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A METHOD FOR IDENTIFYING COMMUNICATION BREAKDOWNS IN USER-INTERFACES

Businesses are increasingly communicating with their customers via web-based interfaces. However, users are experiencing a lack of guidance and support in the communication of these often complex services. This paper proposes a method for identifying where and why there is a breakdown in communication between the interface and the user. In creating the method, the importance and value of having such a method are considered and discussed, particularly for communication rich interfaces. The method is developed based on the results from user trials with a mortgage application interface using the existing evaluation method. Although the results from piloting the method suggest that it is useful for identifying communication breakdowns within the user-interfaces, more work is required before a definitive method can be produced. As a result of this study it appears that communication breakdowns are related either to the information within an interface or to the process.

Keywords: communication evaluation method, user-interfaces, communication breakdowns, interface communication, interface evaluation, communication design recommendations.

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1. Introduction

Customer demand is driving businesses and organisations to offer services such as healthcare, banking, and legal advice via web-based interfaces. Although these demands have been met, it appears that users are not fully utilising these interfaces, and instead using these as an informative device and then reverting back to traditional methods for completing the task. However, in the past it has not been uncommon for people to persevere with web-based interfaces even though they may be considered to be 'unusable'. Therefore this raises the question of why users are unable to continue with these more complex web-based interfaces. The answer may lie in the nature of the activity being carried out and the lack of domain knowledge on the part of the user. For example, when a book is purchased via a web-based interface the buyer has an awareness of the process that they will go through and what the outcome will be. The procedure that they follow within a web-based interface does not greatly differ from the traditional manner of buying a book. However, in the traditional setting where activities such as healthcare, obtaining legal advice, and banking are concerned a person, usually an expert, plays a significant role in guiding a person through the process. For instance, when a patient visits a health centre a doctor will ask them a number of questions in order to establish a diagnosis. However, if a patient wants to obtain a diagnosis using a healthcare website then the process is somewhat different. The patient is presented with the homepage and from here they are required to navigate their way through the interface to establish a diagnosis. This can be achieved using one, or a combination, of the numerous facilities available, such as wizards, diagnosis guided tours, FAQs, forums or simply searching through an index of medical terms. For instance, if the patient chooses to search for a potential diagnosis using the index of medical terms then it is possible that they are unaware of which of these terms is applicable. Consequently, this lack of expert knowledge may result in ineffective searches and results (Bhavnani 2002) which, where healthcare is concerned could compromise a person's condition. In using the healthcare website the patient adopts the role of both, patient and doctor, in that they are seeking out the required information and are also attempting to guide the process. The latter proves to be difficult since the process is unknown to them and they have no knowledge about what questions to ask and what information to look for.

Similarly with a legal environment the client would take on the role of the client and the lawyer within a web-based interface. The situation with regards to general banking is slightly different in that many people are confident enough to manage their finances through a web-based interface (Lewis 2002). However, this is not the case when it comes to applying for a mortgage (Lewis 2002) with the majority of people preferring to speak with a mortgage advisor either in person or by telephone. Broadly speaking, it appears that services where traditionally an expert is involved and is in control of much of the process, whether that involves providing a medical diagnosis, legal advice or a mortgage, do not easily translate to web-based interfaces. The difference between these websites and other websites is that the services offered tend to be rich in communication, involve a high level of interactivity and the user is unlikely to possess the required knowledge in order to control the process. Although usability evaluations are useful for establishing the functionality and aesthetics of a website they do not assist in identifying what process is being communicated to the user. As in the above examples this is important because if users are unable to understand the process then they are unable to use the interface. Therefore, there is a need for some form of facility for evaluating the communication that occurs between an interface and a user. However, in producing such a facility the first step is to understand the problems that users have with existing interfaces of this type.

Therefore, the purpose of this paper is to propose a method for identifying where and why there is a breakdown in communication between the interface and the user. The paper begins by justifying the need and importance for such a method. The remainder of the paper describes how the method was developed and piloted. This includes a discussion of our experiences of applying an existing method to a mortgage application interface. The results from this are then used as a basis for proposing our own method that is piloted using the same interface. The results from this are discussed including suggestions of how the method could be improved. The paper concludes by indicating that communication breakdowns can be broadly classified under the two main categories of information and process.

