

Analysis of 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 context. Such a perspective seems to be important to promote designs that are both use-able and act-able.

Keywords: Communication, User Interface, IT, Usability, Actability, Social Action, Case Study

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. Traditionally, theories of speech acts and communicative action (Austin, 1962; Searle, 1969; Habermas, 1984) have formed an essential foundation for the language/action perspective. The main message of these theories is to consider the use of human language as a form of communication, and thus as human action, rather than merely making descriptions of the world. When using language, people have intentions and change the social world by making commitments, requests, *et cetera*. Social action theory (e.g. Weber, 1978) discusses the nature of human action, i.e. how to understand what influences human beings to act the way they do; e.g. the values in a community and the expectations from other human beings. These theories, along with other theoretical foundations related to human action, are the main ingredients of Information Systems Actability Theory (e.g. Ågerfalk, 2003). Information Systems Actability Theory (ISAT) is a theoretical perspective and a set of analytical tools that help IT designers and IT evaluators to understand the action characteristics of IT systems. The research project behind ISAT was initiated as a critique of the

contemporary, and indeed historically, heavy focus on semantics during conceptual modelling of information systems. One part of ISAT consists of a thorough discussion on the concept of user interfaces (Sjöström & Goldkuhl, 2003), where semiotic theory (e.g. Bühler, 1934; Vološinov, 1985) and action theoretical approaches (e.g. Clark, 1996; Austin, 1962; Searle, 1969) is synthesized with ideas from semiotic engineering (de Souza, 1993; de Souza *et al.*, 2001), resulting in a model of user interfaces that focuses human action aspects of user interfaces while acknowledging that interaction between humans and IT artefacts is important. 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 as part of an organizational, and hence social, context.

The purpose of this paper is to investigate further the usefulness of this communicative perspective on user interfaces, as a means to understand the IT artefact as part of a social and organizational context.

ISAT is used as a foundation for the design of a model for business communication reconstruction through user interface analysis. The model is used to analyze an empirical example consisting of three parts: (1) A user interface of a syllabus management system, (2) the organizations' description of their use of syllabi and (3) a selection of e-mail communication related to the use of the syllabus management system. This analysis is the foundation for a discussion on how this way of analysing user interfaces can help improve the user interface (UI) design; hence improve the integration of the IT artefact in the organizational context.

Chapter two contains a discussion on the theories used in this paper, and a model that will be used to discuss the empirical data in a structured manner. Chapter three is a presentation of the empirical example. Chapter four consists of the analysis and the discussion. Finally, chapter five sums the paper up and summarizes the findings of the study.

2 A conceptualization of user interfaces

This chapter aims at presenting our view of user interfaces. 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 field of IT system design.

2.1 A communicative perspective on user interfaces

Sjöström & Goldkuhl (2003) present a conceptualization of user interfaces – the communicative user interface concept – based on theories of semiotics and social action. Taking semiotics as a starting point means using the concept of a sign as a basic unit of analysis. According to this concept, signs can be viewed from two different perspectives in relation to human action: (a) signs as a pre-requisite for action and (b) signs as a result of action. This view emphasizes humans' production and interpretation of signs in order to reach shared understanding. Hence, this view on signs is considered to be strongly related to communication. This

perspective is important, since it acknowledges both the creator of signs and the interpreters of signs (Vološinov, 1985; Sjöström & Goldkuhl, 2003).

If we consider user interfaces to be systems of signs, we can apply this semiotic discussion to action in relation to signs to the design of user interfaces. A traditional view of the user interface is that it is a part of a user-system interaction. This has been elaborated by de Souza et al (2001), who discuss user interfaces as communication between actors (playing different roles). They identify three types of communication:

1. User-system interaction
2. User-user interaction
3. Designer-to-user communication

Although designer-user interaction issues are important, the user-user interaction is as important in most systems, even if the system is not explicitly designed as a groupware application. This idea is based partly on the conceptualization of signs by Bühler (1934) and Vološinov (1985), and partly on theories of language/action (Searle, 1969; Habermas 1984) and other socio-pragmatic theories (e.g. Mead, 1934; Sacks, 1992; Clark, 1996). The conclusion, from the theoretical point of view, is 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 a medium to make this conversation effective and efficient. 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. Therefore, IT systems should be regarded as systems for technology mediated business communication. Based on this discussion, four types of action are distinguished, as illustrated in Figure 1.

