Investigating Communicative Features of User Interfaces

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Abstract

The concept of usability has evolved in different research communities and the focus of research has varied. During the last couple of years, research has been oriented towards acknowledging more appropriately the social context of IT system use. The purpose of this paper is to investigate further the usefulness of a communicative perspective on user interfaces, as a means to understand the IT artefact as part of social and organizational con-text. Such a perspective seems to be important to promote designs that are both use-able and act-able.

1 Introduction

The concept of usability is one out of many attempts to clarify what is to be considered important when designing (or assessing) IT systems (e.g. Grudin, 1992; Ehn, 1995; Holmlid, 2002). Usability, once introduced by Shackel (1984), is an attempt to strike a balance between human factors and technological issues of IT systems. The concept of usability has evolved in different research communities, and the focus of research has varied. Bevan (2001) points out that it is possible to discuss usability in at least two different meanings. One stream of usability research focuses ease-of-use issues (e.g. Nielsen, 1993), thus separating usability from utility (Grudin, 1992). Another stream conceives of the concept in a broader sense, including the issue of achieving specified goals with effectiveness, efficiency and subjective satisfaction in a specified context of use (ISO 9241-11, 1998). The latter conception of usability puts matters of social action and organization in focus (Maguire, 2001), which recent work on 'embodied interaction' and 'technomethodology' brings even further (Dourish, 2001). In line with this view, research within the language/action perspective has suggested that theories of social action, semiotics and pragmatics may be useful in order to understand the social and organizational aspects of IT systems. One such language/action-based approach is that of Information Systems Actability (e.g. Goldkuhl & Ågerfalk, 2002; Ågerfalk, 2004).

Information Systems (IS) Actability comprises a theoretical perspective and a set of analytical tools that help IT designers and evaluators to understand the action characteristics of IT systems. A central part of IS actability is its conceptualisation of user

interfaces[1] (Sjöström & Goldkuhl, 2003; Goldkuhl et al, 2004). This view of user interfaces, referred to as the *pragmatic duality* of IT system use (Sjöström & Goldkuhl, 2003), is important in order to understand user interfaces within an organizational context. The purpose of this paper is to investigate further this communicative perspective and assess its practical usefulness for evaluation of user interfaces.

The paper proceeds as follows. In Section 2 we describe the IS actability conceptualization of user interfaces and its theoretical foundation. In Section 3, this conceptualization is used to construct a model for user interface evaluation. Section 4 contains a description of the user interface of a syllabus system, the context of this system in terms of the organization's description of their use of syllabi, and a selection of e-mails related to the use of the system. Based on this material, the system's user interface is analysed in Section 5 using the proposed evaluation model. The paper concludes with a brief discussion about re-design suggestions (Section 6) and a reflection on the usefulness of the proposed approach (Section 7).

2   A Communicative View of User Interfaces

In the traditional user-centred design view of user interfaces, these are primarily seen as parts in the interaction between user and system. This view, inspired by Norman's metaphor of a gulf of execution and a gulf of evaluation, has been challenged from a semiotic perspective (de Souza et al, 2001). The Semiotic Engineering approach (de Souza, 1993; de Souza et al, 2001) distinguishes between three different types of communication:

1.   User-system interaction

2.   User-user interaction

3.   Designer-to-user communication

From a semiotic perspective it is necessary to take all types of communication into account (de Souza et al, 2001). Semiotic Engineering emphasizes the communication from the user interface designer to the users of that interface. Accordingly, user interface are understood to be 'one-shot messages sent from designers to users about the range of messages users can exchange with the system in order to achieve certain effects' (de Souza et al, 2001, p. 462). This can be compared with the concept of action potential used in IS actability (e.g. Goldkuhl & Ågerfalk, 2002; Sjöström & Goldkuhl, 2002). The action potential of an information system corresponds to the actions afforded by the system. This action potential is a result of the designers' work

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[1] It should be noted that we use the term 'user interface' a bit reluctantly. On the one hand, the term is appropriate since we are talking about a part of the system's software; namely the part with which the user interacts. On the other hand, communicative features of 'user interfaces' are not a property of the IT system alone. Following Gibson's (1977) original notion of affordances, actions afforded by a system are not pure system properties. Affordances emerge in use and so depend on the reciprocal relationship between a human and an object acted upon (Bærentsen & Trettvik, 2002). Therefore, it may be better to picture the interface between the system and the human as something that belongs neither to human nor to machine and, at the same time, both to human and to machine. Although aware of this ambiguity, we find term 'user interface' useful since it is an established concept within the filed of IT system design.

and as such can be understood as a result of communication from designer to user. Viewing the presentation of action potential as communication between designer and user is a powerful concept. However, in most information systems, the communication between users, i.e. from user to user, is perhaps even more important. Users of the information system communicate while using the artefact as an active medium for communication. Although this type of communication is acknowledged in Semiotic Engineering, it is only discussed in relation to specific types of multi-user applications (such as groupware). We would argue that this type of communication is central to all information systems used within a business context and hence should be our main focus of attention.

Along these lines, and based mainly on Bühler's (1934) semiotics[2], Sjöström & Goldkuhl (2003) argue that users of IT systems are typically taking part in on-going conversations about the state of business in some business context, and the IT artefact is an active medium to support that communication. This way of conceiving user interfaces is also supported by the communication model presented by Walsham (2004). In this model, when using an IT system actors exploit their tacit power to create representations of their view of the world (e.g. by inputting data in a form). Other actors subsequently use their tacit power to interpret these representations (e.g. reading reports from the system) and try to make sense of them.