2. Communication within User-Interfaces

The communication perspective of user-interface design and evaluation has not received a great deal of attention in HCI research circles

(Reynolds 1998; Prates et al. 2000; Sjöström & Ågerfalk 2004). This is understandable since previously, web-based interfaces only consisted of supporting simple activities such as buying a book, and evaluation guidelines such as usability were sufficient. Although this and other such methods will remain important and our intention is not to replace them, the increase in communication rich services being offered through a web-based interface means that a method for evaluating the more social aspects of interface interaction could prove to be as equally, or perhaps, even more important. Another reason why being able to evaluate communication within a web-based interface is important is that users perceive the interface to be a 'social entity' (Kumar & Benbasat 2002). This means that the user interacts with an interface as they would with a human (Moon 2000) i.e. they communicate with the interface. Although very interesting, this theory involves an entirely separate area of research which cannot sufficiently be addressed within the scope of this paper. However, the point that can be derived from this is that if users are communicating with interfaces as if they are human beings then it is important that the interface is providing adequate interactivity that is more reflective of a human conversation. Therefore, understanding the communication that occurs between the interface and the user is important if communication rich web-based interfaces are to be fully utilised. However, as stated in the introduction, the methods and techniques for evaluating interface communication are limited, in fact we were only able to locate one such facility, and therefore this paper aims to develop one. This is achieved by examining the only existing method that has been designed (Prates et al. 2000) and seeing how it can be adapted in order to make it more accessible, since it is intended to be used by experts. The following section provides a description of this method.

3. The 'Communicability' Evaluation Method

In comparison to usability or accessibility, 'communicability' is not a widely known or used term. Therefore prior to describing this method it is important to understand what the developers of the method, Prates et al. (2000), meant by the term communicability. Prates et al. (2000) define communicability as: "the property of software that efficiently and effectively conveys to users its underlying design intent and interactive principles" (p. 32). It is also necessary to highlight that Prates et al. (2000) indicate that the method was designed to be used in parallel with

other interface evaluation techniques such as usability. Therefore, our view of communicability is that it is an extension of usability i.e. it is usability plus communication. This line of thought is similar to Barber and Badre (1998) who introduced the term 'culturability' which, in essence, is usability plus culture. The purpose of the communicability method is to enable designers to establish how well users are receiving their intended messages via the interface. Furthermore, the method is designed to identify communication breakdown points during a user's interaction with an interface.

The method consists of three steps, and according to Prates et al. (2000), each of these requires a certain amount of expertise. The three steps include: 1) Tagging – identifying communication breakdown points; 2) Interpretation – mapping the communication breakdown points to HCI problems; and 3) Semiotic profiling – determining the overall message conveyed by the interface. Tagging involves assigning user utterances, captured during use of an interface, to a predefined set of categories (e.g. where? what? why? and how?) and can be carried out by users, designers or experts. The second step, Interpretation, consists of mapping the utterances, by way of the predefined categories, to HCI design guidelines such as Nielsen's discount evaluation guidelines (1994) or Shneiderman's eight golden rules (1998). It is recommended that HCI experts carry out this step. The final step, Semiotic Profiling, involves interpreting the mapping in semiotic terms in order to establish the overall message conveyed by the interface, which, in turn should indicate the designers intent. This final step is intended to be undertaken by a Semiotic Engineer. Prior to describing our attempted use of the Communicability Evaluation Method developed by Prates et al. (2000) the following section provides details of the background to the study.

4. The Study

This section provides the background to the study that was used to evaluate the two methods i.e. the original method (Prates et al., 2000) and our adapted one. Since the focus of this paper is on the method for evaluating communication within web-based user interfaces the study, and the data derived as a result, merely act as a tool for evaluating the methods. Therefore, the details of the study itself are not discussed at great length here. The remainder of this section describes the process for selecting a suitable interface, the selection of the participants, and finally how the data was collected.

