of a WIS. The following descriptive terms were associated with this effect in explanations: *alive and interactive* (7 users), *friendly* (6 users), *warm* (4 users), *personal* (3 users), and *appealing and understandable* (3 users). One user commented, "It's great! Sometimes I feel a bit alone when surfing the web. But real people talking to you about your problems make you feel like you are part of a huge family. You are no longer alone out there." Another user said, "It gives a feeling of personal attention and makes the user feel important."

Most users are not put off by unavailability of assistants. However, some users are likely to never come back if they find the support system deserted. Their motivation is that they would believe that the system was not working, as is currently the case with many systems on the web.

The support system can be used for different purposes. The support system not only attracts users who need help

with a task that they cannot solve on their own. The system is also of value for more casual purposes, such as saving time or effort.

User Questionnaire 2

The results from the second user questionnaire are presented in Table 4. The percentages are calculated over the number of respondents (175). Some users gave more than one reason for not making use of a human assistant. Many users gave alternative reasons according to option G. Most of these indicated that the users had registered out of need but then never got the time to actually try the support system during the three week period of the field study.

From the results, we note the importance of an easy-to-use support system. A user who cannot figure out how to use the support system is unlikely to maintain a positive view of the WIS. The results also show that the FAQ system was useful in answering several users' questions.

Table 4. Results from user questionnaire 2

Reasons for not using a human assistant	
A. The system didn't work.	18 (10%)
B. The FAQs solved the problem.	26 (15%)
C. There were no assistants logged in.	50 (29%)
D. I registered just to check things out.	67 (38%)
E. I didn't understand how to use the system.	24 (14%)
F. The system took too long to load.	20 (11%)
G. Other reasons.	24 (14%)

Assistant Questionnaire

The following information is a summary of the most important issues that came out of the assistant questionnaire. The points that are raised follow issues in the open-ended questions. Notice that the presentation expresses the subjective opinions of the assistants, based on their experience during the field study. In our analysis of the questionnaires we employed a method similar to the one we described for analysing the statements in user questionnaire 1 above.

Users differ in conversational style and in background knowledge. The assistants need to be sensitive to these differences in order to adapt appropriately. For example, some users want quick answers to their questions, while others want to discuss alternative solutions. A few users can be impolite.

Users generally come straight to the point with their questions. Sometimes however, follow-up questions are necessary to fully understand a user's problem.

Users explicitly express their opinion on the given advice. They generally tell the assistant what they think, and whether they are satisfied or not.

An assistant does not need to speak English as a first language. Decent fluency and familiarity with the terminology of the domain seems to be enough. Observe though that this is likely dependent on the application domain. For example, in a banking application the situation could be different.

Being an assistant can cause stress. The following sources of stress were identified: Hardware and software problems during help sessions. Having to multi-task to find information for the user while chatting. Having a slow or unreliable network. Impolite users. Having difficulty expressing a solution in writing.

The most important skills or characteristics for an assistant are patience, domain knowledge, social skills, and fast typing. About one third of the responding assistants mentioned these skills. Several assistants also mentioned that it was important to be friendly, to have a sense of humor, and to be able to explain things in written words.

Textual chat is sufficient as a means of communication. Also, textual chat has an advantage over voice chat as the history of the chat is easily accessible in textual form, which means that the participants do not have to take notes while chatting. However, in some cases the ability to graphically demonstrate things was missed in textual chat (mainly for art-related topics).

Handling more than one simultaneous help-session can be difficult for some assistants. Eleven assistants thought they could handle several simultaneous help sessions, while ten thought they could not. Most assistants agree that their typing speed, the users' conversation styles, and the kinds of questions affect their ability to handle simultaneous help sessions. Most assistants thought that three was the maximum number of possible simultaneous sessions.

LIMITATIONS

A field study is expected to allow findings that can be generalised from the field setting to other similar real-world settings. The drawback is that there might be alternative explanations for the findings that were not eliminated in the design, due to the generally uncontrolled nature of a field study. In this section we discuss such limitations, and our approach to dealing with these.