Figure 1 depicts this view of IT systems as systems for technology-mediated business communication, distinguishing between four types of action that can be performed when using an IT system.
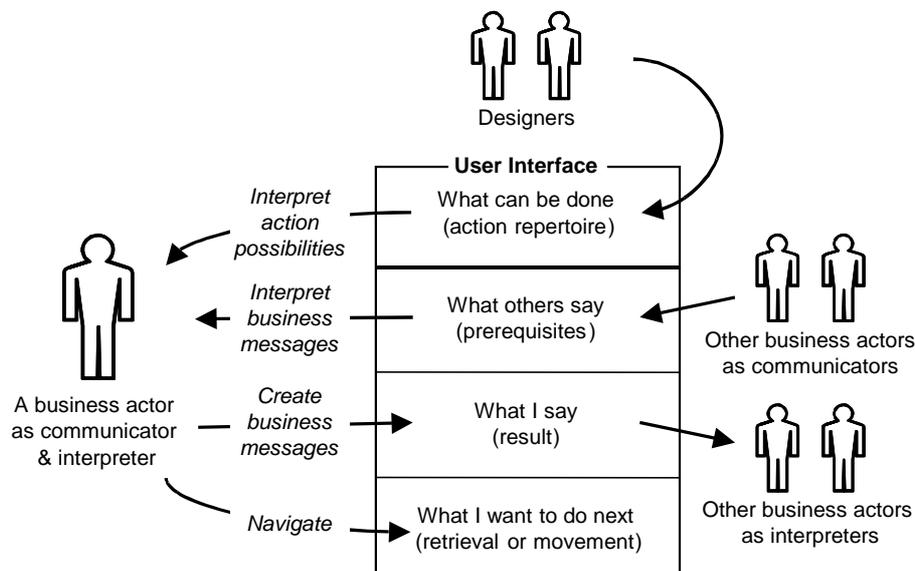

Figure 1: A communicative perspective on user interfaces (adapted from Sjöström & Goldkuhl 2003).

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[2] Bühler (1934) relates the sign to a locutor, a referenced object and an addressee. The creation of the sign is an act of a locutor, aiming at expressing something. The sign has a signalling function, allowing the addressee to interpret the sign; thereby gaining an understanding of the object the sign refers to. Two important actions are thereby related to the sign: the creation of the sign and the interpretation of the sign.

The four different parts of a user interface depicted in Figure 1 should be understood as follows.

1. A person working with an IT system interprets the action possibilities, which – according to this perspective – is an interpretation of messages from the designers. An IT system offers a set of services to the user. The user interface designer has to provide the user with information about these services. The process of understanding the action possibilities thus consists of interpreting signs from the designer.

2. In many systems it is possible (and necessary) to retrieve information that other actors have supplied to the system. This information is often a prerequisite for some action (e.g. when making a reservation, I need some information about previous reservations). This is considered to be an interpretation of business messages; i.e. some other user communicated something to the current user.

3. When using IT systems, we often create signs (and hence leave traces) that are interpretable by other actors; i.e. user-to-user communication. Sometimes this is explicit and sometimes it is implicit. Within the theory of IS actability, systems are considered to have an action memory (Goldkuhl & Ågerfalk, 2002; Ågerfalk, 2004) where such traces are stored. These signs may of course be transformed by the IT system in some way before being presented to other users. It is sometimes hard, or even impossible, to trace the sources of signs. This will be further discussed below.

4. The fourth part of the user interface concept is navigation. A user of the system can move around in a system; e.g. by opening a form or typing a URL to reach a new site in a Web browser. This is considered to be a separate part of the concept, since there is an important difference between creating messages to other users and creating messages that are used by the system (and user) alone (without an impact on other people). Navigation could for instance include opening a search engine on the web, typing in some keywords and clicking the search button. This is not about communicating something to someone; still, it is an important part of most user interfaces.

This perspective on user interfaces should be thought of as a tool to understand IT mediated communication as part of a larger communication context. The four parts of the user interface are shortly summarized in Table 1.

An IT system does not only mediate messages, it also has the ability of storing these over time, producing different views of them, processing (hence changing) the information, and, in an abstract sense, take initiatives (e.g. to alert users about something). This can be seen as delegation of responsibility from human actors to the IT system (Goldkuhl & Ågerfalk, 2002). This means that the IT system is seen as an agent that performs action on behalf of some human actor. According to IS actability, there is always a human being responsible for every action, even if the performance of action is concealed in the IT artefact (Ågerfalk, 2004).

Table 1: Types of communication of different parts of the user interface (Sjöström & Gold-kuhl, 2003).

Part of UI	Type of communication and communicators
Action repertoire	A user interprets possible action types afforded by the system (communication from designer to user)
Business communication – for interpretation	A user interprets messages from other users. These messages are mediated through the IT-system. (Communication from user to user)
Business communication – formulation and sending	A user creates messages to be mediated by the system to other users (Communication from user to user)
User interface navigation	Interaction between user and IT system (No communication between human actors)

Figure 2 illustrates the IT-system as a mediator of input-messages, forwarding these to some other use situation. As discussed above, sometimes this mediation includes transforming one or several messages into another type of message. This would, for example, be the case when several messages of type A become a message of type C. Some messages are not transformed, but forwarded 'as is' to other users.
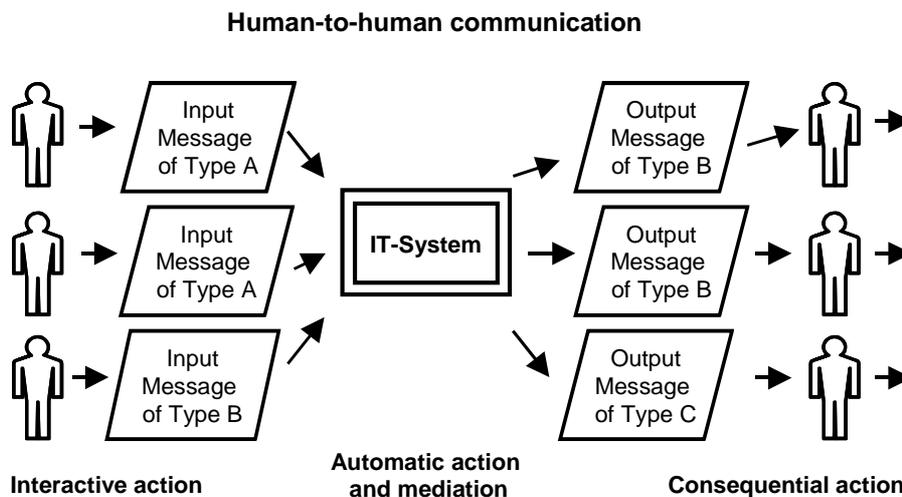
Human-to-human communication

Figure 2: Types of actions related to three different types of use-situations (adapted from Sjöström and Goldkuhl, 2002).