4.1. Selection of the User Interface

The first stage involved seeking out a 'suitable' interface on which the method could be investigated. This involved identifying an interface where a high level of communication is required and where the user is unlikely to have extensive knowledge of the process. Having previously carried out research in online banking, and knowing that applying for a mortgage through a web-based user-interface was an area where uptake was particularly poor in comparison to other banking services (Lewis, 2002), this was considered to be a suitable interface to explore the communicability method. Furthermore, applying for a mortgage in real-life requires a high level of communication and interaction between the mortgage advisor and the buyer. Therefore, investigating how this is translated within a website makes this an ideal study for testing the communicability evaluation method.

The intention was to use the same mortgage application interface to evaluate both of the methods. Using the same interface means that the same set of data is used to evaluate and compare the methods. The idea was that the data would be gathered using protocol analysis (described further in Section 4.3). This would then be used to evaluate the original method developed by Prates et al. (2000). The method would then be adapted according to our experiences with the application of the original method. The adapted method would then be applied to the same set of data. To identify a suitable interface a leading Internet directory for UK financial websites was searched for potential candidates. The directory contained a list of the 'Top 10 most popular mortgage lenders websites'. Two main criteria were used to identify suitable banks. Firstly, the bank had to offer a complete online mortgage application facility. This meant that the customer should be able to go through the entire process of applying for a mortgage online. Secondly, this facility should be available to first time buyers (see Section 4.2 for a justification of this user group). From the list of top ten mortgage lenders, six provided only a basic online mortgage application facility (e.g., a quick quote) and one provided a current account facility only and so these were discounted. The remaining three provided a complete online application process, but one of these did not support this facility for first time buyers. Therefore, of the remaining two, the one that was most highly ranked was selected for this study.

4.2. Participants

To evaluate the interface, participants were selected on the basis that they were first-time buyers, and frequent Internet users (at least 15 hours per week). This was to ensure that they would have little prior knowledge or experience of the mortgage application process itself, but would be confident and competent enough to use an online application. Therefore, the users would be relying heavily upon the interface to communicate enough meaning into the application process to facilitate a successful and satisfactory submission of their application. Furthermore, since the study was of an exploratory, highly focused nature and the type of data gathered would be qualitative, fewer participants were required to reach data saturation (Benbunan-Fich 2001). In total, 12 participants were involved within the study. The following section describes how data was collected as the participants navigated their way through the mortgage application interface.

4.3. Data collection

The data was collected using the protocol analysis method, which required participants to think aloud and provide continuous verbal reports of their actions and thoughts, which is in keeping with other similar studies on user-interface interaction (e.g. Wang, Hawk and Tenopir 2000, Light and Wakeman 2001). Before being presented with the interface, participants were briefed on their task, which was to apply for an online mortgage. During the session, a researcher noted down the participants' individual procedures to navigating the site, together with user quotes and explanations that were offered for the actions performed. The researcher also prompted participants into verbalising an action should they click on a button without explanation. On average, the participants required 55 minutes to complete the application. Having collated the data we proceeded with analysis of it using the communicability evaluation method proposed by Prates et al. (2000). Details of this are contained in the following section.

5. Applying the Communicability Evaluation Method

Although we have knowledge of the HCI field we would not consider ourselves to be Semiotic Engineers and therefore, from the outset it was anticipated that we would encounter problems applying the method.

However, having established a suitable interface on which to test the method we proceeded with the evaluation. As described in section 3, the first step of the method involves 'tagging' which means that user utterances, while they navigate the interface, are noted and subsequently 'tagged' to a pre-defined set of categories. This step was relatively straightforward and simple to complete. However, in some cases it was difficult to identify which of the pre-defined categories the utterance should be classified under. Table 1 demonstrates the results from the Tagging exercise including the pre-defined categories identified by Prates et al. (2000), the associated user utterance, and a description of how the utterance came about.