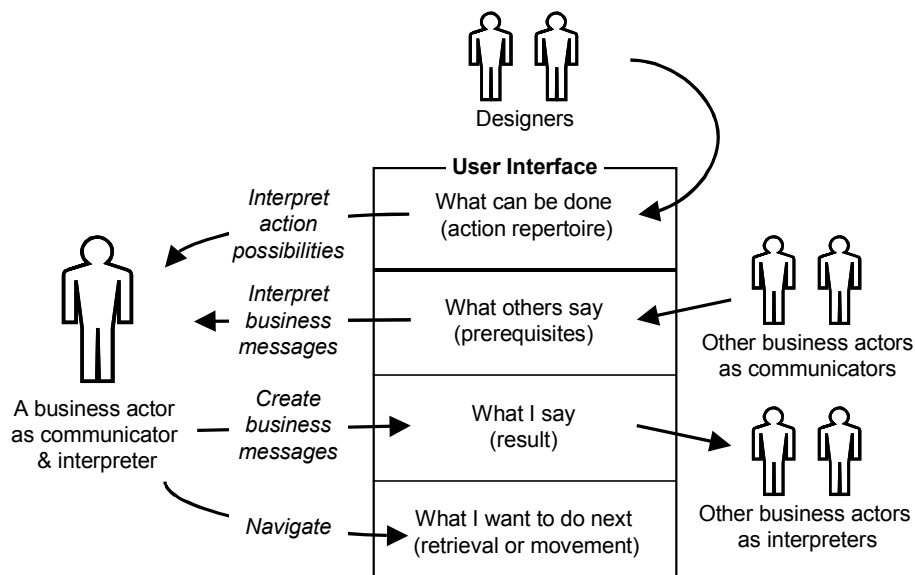


Figure 1 - A communicative perspective on user interfaces (adapted from Sjöström & Goldkuhl 2003)

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, which are part of the system implementation. The UI 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 (hence leave traces) that are interpretable by other actors. Sometimes this is explicit and sometimes it is implicit. Within ISAT, systems are considered to have an action memory (Goldkuhl & Ågerfalk, 2002) where these traces are stored. This is typically a database. This conceptualization regards actions that produced (stored) signs to be an intervention in the world – something is being communicated to other actors. This is regarded to be user-to-user communication. These signs may of course be transformed by the IT system in some way before it is presented to other users. Sometimes, it is hard or 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 the 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 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, but still it is an important part of every user interface.

It is also important to point out that the IT system use (i.e. the communication that takes place using the IT system as a communication medium) should be seen as part of a larger communication context. This perspective on user interfaces should be looked upon 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 the table below.

Table 1- Types of communication of different parts of the user interface (Sjöström & Goldkuhl, 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)

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 an agent that performs action on behalf of some human actor. According to ISAT, there is always a human being responsible for every action, even if the performance of action is concealed in the IT artifact (Ågerfalk, 2003).