Based on this, we can distinguish between four types of situations (Sjöström & Goldkuhl, 2002):

- 'one-to-one' situations: one actor intervenes and produces a message which might be automatically transformed, and which is interpreted by another actor.

- 'one-to-many' situations: one actor intervenes using the IT system and several actors receive the message, or an automatically transformed version of the message.

- 'many-to-one' situations: several actors intervene by using the IT system, and one single actor receives some view of the message.

- 'many-to-many' situations: several actors intervene and several actors receive different views of the message.

This illustrates the complexity of communication when an IT artefact is the mediator. Since an IT system can obscure features of communication that normally are apparent (e.g. "who am I talking to?", "why am I supposed to say this?" or "why did someone say this?"), IS actability states that an important part of the UI design process is to decide whether the communication between actors should be "transparent" or not (Ågerfalk, 2004). A lack of transparency in this communication between users can be a source of problems for users of an IT system (Sjöström and Goldkuhl, 2002; 2003). People need to be able to 'get an account' (Dourish, 2001; Eriksén, 2002), to trace the rationale, of actions performed by others in order to understand them and their meaning.

3 A Model for User Interface Analysis

In this section, we formulate an approach for user interface evaluation based on the IS actability view of user interfaces from Section 2. Section 3.1 provides a theoretical model that helps us direct attention towards communicative properties of a user interface. This model is expressed as a set of questions to ask during evaluation. Section 3.2 presents a process for how to use this model in practical situations.

3.1 A model for User Interface Analysis

As detailed in Section 2, a user interface is an active medium for business communication, which supports the four types of communication depicted in Figure 1 and Table 1. In order properly to analyse user-to-user communication (i.e. social action) in a user interface we need some guidance. Previous work on IS actability has generated criteria for evaluation of user interfaces (and IT systems). These criteria exist in a number of different variations (Ågerfalk *et al.*, 2002; Cronholm and Goldkuhl, 2002; Ågerfalk, 2004). Specifically, Sjöström (2003) presented a set of criteria mainly aiming at the social and pragmatic aspects of IT systems, of which we will use a subset in this paper (see Table 2).

These criteria are mainly derived from Weber's (1978) social action theory and the pragmatic theory of Grice (1975). According to Weber (1978), social action is human behaviour to which meaning is attached and which is oriented towards the behaviour of others. That is, the way a person acts in a social context is always influenced by how their actions will be interpreted by others. Grice (1975) formulated a set of communication maxims, which capture parts of this influence in terms of the expectations one has on other people's utterances.

Table 2: Socio-pragmatic aspects of business messages (adapted from Sjöström 2003).

Criterion	Description
Visible Actors	Make the users understand the social context by making the actors visible in the IT system. This way, the users will be aware of the origin of messages, and whom they are sending messages to.
Timing	Allow the users to understand when other actors will interpret their messages. This can be done by making it transparent when messages reach their intended interpreters, and if messages are pushed to them or pulled by them.
Message Context	Promote qualitative utterances by making information about previous actions available in the action memory and 2) making the actors visible in the IT system in order to make clarifications possible and promote users to trust the information.
Info Quantity	Promote a suitable quantity of information handling by 1) displaying and requesting an adequate amount of information in screen documents and 2) making the actors visible in order to allow users to retrieve more information if needed.
Action Affordance	Make sure that all required actions (business actions and navigation actions) are afforded and readily available by the IT system.

The set of criteria in Table 2 is by no means exhaustive, but is sufficient for the purpose of this paper: to facilitate discussion about action-related characteristics of IT systems. There are also some overlaps in the table. The reason for this is that we want to emphasize that some design advice are motivated in different ways; for example, keeping actors visible.

Tables 1 and 2 can be combined into a model that helps us direct attention towards social phenomena when analysing a user interface:

1. The two middle-tiers in Table 1 separate between two different aspects of user-to-user communication: (a) the interpretation of messages and (b) the formulation/sending of messages.

2. The set of design advice in Table 2 provides specific questions concerning different properties in the user interface related to user-to-user communication.

By combining (1) and (2) we arrive at a rich set of questions which facilitates the analysis of user interface features from the interpretation as well as the formulation/sending perspective (see Table 3). According to the presented view of user interfaces, the functionality afforded by an IT system is the result of a designer's work; i.e. a result of communication from designer to user. Therefore, the criterion 'action affordance' is *not* discussed in relation to interpretation and formulation/sending, but in relation to action repertoire and user interface navigation alone.

Table 3: A set of questions to analyse communicative aspects of a user interface.