Table 1: Results from the Tagging Exercise

Pre-defined Categories	User Utterances	Context
I can't do it.	"It doesn't allow me to leave this blank and I don't know if this is important or not."	The user was unable to proceed with the application without completing details about their insurance requirements.
Looks fine to me…	"That was easy!"	The user was required to answer questions based on their finances using simple yes/no answers e.g. do you have any other loans?
Where is? What now?	"I didn't get any information about the bank."	The interface launched directly into completing the application without providing any information about the bank – this would normally be the case in a real-life context.
What's this? Object or action?	"The personal details bit keeps popping up in the middle of the application."	The customer is asked to enter personal details at various stages of the application process.
Why doesn't it? What happened?	"So has this been sent to the bank then?"	There is an option to save and print the quote to submit the completed application form by clicking a button.
Oops! I can't do it this way. Where am I?	"Oh, why are there no products available to me?"	Once a user had entered in their requirements for a mortgage the interface responded by displaying a message that no packages were available. However, no reasons for this were provided
Thanks, but no thanks. I can do otherwise.	"I'm not sure I understand fully."	An explanation of the payment options is not part of the application process.
	"There's too much information to take in and I can't make sense of it."	No explanation of mortgage products was provided within the application process.

Having completed the first step without encountering any major problems we progressed with the second, Interpretation. It is important to note that the developers of the method intended for an HCI expert to

undertake this particular step. This involved mapping the pre-defined categories to a set of HCI design guidelines. Prates et al. (2002) use what appears to be their own general classification of common HCI problems. However, in the absence of specific guidelines for the purpose of online banking we chose to employ Norman's (1988) set of seven design principles to illuminate the communication problems to achieve this. According to Flemming & Koman (1998) these have been found to be just as applicable to web-based interfaces as system design. Table 2 shows our results from the Interpretation exercise.

Table 2: Results from the Interpretation Exercise

	Constraints	Mappings	Visibility	Consistency	Experience	Affordance	Simplicity
I can't do it.	X						
Looks fine to me…							X
Where is? What now?		X					
What's this? Object or action?			X				
Why doesn't it? What happened?				X			
Oops! I can't do it this way. Where am I?						X	
Thanks, but no thanks. I can do otherwise.					X		

Prates et al. (2000) believe that mapping in this way enables designers/HCI experts to identify the exact nature of the problem and trace it back to the problematic area within the user-interface. Although the description from this step would suggest that it is much simpler than the previous, this step proved to be fairly complex and subject to a certain amount of interpretation. For instance, it could be argued that the category 'I can't do it' could have been classified as a constraint, mapping, visibility, experience or simplicity. The approach that we employed was to select the HCI problem that we felt was 'most appropriate'. However, ultimately this results in matter of opinion. It would appear, from the outcome of this step, that the result is neat and relatively clear-cut.

However, a great deal of time was spent debating the mapping of the categories to the design principles. The difficulties that were encountered could be attributed to the choice of HCI guidelines. In the course of performing this exercise we questioned the value of this step since, by using pre-defined categories the mapping would always result in the same outcome regardless of the interface being evaluated. For instance, the pre-defined category 'Looks fine to me…' will always be classified as 'Simplicity' whether a healthcare interface or a supermarket web-based interface is being evaluated.

Having accomplished the second step, we moved on to step three, semiotic profiling. The developers of the method (Prates et al., 2000) stress that this step *must* be carried out by semiotic engineering experts. The purpose is to establish the designer's intended message to the user. A Semiotic Engineer's role is to derive meaning from the signs, structures and interactive patterns that constitute the user interface (Prates et al. 2000; Leite, 2002) and to attempt to discover the intended message of the designer. This means that they are required to investigate a user interface in terms of the icons, text, audio, etc and the relationships between them and the interface. Unfortunately, this is where the evaluation stopped since none of us had the experience of a semiotic engineer. Therefore, having applied the method we went about looking at how it could be adapted for use by a non-expert. The following section describes how the method was adapted and illustrates its application using the same mortgage application interface.

6. Adapted Communicability Method

Having evaluated the Communicability Method developed by Prates et al. (2000) using a mortgage application interface we set about adapting the method to increase its accessibility. As with the original, the adapted method still consists of three steps even though we were sceptical about the value of the middle step. However, we decided to keep it because it was possible that the changes made to step one would have an impact on step 2. Figure 1 shows how the adapted communicability method differs from the original. The remainder of this section discusses each step in turn describing our experiences from applying the original method and then in light of this how and why the step was adapted.