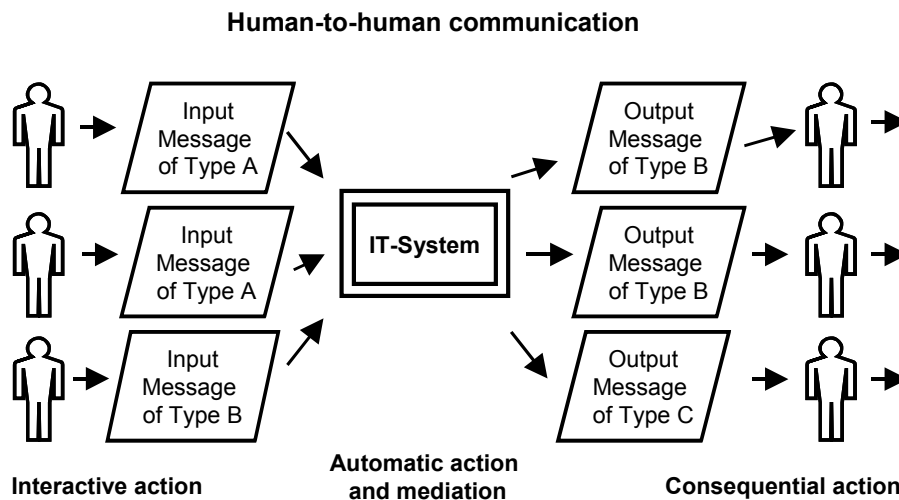


Figure 2 - Types of actions related to three different types of use-situations (adapted from Sjöström and Goldkuhl, 2002).

Figure 2 illustrates that the IT-system can process input messages and forward them to some other actor. This would, e.g. 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. Based on this, we can distinguish between four types of messages (Sjöström & Goldkuhl, 2002):

- ‘one-to-one’ situations, where one person intervenes, produces a message which might be automatically transformed, and which is interpreted by another person.
- ‘one-to-many’ situations: One individual could intervene using the IT system, and several individuals could receive the message, or an automatically transformed version of the message.
- ‘many-to-one’ situations: Several individuals could intervene by using the IT system, and one individual could receive some view of the message.
- ‘many-to-many’ situations, where several individuals intervene and several individuals receive different views of the message.

This illustrates the complexity of communication when an IT artifact 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?”), ISAT states that an important part of the UI design process is to decide whether the communication between actors should be “transparent” or not (Ågerfalk, 2003).

2.2 A model for communicative user interface analysis

In order to be able to analyze a user interface in a structured way, a set of questions has been derived from previous work on communicative aspects of IT systems.

Sjöström & Ågerfalk (2002) used the communicative user interface concept to shape a set of questions that can guide system analysts and designers during the systems development process.

Table 2 -Socio-instrumental assessment model (Sjöström & Ågerfalk, 2003)

Part of UI	Related question(s)
Action repertoire	How should the IT system [the designer] communicate the systems action repertoire [the set of actions that can be performed using the system, including navigation] to the user?
Business communication – for interpretation	Which are the pre-requisites [previous messages/social facts] for performing a certain action using the system, and how should it be provided/presented to the user?
Business communication – formulation and sending	Which [business] message has to be composed to perform action, and how should the system support the process of composing it?
User interface navigation	How should the user navigate between different screen documents in the system?

For our analysis we need to formulate a set of questions that can be used to understand communicative aspects of an IT system. Consequently, the two middle rows in Table 2 are especially interesting. They point out the difference between interpreting and formulating a message.

The underlying theories and empirical work of ISAT are the foundation for a set of criteria for evaluation of UI (or IT system) design. The set exists in several versions (Ågerfalk *et al.*, 2001; Cronholm and Goldkuhl, 2002; Ågerfalk, 2003). Specifically, Sjöström (2003) presented a set of heuristics mainly aiming at the social and pragmatic aspects of IT systems. The table below contains only the subset of the heuristics that are distinctly related to business messages.

Table 3 - Socio-pragmatic aspects of business messages (adapted from Sjöström 2003)

Communication property	Description
Visible Actors	Make the users understand the social context by <u>making the actors visible</u> 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 <u>when</u> 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 <u>information about previous actions</u> 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 <u>adequate amount of information</u> 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.

This set of criteria can probably be criticized in many ways, but it serves its purpose in this paper – as a means to be able to discuss action related characteristics of IT systems. The criteria are mainly derived from social action theory (Weber 1978) and the pragmatic theories of Grice (1975). There are some overlaps in the table. The reason for this is that we want to em-

phasize that some design advice are motivated in different ways, e.g. keeping the actors visible.