Question	Criterion	Part of UI
1. Who created each message?	[Visible Actors]	[Interpretation]
2. When were the messages created?	[Timing]	[Interpretation]
3. Are there other messages related to the interpretation of an existing message?	[Message Context]	[Interpretation]
4. Do I receive unnecessary information?	[Info Quantity]	[Interpretation]
5. Are the recipients of the information visible?	[Visible Actors]	[Formulation/Sending]
6. When will the message reach its recipients?	[Timing]	[Formulation/Sending]
7. Are there other messages related to the formulation of a new message?	[Message Context]	[Formulation/Sending]
8. Do I have to supply unnecessary information?	[Info Quantity]	[Formulation/Sending]
9. Can I create this message that I need to communicate?	[Action Affordance]	[Action Repertoire]
10. Can I move to another part of the system as required?	[Action Affordance]	[UI Navigation]

3.2   A Process for User Interface Evaluation

In this particular paper, we perform a criteria based (heuristic) evaluation of the user interface of a syllabus system. We have had limited access to the users of the system, and have studied the user interface based on the empirical sources listed in Table 4.

Table 4: Empirical sources and corresponding domains of interest.

Domain of interest	Empirical source
The role of syllabi in the organization	Excerpts from staff handbook
The user interface	Access to the syllabus system
Business communication	Selected e-mails, concerning the work with the syllabus system

The empirical sources listed in Table 4 served as a basis for discussing the communicative features of the user interface of the syllabus system (see Section 4). The discussion is structured according to the set of questions presented in Table 3. A further investigation of user experience would be interesting, but is beyond the scope of this study. We would argue that the e-mail examples clearly indicate problems and are sufficient to substantiate the points we want to make in this paper.

4   The Syllabus System: A Case Description

The process of creating syllabi is essential in Swedish universities. A syllabus can be understood as a contract between the university and its students. This contract specifies the goals, content, examination forms, literature, etc, of a particular course[3]. Changes in a syllabus, and development of new syllabi, are important activities involving many people.

4.1   The Role of Syllabi in the Organization

Figure 3, a guide for teachers that can be found in the staff handbook on the university's intranet[4], is an illustration intended to position the syllabi within its business context. This illustration provides an overview of the pre-requisites, activities, systems, and catalogues related to the syllabus. It also shows the 'inputs' to a syllabus, and what each syllabus is used for.

Figure 4 has been refurbished in two ways (compared to the original version). The 'intranet' nodes originally contained the name of the intranet, and the letters A–J have been augmented to the figure in order to facilitate referencing to its parts. The figure indicates that syllabi are vital parts of the organizational communication. Some parts of the figure (in relation to the user interface) are worth reflecting upon (these figures are also described in the teacher guide):

A.   Syllabi are linked with the bookshop and the library.

B.   Confirmed courses are the basis for student registration

C.   The university's intranet contains course information that is fetched from the syllabus system

D.   The syllabus system is linked to the class scheduling system

E.   The syllabus is used in the production of the ECTS catalogue, which is sent to partner universities to inform exchange students about courses given in English

F.   The short versions of the course description are used to produce descriptions of optional courses and elective courses

G.   The short versions of the course description are used to produce the descriptions of courses that are not part of a programme

H.   Course descriptions are also published on the website www.studera.nu, which is a national Swedish service for students to find information about programmes and courses at all Swedish universities.

I.   The syllabi are used to map each course to a programme. This is also linked to Ladok – the Swedish national system for registration of credit points from Swedish universities. When a syllabus is changed and re-confirmed, a new Ladok ID is generated for each link between the course and its programme(s).

J.   The syllabi are used by the administrative staff to design the examination plan, which is a schedule of written exams

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[3] Note that the term 'course' refers to the distinct parts that together form a degree programme. In other universities, this is sometimes referred to as, for example, 'module' or 'subject'.

[4] The intranet is a separate system that is not integrated with the course plan database. The guide for teachers is a downloadable PDF document.
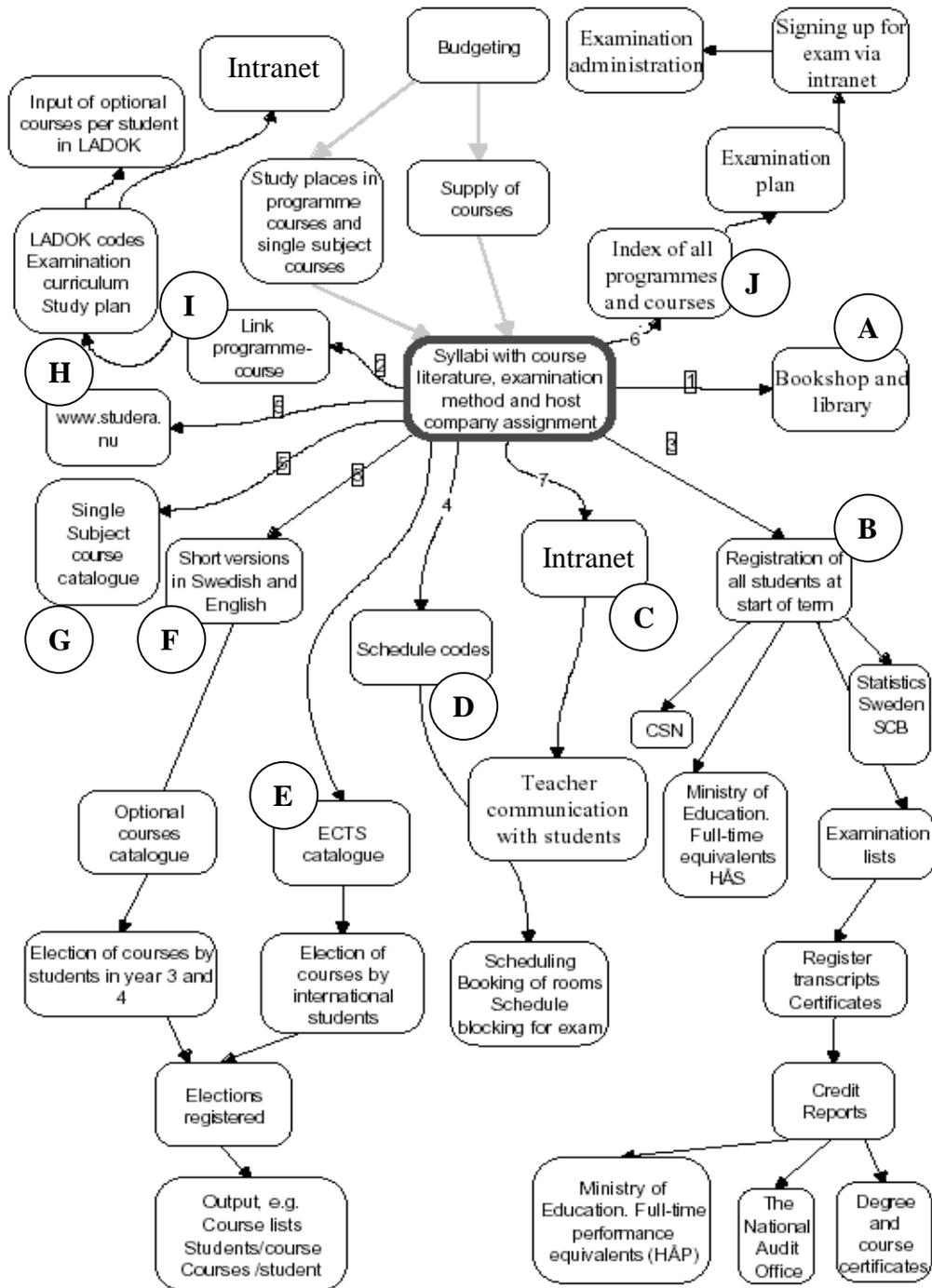
Figure 3: The teacher's guide illustration of the syllabi context.