Original Communicability Evaluation Method		Adapted Communicability Evaluation Method	
Step	**Purpose**	**Step**	**Justification**
TAGGING Assign user utterances to generic categories where? what? why? and how?	Identifies communication breakdown points.	**TAGGING** Assign user utterances to themes. Where themes are derived from the data.	Themes are more specific to user experience.
INTERPRETATION Map categories to design guidelines to achieve classification table.	Maps the breakdowns to HCI problems.	**MAPPING** Map themes to design guidelines to achieve classification table.	Instead of generic categories, themes are mapped to design guidelines.
SEMIOTIC PROFILING Interpret tabulation in semiotic terms. E.g. intention of designer.	Establishes the overall message conveyed by the system.	**INTERPRETATION** Interpret tabulation using the 3 levels of communication.	Expert not required for carrying out this step. Interpreted in communication terms.

Figure 1: Comparison of the Original and Adapted Communicability Methods

6.1. Tagging

In the first step of the original method, user utterances are assigned to a predefined set of generic categories e.g. where? what? why? and how? However, this approach was felt to be rather restrictive in that, in many cases, a 'best fit' technique was required in order to tag the utterances to the categories. In light of this, and in order to make this step more reflective of the interface and the users interaction with it, in the adapted version the user utterances are 'tagged' to themes that have emerged from the data itself. A thematic analysis was conducted on the data using a similar approach to Li et al (2001), and which has been applied in other studies that have focused on the design and evaluation of financial systems (e.g., Longmate et al., 2000). Firstly, the authors coded each user utterance independently by attaching a content label that summarised the unit of thought within the utterance. After familiarisation with the data, this initial coding scheme was refined iteratively, whereby the content labels were assigned to categories. These categories constituted the emergent themes interpreted inductively from the data, which were discussed, modified and refined amongst the authors until a set of agreed themes were established. Thus, user utterances were reduced into a set of eight themes used to characterise the users' communication experience with the mortgage application process. Table 3 illustrates the outcome of using the adapted communicability method for the Tagging exercise.

Table 3: Outcome from the Tagging Exercise using the Adapted Method

Theme and Definition	User Utterance
Overloading Refers to when too much information is provided in that it overwhelms the user.	"There's too much information to take in and I can't make sense of it."
Insufficient Applies when not enough information has been provided.	"Oh no, I would need to speak to someone at this point, it's a big commitment and I don't feel *confident*".
Absence This theme simply refers to where information is missing from the interface.	"It's asking me to choose a product but I haven't been given any information about them".
Confusion This theme relates to where the information that is presented within the interface cannot be understood.	"I've already told them that I am a first time buyer, why has this come up? Have I done something wrong?"
Structure This theme concerns the overall logical flow of the process.	"The personal details bit keeps popping up in the middle of the application".
Progress This theme is related to information within the interface about where the user is in terms of the process i.e. what has been completed and what is remaining.	"How much longer will this take?"
Termination This theme relates to the end of a process, this can be either a natural end e.g. when the application is submitted, or a forced end e.g. when the user or interface interrupts the process.	"So has this been sent to the bank then?" "Oh, why are there no products available to me?"

6.2. Mapping

The second step is the same as the original except that in the adapted method it has been renamed 'Mapping', which was felt to be more reflective than 'Interpretation' of the activity that is being carried out. It was decided that Norman's set of seven design principles (1988) would be employed again for this step so that a comparison with the results from the original method could be made. However, instead of mapping the design principles to pre-defined categories the principles were mapped to the themes derived as a result of the Tagging exercise. Table 4 shows the

results from the second step, Mapping, using the adapted communicability method. Going across the top of the table are the themes, and Norman's principles (1988) going down the left-hand side of the table. Taking the theme 'overloading' as an example, it can be seen that it has been mapped to Norman's principles (1988) constraints, visibility, and experience. The overloading theme is related to where there is too much information displayed within the interface for the user to absorb. Therefore, this prevents users from being able to differentiate between the relevant and irrelevant content, which means that this acts as a constraint to the user completing the mortgage application form. Since the user is overwhelmed with information this means that there is a visibility problem in that the information provided is not clear. Finally, even though the interface is overloaded with information it does not take a user's experience into account. For instance, the users were asked to select a mortgage product without being provided with any information. The interface assumed that the user already had knowledge of the products. Since the data itself is not a focus within this paper we do not interpret the entire table, suffice to say that the mapping of the other themes to Norman's principles (1988) can be interpreted in a similar fashion to the above example.