Tables 2 and 3 can be combined into a simple model that helps us direct attention when analyzing a user interface. Table 2 asks the questions on a high abstraction level and Table 3 provides us with specific questions concerning the formulation and interpretation of business messages. The set of questions in Table 4 is the result.

Table 4 - A set of questions to analyse communicative aspects of a user interface

Question	Comm. Property	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 The syllabus database: a case description

The process of creating syllabi is essential in Swedish universities. The syllabus can be thought of as a contract between the university and its students. This contract specifies the goals, content, examination forms, literature, *et cetera*, of a particular course¹. Changes in a syllabus, and development of new syllabi, are important activities involving many people. In the following sections (3.1–3.3), the object of our analysis will be dealt with in three parts, all related to a syllabus management system at a Swedish university:

- 1) Screenshots and a description of the syllabus database user interface, where the organization's syllabi are stored and edited. This part is included in the study in order to understand the system as such.
- 2) A description (provided by the university) of the role of the syllabi in the organization, which illustrates the use of syllabi within the organization. This is included in the study in order to gain an initial understanding of the business context, in which the IT system is used.
- 3) E-mail communication related to the use of the syllabus database. These examples are included in the study with the purpose to understand how communicative features of the user interface in relation to the business context.

3.1 The syllabus database user interface

This section illustrates and describes the user interface of the syllabus system. The screenshot in Figure 3 shows the part of the system focused in this study: the screen document where users can find and edit syllabi.

¹ 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', and the whole degree programme could then be a 'course'. Our use of the terms is the typical use in Sweden.

Figure 3 - Snapshot from the syllabus database UI

The screenshot in Figure 3 tells a lot about the syllabus – it has several properties. The course it describes 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

3.2 The role of the syllabi in the organization

The university's intranet contains a guide for teachers, which includes an illustration (depicted in Figure 4) intended to position the syllabi within a business context. (The intranet is a separate system that is not integrated with the course plan database. The guide for teachers is a

downloadable PDF document.) 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. It is not clear, however, whether a change in the literature (and a confirmation of the change) automatically means that books are ordered for the students.
- B. Confirmed courses are the basis for student registration at the beginning of each term.
- C. The university’s intranet contains course information that is fetched from the syllabus database.
- D. The syllabus database is somehow linked to the scheduling system in the organization.
- E. The syllabus is used in the production of the ECTS catalogue, which is sent to partner universities to inform potential exchange students about courses given in English.
- F. The short versions of the course description are used to produce descriptions of optional courses and electives.
- G. The short versions of the course description are used to produce the descriptions of single subject courses (i.e. courses that are not part of a programme).
- H. Course descriptions are also available at 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 also 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. Ladok has its own set of course IDs – each time a course is changed, a new course ID is generated for each link between the course and a programme.
- J. The syllabi are also used internally in the university to index all courses – this is needed for administering written exams and other examination activities related to the courses.