4.2   The User Interface

This section illustrates and describes the user interface of the syllabus system. The screenshot in Figure 4 shows the part of the system focused in this study: the screen document where users can find and edit syllabi. This screenshot illustrates the syllabus system's user interface and parts of the content of a syllabus.

Figure 4: Snapshot from the syllabus system's user interface.

The course described in this screen document has a set of attributes, such as name, ID, number of credits, level (A–D, where A is basic level and D is masters level), field code (e.g. *informatics* or *business administration*), area of science (e.g. *social science* or *technology*), and course language. Furthermore, the description of a course includes course objectives, course contents, examination type, literature, a short description of the course in Swedish and English, *et cetera* (there are more text fields in the window which appears when scrolling down – the scrollbars have been cut off from the right side of the picture in order to save some space). Each course has a course co-ordinator, who is responsible for the administration and planning of the course, and an examiner, who is responsible for the overall quality of the course. The

syllabus is in one out of two different states: confirmed or edited but not confirmed. The syllabus may also be audited to secure the quality of the language. In order to edit the contents of a syllabus, it has to be unlocked. After finishing editing, the syllabus is supposed to be locked again.

4.3   Business Communication

This selection of e-mails represents a few different communication situations that are related to the development of syllabi. The real names used in the e-mails have been replaced with fictional ones. English text has been retained, including spelling errors. Text originally in Swedish has been translated to English by the authors.

The e-mail message from the administrator, depicted in Figure 5, is a question to a course co-ordinator regarding why a syllabus has been copied[5]. The course co-ordinator has created a copy – a measure that could have been taken for several reasons, e.g. that the course co-ordinator plans to make some changes in the near future or that the creation of the copy was unintended.

From:	Joe the Administrator
To:	Ben the course-coordinator
Date:	2003-05-28 15:19:36
Subject:	Syllabus for course X

Hi Ben!
There is a copy of the syllabus for course X [in the syllabus system], but I can't find any changes from the syllabus that was determined 2001-06-11. Are you editing the syllabus or should we remove the copy?
Greetings
Joe

Figure 5: E-mail 1 – From an administrator to a course coordinator, concerning difficulties to interpret syllabus changes.

In Figure 6, we can see a high priority e-mail stating that course-coordinators should make sure that the courses they are responsible for are described shortly (Short description is an input field in the user interface). Note that the deadline for this update is the day after the mail is sent.

The e-mail depicted in Figure 7 is another reminder, this time from marketing staff to course co-ordinators (it is sent to all staff members, though). It is revealed that earlier messages have been sent to remind the course co-ordinators to update the short descriptions of the courses. The term course plan is used instead of the term syllabus in this case. Information about several deadlines is revealed in the message.

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[5] In order to edit a confirmed syllabus, you have to make a copy. The copy then has to be confirmed by the undergraduate council.

From: Karen the Administrator
To: All staff members
Date: 2003-11-18 09:29:49
Subject: Course syllabi - important information

To Course Coordinators

For every course syllabus there must be a short description in the database ("kursplanedatabasen") [the syllabus system]. The course syllabi for spring 2004 will be confirmed (and locked) tomorrow the 19th of November. Please make sure today that you have included a desription in the syllabus. Please also check that you have given a date under "Granskad datum" [audited on].

Regards
Yoda, responsible for undergraduate programmes

Figure 6: E-mail 2 – From administrator to the entire staff, concerning the process of updating the syllabi.

From: Yolanda the marketing manager
To: All staff members
Date: 2001-11-28 09:34:20
Subject: Swedish and ECTS Course Catalogues

Hello,
As a reminder I would like to inform you all who are course co-ordinators/course responible that today we are sending out the Swedish and ECTS Course Catalogues for fall -02/spring -03 to all subject resonsibles. Old course summaries should be revised and new should have be written into the course plan database at this time. If you for some reason haven't done this yet (deadlines according to earlier messages this fall were 15 November (ECTS) and 1 December (Swedish)), please do so now.

The ECTS course catalogue's deadline is 7 DECEMBER! (All changes should go to Usagi Yojimbo)

For the swedish course catalogue there is a need to revise the short short texts versions in the catalogue and make them even shorter. The summaries of single subject courses from the course plan database will be published on the Internet and will be referred to from the
catalogue for further information.