Users in our study might have been loyal to the Elfwood site and thus only willing to give positive feedback. We did our best to discourage such behavior by clearly pointing out that the support system was only a limited time experiment, and that all kinds of feedback, whether positive or negative, were welcome. The assistants were volunteers with limited experience in helping others. Thus, they might not be representative of assistants with proper experience and education. We tried to make the best of the situation by providing instructions on how to handle the help conversations, and by only selecting the volunteers who had proper skills within some area of expertise. We should also note that the participating users and assistants were all self-

selected. Still, since the support system was operating in a real environment and the users used the system purely out of need and curiosity, the usage likely reflects real usage. A further limitation is that we cannot know if the persons who did not respond to the questionnaires differ systematically from the respondents.

It is reasonable that the results can be generalised to WISs similar to Elfwood. Such WISs include information providing sites such as Intranet systems and so-called web presence sites (“sites that are marketing tools designed to reach consumers outside the firm” [8, page 78]). Our study in step 1 was performed in an electronic commerce setting and gave indications similar to the findings reported here for user attitude [1]. However, it is not obvious that all our recent results are valid for electronic commerce sites. For example, when it comes to trust, the situation for users is clearly different when trust in the advice might have financial consequences. Further studies should be carried out in electronic commerce contexts where users need to commit themselves to potentially risky decisions.

DISCUSSION

Achieving universal usability is a very well-motivated albeit difficult objective. From our findings it is clear that humans have an important role to play in user support for WISs, and in the long run, for achieving universal usability. However, we are just at the beginning of this research, and there are ample opportunities for further interesting work.

We have shown that human assistants have a positive influence on user attitudes towards a web site. Still, the direct influence of these attitude variables needs to be studied, for example on site loyalty for different kinds of WISs such as web presence sites or electronic commerce sites. While it is suggested that trust has a positive influence on customer loyalty for electronic commerce sites [14], there are still many open questions.

Trust is a complex concept [17] and it is difficult to interpret our results on trust, due to the simple nature of the questionnaire statements. Future work should more thoroughly investigate the effect of human assistants on users’ trust in a WIS. Another concept worth studying is playfulness, which can have a positive influence on a user’s learning, mood, involvement, and satisfaction [22]. Do human assistants evoke users’ playfulness?

The three-week duration of our field study is another limitation. It is possible that usage patterns would change over a longer time period. Further work is needed to study the longitudinal effects on this kind of user support system.

The study by Lohse and Spiller [15] suggests that customer service influences neither site traffic nor sales. However, the variables used in the study to represent customer service are limited (e.g. presence of a FAQ section, email support, or a phone number to a customer service department). Thus, the results cannot be generalised to more advanced forms of customer service, and further studies are needed to see what

effects the form of customer service that we propose in this paper would have on the variables mentioned.

In [10] the effect of communication modality on trust and cooperation in online environments is studied. The results do not indicate a statistically significant difference between “no communication” and communication via textual chat, while voice chat has a significantly better effect on trust and cooperation. This indicates that users’ trust for the support of human assistants could be further increased if voice communication were to be used instead of textual chat.

IMPLICATIONS

The implications of this study are twofold. First, our results about user attitudes and the efficiency of the support have implications for decision-makers of information providing WISs in general. The kind of user support system we have studied should be considered as an option whenever user satisfaction is of importance. While our study has shown the technical feasibility, the economical feasibility remains an open question. The expected gain from the efficient user support and the improved user attitudes must be weighed against the cost for each individual application.

Second, our study revealed a number of design implications, and we conclude with the following summary:

- Textual chat is a viable means for communication between assistants and users. Depending on the domain, a text chat system may need to be accompanied by other communication options for special cases where text does not have sufficient expressive power, as is the case of art.
- Some users do not want to wait in a queue for the chance to talk to an assistant. Optimally, there should be enough assistants to avoid having users wait. Still, if a queue system is necessary, make sure that users are continuously updated with their queue position and expected waiting time via audio as well as visually. This is important since many users do other things on their computers while waiting, and might not observe visual update information. Furthermore, some users might not think of the possibility of doing other things online while waiting in a queue and a hint at this possibility could benefit them.
- The efficiency of this kind of support system is closely correlated to the efficiency of the assistants. Assistants need to be knowledgeable, patient, have good social skills, and type fast.
- Users differ in their knowledge and conversational style. Assistants need to be aware of this in order to give each user proper support.
- This kind of user support can very well be used for web sites with an international user base. It also works well to have assistants from different countries, as long as the assistants have decent fluency in the communication language.

ACKNOWLEDGEMENTS

This work has been partially supported by TFR. We would like to thank Johan Lövdahl, Jonas Almfeldt, and Thomas Abrahamsson for their help with the field study.

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