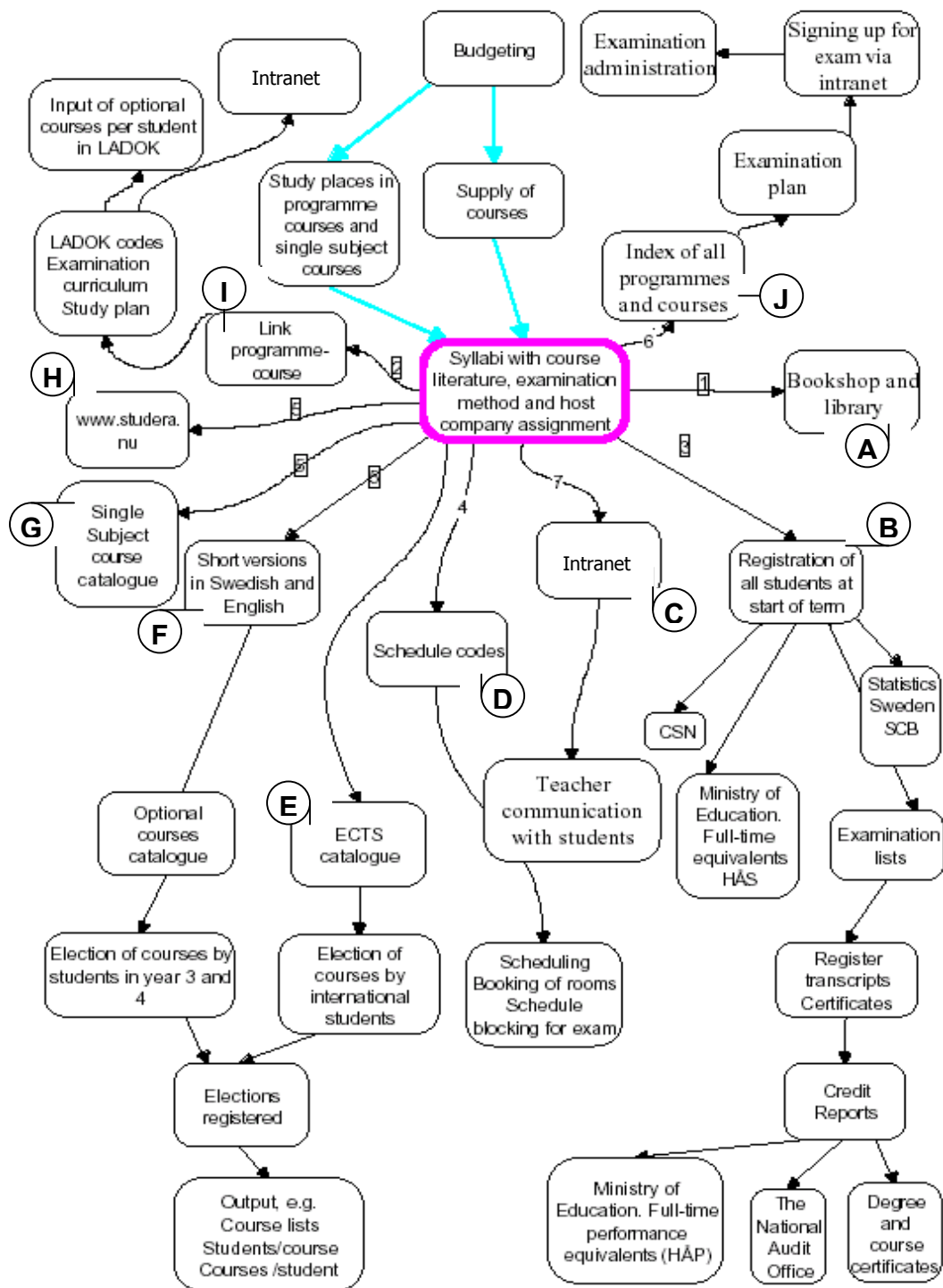


Figure 4 – The teacher’s guide illustration of the syllabi context.

3.3 E-mail communication related to the use of the syllabus database

The third part of the empirical study concerns e-mails that have been sent within the organization. The 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.

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 database], 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

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 copied². 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 a mistake (the course co-ordinator were unaware that this particular action in the system would have this type of consequences). Based on the material at hand, it is hard to understand the course co-ordinators use of the system fully, but one conclusion is that the use of the system has been an act of communication within the organization; an act of communication that has led to a need for clarification.

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 database]. 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 description 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

Let us now turn to another example – one that is related to time aspects as well as role aspects. The message depicted in Figure 6 is directed towards course co-ordinators, and the problem seems to be that the course co-ordinators have not updated (or formulated) short descriptions of the courses. The bold text format used in the message subject signifies that this is a high priority message. The mail also implies that the course co-ordinators are supposed to audit their own changes by entering the current date in the text field that is designated for this purpose. The e-mail encourages (or even directs?) the course co-ordinators to complete this task today, and the mail was sent as a high priority mail. Both these things indicate the importance of this task. It is worth noting that the mail is sent to the entire staff, but the message is actually only directed towards course co-ordinators. Another point worth mentioning is that

² In order to edit a confirmed syllabus, you have to make a copy. The copy then has to be confirmed by the undergraduate council.

this message was sent by one person (Karen) on behalf of someone else (Yoda), thus indicating some sort of delegation, or agency, in the organization.