Deadline for the swedish course catalogue: 12 DECEMBER. (All changes should go to Yolanda the Marketing Manager)

Regards
Yolanda and Stephanie

Figure 7: E-mail 3 – From the marketing manager to the entire staff. The issue at hand is the role of syllabi as a part of the university's marketing material.

5 Analysis of the Syllabus System

Table 3 contains a set of questions that can be used to analyse communicative features of user interfaces. These questions are used in this section to analyse the syllabus system. Each question is addressed based on the three parts of the empirical study: the documentation, the user interface, and the e-mail communication. One assumption is that university employees are familiar with the semantics of the syllabus information. Therefore, the semantic meaning of individual input fields is not further discussed in this analysis. Throughout the analysis, we name each identified type of problem. In Section 6 we revisit these and elaborate possible re-design suggestions.

5.1 Who Created Each Message?

It is not possible to see who created each message by examining the user interface; the pieces of information in the screen document are of unknown origin. However, the text fields indicate that actors with different roles process different parts of the syllabus. Someone has to design it initially, someone has to check the language (particularly important when courses are given in English), and someone has finally to approve the syllabus. It is transparent who audited the course, and who performed the language check (at least there is support for communicating this information).

The documentation does not explicitly identify the individuals or roles responsible for editing and creating a syllabus. However, it is indicated that inputs needed to make a syllabus comprises the budgeting process, the supply of courses, and the study places in programme courses and single subject courses. Still, the actual meaning of these inputs remains unclear.

The first e-mail (Figure 5) is directed towards an individual (Ben the course co-ordinator) which seems to imply that Joe the Administrator presumes that Ben created the copy of the syllabus. The second and the third e-mails are also directed towards course co-ordinators. This indicates that several people who interpret the syllabi interpret the course co-ordinators as the origin of syllabi.

The analysis above indicates that it can be problematic for course co-ordinators to understand who edited a syllabus, but the people who use the syllabus for different purposes (i.e. the ones to confirm them, and the marketing people) seem strongly to believe that the course co-ordinators are the originators of the messages. It is worth pointing out that the e-mail communication is directed towards others than the intended recipients; one interesting follow-up on this is that IT system design (at least in this case) causes a need for communication also outside the system, sometimes to people who are not involved in or concerned with the current issue. This can be referred to as *the communicator problem*.

5.2 When Were the Messages Created?

It is possible to find out (approximately) when the most recent changes were made. By searching for earlier versions of this syllabus, we can deduce that this version has been created after the previously approved version (since this version is a copy of the syllabus that has not yet been approved). So far we know that someone made changes to a syllabus, sometime after the previous version was approved. Some aspects of time are thus made transparent in the system: the course co-ordinators are supposed to

communicate that they have audited a syllabus by entering their name and signature. There is also an input field where the confirmation date of the course is revealed.

The documentation does not present any time aspects of the use of syllabi. The workflow of the organization, including important dates, is not part of that model.

The first e-mail (Figure 5) reveals that Joe the administrator has compared the confirmed syllabus and the copy of the syllabus in order to draw the conclusion that they are identical. Joe cannot determine if the copy was made yesterday or last year, so he needs to contact the course co-ordinator in order to get a clarification.

A reflection at this point is that the time aspect is sometimes considered important, while on other times it is not. The e-mail indicates that undisclosed time aspects (and the fact the Joe the administrator is not aware of the course co-ordinator's intentions) might give rise to extra labour – in this case, the comparison of two documents, and additional communication in the organization. This can be referred to as *the temporal problem*.

5.3   Are There Other Messages Related to the Interpretation of an Existing One?

Different versions of the syllabus can be retrieved in the system. Except that, there seem to be no more messages of interest accessible from the user interface.

The entire documentation can be looked upon as a message that is related to all syllabi. This document is not actually a part of the system, but it indicates a need for complementary information when working with course plans.

When a course co-ordinator receives an e-mail, such as the ones presented above, it is likely that this causes them to open the syllabus system to see if something is supposed to be done. In that sense, the e-mails are indeed related to the messages in the IT system.

On an abstract level, the e-mails imply that the syllabus system does not support the process of working with syllabi – it only supports the semantics related to them. Studying the communication that arises as a consequence of IT system use seems to be one way of understanding the communication characteristics of the IT system. It could hence be one valuable input for system re-design and maintenance. Once again, we see an instance of *the temporal problem*.

The same type of reasoning is applicable on the documentation part. Since the documentation can be considered as related to system use, it should be easily accessible from within the system. This can be referred to as *the documentation problem*.

5.4   Do I Receive Unnecessary Information?

The three input fields 'Language checked', 'Audited date' and 'Audited by' constitute one example of this in the current user interface. These three text fields are directed towards different actors. The language check is supposed to be performed (and entered into the system) by a language expert, and the auditing information is supposed to be handled by course coordinators. It is possible, though, to interpret the text fields in the wrong way, as they all seem to be related to the language check.

The documentation tells us that several actors are updating the syllabus, and several actors are affected by these changes. These actors are working with the same screen document in the user interface. The amount of information displayed on the screen thus has a generic character; no matter which action you are supposed to perform (e.g. copy or edit the syllabus, confirm it or perform a language check, or per-

form some actions based on the contents of the syllabus) you are confronted with the same view of the business messages. This can be referred to as *the mixed message problem*.

The second e-mail (Figure 6) is possibly partly a consequence of the receipt of unnecessary information – not in the system, but related to the nature of the system. All staff members receive messages that are really meant for course co-ordinators (indeed, some of them are course co-ordinators, but certainly not all of them).

5.5   Are the Recipients of the Information Visible?

There is no way to find out with whom you are communicating by looking at the user interface alone. There are some indications that others will view a message, such as language experts and some authority that will confirm (or deny) changes made in the syllabus. Still, it is unclear who will actually make use of the information I put into the system, and what I am accountable for in respect to these people's future actions.