	Overloading	Insufficient	Absence	Confusion	Structure	Progress	Termination
Constraints Refers to what users can and cannot do, and i ncludes the physical and semantic	X	X	X	X			
Mappings Entails making the relationships between user action and interfa ce feature clear					X	X	X
Visibility Providing clear visual information, especially in the form of feedback	X	X	X	X			
Consistency Refers to making things work in the same way at different times					X	X	X
Experience Making use of what users already know, without making assumptions	X	X	X	X			
Affordance Refers to making use of the properties of items to suggest use					X	X	X
Simplicity Making tasks as straightforward as possible					X	X	X

Table 4: Outcome from the Mapping Exercise using the Adapted Method

As with the original method this step proved to be rather difficult in that mapping the themes to the design principles was rather subjective and it could be considered that the results are presented without confidence. This may also be the reason that the results presented within Table 4 appear to be so neat with four of the themes mapped to the same three design principles and the remaining three themes mapped to the remaining four design principles.

6.3. Interpretation

The third step, Semiotic Profiling, within the original method was not carried out since expertise in the area of semiotic engineering was required. Within the adapted communicability method this step has been renamed 'Interpretation' since in this step the intention is to interpret the results. Furthermore, since the focus is on measuring communication within a user-interface the results are interpreted using a classic model of communication by Shannon & Weaver (1949). This particular model was selected because it is based on a general theory of communication for the sending and receiving of messages via a channel. In this case the interface represents the sender and the user is viewed as the receiver. The quality of the messages sent between the interface and user are assessed on three levels of communication (technical, semantic and effectiveness) that are also based on Shannon and Weaver's (1949) classic typology. The meaning for each has been modified in order to reflect the nature of the environment that is being examined: 1. *Technical* – the message sent by the interface; 2. *Semantic* – the message received by the user; and 3. *Effectiveness* – the outcome of the above. The interpretation is specific to the user-interface, in this case the mortgage application process. This enables the evaluators to pinpoint the particularly problematic areas within the interface. Table 5 provides an example of the interpretation for each of the themes.

Table 5: Outcome from the Interpretation Exercise using the Adapted Method

Theme	Technical	Semantic	Effectiveness
Overloading	The mortgage application homepage provided lots of links and it was unclear where the application process should begin.	This resulted in the user randomly selecting links in the hope of finding the correct one.	Some users would not feel confident about correctly completing the application.
Insufficiency	The interface requests for the user to select a mortgage product without having displayed any product information.	Users feel that they are unable to proceed with the application because they do not have adequate information about the products.	Users would stop using the interface at this point and contact the bank so that they could speak with someone.
Absence	The interface does not display any infor mation about mortgage products as part of the application process.	The user does not understand the process.	Since the users are not presented with the required information they do not have confidence in the decisions that they are making.
Confusion	The interface asked the user to enter their personal details at random points in the application	The user does not know why the interface keeps asking for the same information.	The users question whether they have entered the information that the application is looking for.
Structure	There is no logical sequencing of the application.	The user does not understand the process.	The users lose confidence since they feel as though they are randomly filling in information.
Progress	The interface does not provide any information about the users positioning within the application process.	The users feel frustrated because they cannot see a clear end to the application.	Some users wish to abandon the application.
Termination	The interface has a 'submit' button bu t this is not the actual end of the application.	The user cannot understand why their application has not been sent to the bank even though they have submitted it.	Users wanted to contact the bank to check whether they had received their application.