The documentation indicates that the screen document will be the subject to other people's actions, but it is still presented at an abstract level (you cannot see the roles or individuals that will be affected by your actions). Some 'recipients' can be derived from the user interface and the documentation.

The bookshop and the library seem to receive information about syllabi. This indicates that books are ordered when a syllabus is approved. The user interface does not reveal this. It seems fair to specify the person who decides on whether the assignment of literature should affect the ordering of books or not (there might, for instance, be freely available online versions). The course co-ordinators are neither able to understand that books may be ordered based on their changes in a syllabus, nor are they able to communicate to other actors that books are not supposed to be ordered[6].

The syllabus will be viewable on the intranet, but it is unclear exactly whom it is directed towards. Will it be published immediately, or after it has been confirmed? Since this is some kind of workflow situation, where the syllabi can have different states, there is a relation between time aspects and possible recipients of the actions. This is concealed in the system.

The first e-mail (Figure 5) is an example of 'accidental' or 'unintentional' communication, since a course co-ordinator has created a copy of the syllabus without knowing what consequences it would have for someone else. This is an example where the nature of the artefact causes people to communicate something without being aware of it; causing confusion and a need for clarifications. This can be referred to as *the action transparency problem*.

5.6   When Will the Message Reach its Recipients?

Neither the documentation nor the user interface reveals any information about when messages will be interpreted by other actors in the organization. Since the e-mails are related to issues that have not been dealt with in due time (e-mails 2 and 3) and issues that need clarification, they do not provide any answer to this question. The lack of understanding of when others will interpret a message makes it unclear for the users of the system to evaluate the business effects that may occur when they make changes

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[6] According to one user of the system, this has actually happened. The teacher planned to use the free PDF-file version of the book; still the books were ordered by the bookstore without the teacher's knowledge.

to a syllabus. This temporal aspect of business communication seems important to acknowledge when designing workflow-supporting systems (such as the syllabus system). The empirical data does not point this out explicitly, since the problems that are indicated in the e-mails seem to be more related to problems of understanding if and how someone will receive messages created, rather than when they will be received. This is another instance of *the temporal problem*.

5.7 Are There Other Messages Related to the Formulation of a New Message?

Whether or not there are other messages related to the formulation of a new message proves to be hard to answer without greater knowledge of how actual users work with the system. One clear answer to this question is that messages viewed on the screen (constituting the syllabus that is being managed at the moment) are required when formulating new messages (e.g. confirming the syllabus or editing its content).

E-mails number 2 and 3 (Figure 6 and Figure 7) will probably trigger course coordinators to start working with the syllabi. In this sense, the e-mail messages are related to the work of the system. E-mail 1 (Figure 5) might also trigger a course coordinator to start formulating a message in the syllabus system. It seems important to compare the answer to this question with the answer to the question concerning "other messages related to the interpretation of messages" (Section 4.7). In a system like this, where we are working with one screen document only, messages required for interpretation are the same as the messages we are formulating (at a type level, that is). This makes the answers to the two questions similar. In situations like this, the rational choice might be to try to answer both questions at the same time.

Arguably, this is related to at two latter problems – the *temporal problem* and the *mixed message problem*.

5.8 Do I Have to Supply Unnecessary Information?

There are input fields that are meant to be used by different actors, all in one screen document. This could confuse the actors working with the system, since they may be led to believe that they should input something that is actually supposed to be done by someone else. This, together with the reception of unnecessary information, indicates that there should be more screen documents in this system, each one adapted to the needs of a specific actor role. This is another instance of *the single view problem*.

The documentation describes the syllabi's complexity, which may be interpreted (by the individual actors working with the system) as if they are supposed to write everything. The obligations of each role are not well defined. What is the course coordinator supposed to do, what is the examiner supposed to do, what are the marketing people supposed to do, *et cetera*?

One sign of this problem, as seen in e-mail 3 (Figure 7), is that the course coordinators are reminded to write short descriptions of the courses, in two languages. Note specifically the remark about short versions already supplied, which need to be even shorter.

5.9 Can I Create This Message That I Need to Communicate?

We cannot say what the users need to communicate only by studying the user interface, and the documentation does not help us much either. It does indicate that a lot of communication is needed, since the communication of a syllabus sends many different messages to different people, and these people will use that information for many different purposes.

When the course co-ordinator creates a copy of a syllabus, there seems to be a need to provide an explanation (e.g. "this syllabus will be changed – do not use it until it has been audited by me"). There is thus a need to communicate informally using the IT system. This is also related to the *communicator problem*.

For the users, there might be a problem to understand exactly what they are supposed to do and when they are supposed to do it. We consider these two issues as strong candidates to be included in the battery of questions we use for analysis. At this point, the obligations of the users are not transparent in the system. The system supports of the semantic contents of syllabi, and to some extent there is a workflow support (auditing and confirmation of course plans). However, a lot of the workflow is managed outside of the system, resulting in communication sometimes directed towards other people than the relevant recipients (e.g. "all staff members" instead of the course co-ordinators who have not performed actions which they are obliged to perform).

5.10 Can I Move to Another Part of the System as Required?

In the analysed user interface, there is only a minimal amount of navigation possible: You can navigate the contents of the screen document by using the 'go to', the 'show' and the 'search' (the binoculars) components of the interface. Our analysis so far has discussed the problems of having one screen document only, since each syllabus is actually developed in a workflow where several actors are involved in formulating, auditing, language checking and confirming each syllabus. Furthermore, when the syllabi have been developed and confirmed, they are used for a number of different purposes. This indicates that the syllabus system might support the users' work better if it consisted of a set of screen documents, supporting the workflow and the actions that the different actors are obliged to perform. That is, there is a need for more screen documents, hence a need for enhanced navigation in the system. Once again, this is an instance of *the mixed message problem*.