This step was relatively straightforward to carry out. However, this could be as a result of the selected interface and the consistency of the users opinions towards it. However, it was helpful to analyse the communication in three distinct phases. That is, determining the condition of the interface (technical), attempting to understand what impact this has on the user (semantic), and evaluating the overall outcome (effectiveness), in this case would the user apply for a mortgage online. A designer could use the results presented within Table 5 to identify the aspects of the interface that are proving to be problematic. For instance, the second row of Table 5 with the theme insufficiency informs the designer that an explanation of the mortgage products should be displayed before the user is requested to select a product. The following section discusses and compares the results from each method.

7. Discussion

The original communicability method does not appear to be widely adopted or referenced. This could be due to the need for expertise in particular areas to carry out some of the steps (steps 2 and 3). Furthermore, as was demonstrated in section 5 the original method may be considered as being imprecise because of the need to use a 'best fit' approach with the pre-defined categories in the tagging exercise, which may result in the overall results becoming distorted. The other step that we were able to carry out within the original method was interpretation, step 2, where the pre-defined categories were mapped to HCI principles. The value of this step was unclear since it is understood that the category 'I can't do it' will always be classified as a constraint regardless of the interface. As specified in Section 5, step 3 needs to be carried out by a semiotic engineer and therefore this step was not undertaken.

In an attempt to make the method more widely accessible the method was adapted. However, it should be pointed out that this method should not be considered as definitive, but rather a work in progress. Within the adapted method the themes ('categories' in the original method) were derived from the data gathered from the actual interface. Therefore, it is assumed that each interface that is evaluated using this adapted method would produce a different set of themes. The study of the mortgage application process was small and the themes that were identified could easily be handled. If a more complex interface is evaluated then it may be that the themes are ranked according to the number of user utterances providing evidence of this theme. This would also enable the 'severity' of the communication problems to be established. Even though the second step of the original method was adapted we still questioned the value of it and would consider removing it altogether in future versions of the method since moving directly onto step three would not alter the outcome.

Since results from the final step, Semiotic Profiling, of the original method could not be obtained the results from the adapted method will be discussed. Step three of the adapted method, Interpretation, was where the most significant changes were made. Since the focus of this paper is interface communication the final step involved interpreting the results using Shannon & Weaver's (1949) communication model. Using the communication model in this manner enabled the results to show what characteristic of the interface, e.g. structure, triggered the break-

down in communication. The impact of this on the user (semantic) was associated with this e.g. the lack of structure within the user-interface meant that the user was unable to understand the process. Therefore, the overall impact of this (effectiveness) was that the users did not have confidence in the interface as they were randomly entering information.

In summary, the original method developed by Prates et al. (2000) was designed so that communication breakdowns between the interface and the user may be understood in semiotic terms. It is not our intention to argue that this method is not sufficient for the purposes it was originally designed. However, it is our intention to enhance this method to increase its accessibility. Therefore, non-experts may use the adapted method presented within this paper, although the coding of the data may require some practise. Furthermore, it is believed that the adapted method enables a more reflective view of the communication that takes place between the user and the interface to be obtained since the themes are directly derived from the user utterances whereas the original method uses a set of pre-defined categories. Having said this however, as previously stated this is not a definitive method and it is anticipated that the method will evolve.

8. Conclusions

The ability for an interface to communicate with the user is indeed an important feature and may possibly make the difference between success and failure, particularly where communication rich web-based interfaces are concerned. Therefore, understanding the communication that takes place between the user and an interface would enable an evaluator to determine the parts of an interface that the user understands and can follow, and where further attention is required because there is a breakdown in communication. The method presented within this paper achieves this to some extent. It enables an evaluator to understand the problem in terms of the actual interface, this is then interpreted to establish how this may impact the user, and finally whether the communication is deemed to be effective or not. Analysis of the themes that were identified as a result of the Tagging exercise within this study (Table 3) indicated that communication breakdowns are related to the information (overloading, insufficient, absence, and confusion) or the process (structure, progress, termination) aspect of a web-based user interface. This supports the the-

ory that lack of domain knowledge has an impact on the users ability to use a communication rich interface. However, these findings are specific to this particular study and further communication rich web-based interfaces would need to be evaluated in order to provide generic results.

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