6 Discussion

Many of the answers to the questions posed in the analysis signal that users of the system are in a situation where they cannot validate the consequences of their actions or the expectations others have on them in the process of working with syllabi. This generates a need for a discursive conversation outside of the IT system in order for actors to obtain clarifications or remind their co-workers about their obligations. These reminders are typically communicated using e-mail. Sometimes mailing lists are used, which sends the messages not only to the intended interpreters, but also to other actors who are not really related to the issue at hand. Above we identified five types of problem: the temporal problem, the action transparency problem, the documentation problem, the mixed message problem, and the communicator problem. Let us revisit these and see how each can be overcome.

6.1   The Temporal Problem

The temporal problem concerns timing in the organization. E-mails are sent out by administrators, reminding course co-ordinators what has to be done. These reminders are sometimes sent out with a short notice. A re-design advice would be to allow administrators to communicate important dates through the system. Deadlines for course-coordinators' editing of syllabi, dates for language checks and for syllabus confirmation dates should be visible in the system. These types of reminders could even be implemented in the system itself and sent automatically to remind course co-ordinators to check the syllabi at given times before the deadline. This way the communication would be directed towards (and only towards) the intended interpreters. This would also help course co-ordinators understand what they are supposed to do, and when they are supposed to do it.

6.2   The Action Transparency Problem

The action transparency problem concerns the fact that it is sometimes unclear what effects an action has. To overcome this problem it would be necessary to make sure that each action performed through the system is clearly presented to the actor, with respect to what is being done, and to whom it is being done. This may be hard to include fully in the design of the system, but at least vital parts of the documentation (Figure 3) could be communicated to the user through the syllabus system's user interface. It would also be possible, for instance, to make it possible for course co-ordinators to decide whether books should be ordered or not.

6.3   The Documentation Problem

We argue that the need for a major illustration of the syllabus system's relation to the business context is a sign of a problematic user interface design – the documentation problem. The illustration helps users to understand that a syllabus is an important document, involved in a large communication process. The user interface and the documentation help us picture parts of the use of syllabi. However, it is not fully transparent what the process really looks like. Parts of this could be communicated to users through on-line help, instead of (or as a complement to) being communicated through the staff handbook.

6.4   The Mixed Message Problem

One important and problematic issue seems to be that only one screen document (view) is used, even though there are several different actors involved, who have different roles in the process of developing, confirming, and acting on basis of syllabi. The implication of this 'mixed message design' is that the one and only screen document affords the functionality needed in all actions and for all users, which makes it hard for users to understand their obligations and action possibilities when they are using the system. Users are forced to communicate and to make sense of several unrelated messages in one screen document.

A re-design advice would be to create multiple screen documents that are tailored for different actors. One view for course co-ordinators, one view for language checkers, and one view for administrators. This would make it easier to design each screen document to suit the needs of the group of actors who is to work with it, and it will be

possible to remove (or de-activate) parts of the screen document that currently confuse users.

6.5   The Communicator Problem

An obvious problem in the syllabus system was that it was sometimes unclear who communicated what to whom and with what intentions – the communicator problem. The final re-design suggestion would thus be to allow course-coordinators to communicate informally[7] with other actors (e.g. by using a text field). This text field would give the course-coordinator the possibility to comment what is done, for example: 'This copy of the syllabus is still under construction and should not be confirmed yet!' This would make the status of each syllabus more understandable to administrators and the language check department. This would probably reduce confusion among the different actors working with syllabi, and hence reduce the need for clarifications through e-mail communication. The actual use of this text field (which would emerge over time) could also be valuable input to designers in future re-design activities.

7   Conclusion

In this paper we have derived a set of theoretically justified questions for user interface evaluation. These questions, derived from a communicative perspective on user interfaces, social action theory and pragmatics, have proven useful in identifying problems with the user interface of a syllabus system. The recognition and analysis of these problems are based on the notions of communication and social action. This way of understanding (and evaluating) user interfaces emphasizes problems related to the organizational action, which the IT system is supposed to support. This is not a substitute for traditional human-computer interaction approaches to user interface evaluation. Rather, it is a complement which can support evaluators (and/or designers) in keeping the bigger picture in mind: human beings are social by nature, and human behaviour is strongly linked to the social setting in which they act. Information technology is designed by humans, for humans, and in many cases for a specific purpose (such as coordinating syllabi work at a university), which is emphasized in the proposed evaluation model. This way, the suggested approach complements traditional usability evaluation criteria by clarifying what is actually to be meant by "task match". It is worth noting that some of the problems identified, and the corresponding re-design suggestions, would likely have been pointed out also by traditional usability evaluation approaches (e.g. the suggestion to improve the on-line help). However, our design advice concerns including help about the work activity and the users' relationships with other actors in the organization, which is typically not focused in traditional usability design guidelines.

The small case study presented in this paper shows that the users' lack of process understanding is a source of the problems, as illustrated in the e-mails. One could argue that the IT system as such is not the problem; that the problem is that the actors

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[7] Schoop *et al*. (2003) designed a negotiation system based on communication theories that allows users to communicate both informally and formally. This is one example of how a design can permit actors to act without worrying about the consequences of what they do. In this case, meta-communication about the syllabus management process can take place, which might be one way of avoiding misunderstandings.

in the organization just need education. However, a different system design, which would reveal more of the communication context, is likely to reduce the risk of user misunderstandings, and is also likely to increase users' understanding of how the organization works as a whole.

Although the communicative perspective on user interfaces has been helpful to assess the IT system's role within its social and an organizational context, we do not claim to have proven the usefulness or strength of this model of analysis – we have only shown an example of the use of the model. Although the model was useful in this case, an important task for the future is to test its relevance and usefulness in more comprehensive empirical studies. Future work will also focus on the relation between established usability concepts and user centred design principles on the one hand and the suggested communicative perspective on user interfaces on the other.

Acknowledgements

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