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 responsible that today we are sending out the Swedish and ECTS Course Catalogues for fall -02/spring -03 to all subject responsables. 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.

This 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. Note that the term course plan is used instead of the term syllabus in this case.

4 Analysis of the syllabus database

Table 4 contains a set of questions that can be used to analyse communicative features of user interfaces. These questions are used in this section to discuss the empirical findings introduced above. Each question is addressed based on the three parts of the empirical study: the user interface, the documentation and the e-mail communication. One assumption of ours 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.

4.1 Who created each message?

By studying the user interface, it is not possible to answer this question. The pieces of information on the screen have an 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 course plan 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.

4.2 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.

4.3 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 course plans. This document is not actually a part of the system, but there is obviously 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 database 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 database 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. 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.

4.4 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 perform some actions based on the contents of the syllabus) you are confronted with the same view of the business messages.

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).

4.5 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 a message will be viewed by others, 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.

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.

4.6 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 when a message will be interpreted by others makes it unclear for the users of the system to evaluate the business effects that may occur when they make changes to a syllabus. This temporal aspect of business communication seems important to acknowledge when designing workflow supporting systems (such as the syllabus database). 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.

4.7 Are there other messages related to the formulation of a new message?

This question 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).

The documentation also seems to be related to the formulation of syllabi, since knowledge of the use of the syllabi in the organization probably affects the way they are formulated. If, for instance, the material were to be for internal use only, the formulations would probably be different.

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 co-ordinator to start formulating a message in the syllabus database. These types of reminders could be implemented in the system itself, and sent automatically to the right course co-ordinator when needed. Actually, an agent did send e-mail 2 on behalf of someone else, but in this case it was a human agent.

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.

4.8 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.

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.

4.9 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"). Implicitly, we can thus see a need to communicate informally using the IT system. Informal communication has been discussed by Schoop *et al.* (2003), who designed a negotiation system based on communication theories that allows users to communicate both informally and formally. This separation of 'discussion' and 'organizational facts' seems to be applicable in many cases; the syllabus database could be one. This way, meta-communication about the syllabus and the syllabus management process can take place, which might be one way of avoiding misunderstandings.

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 management 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).

4.10 Can I move to another part of the systems as required?

In this analysis, we have only looked at the basic functions for managing syllabi. There is one more screen document with the purpose of searching for students on elective courses (different searches are possible), but that is outside of the scope of our analysis in this paper.

In the user interface analysed, there is only a minimal amount of navigation possible. You can navigate the contents of the screen document, through the 'go to', the 'show' and the 'search' (the binoculars) parts of the interface. Our analysis so far has discussed the problems with

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 database 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 navigation in the system.

5 Conclusions

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.

The need for a major illustration of the syllabus system's relation to the business context is a sign of a problematic system design. 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 business context. However, it is not fully transparent what the process really looks like.

One important and problematic issue seems to be that only one screen document is used, even though there are several different actors involved, who have different roles in the process of developing syllabi. The implication of this 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.

If a communicative perspective had been applied in the requirements and the UI design process, then the need for clarification in external documentation could have been reduced. A design advice would be to support informal communication between actors. Such communication may not be a part of the syllabus itself, but may help the users of the system to communicate during the process in which the syllabus is formulated and approved. Another design advice would be to create screen documents with different views for different actors in order to reduce the risk of confusion and misunderstandings when different tasks are performed.

This small case study shows that a lack of process understanding is a source of the problems illustrated in the e-mails. One could argue that the system as such is not the problem; the actors in the organization just need education. However, we believe that another 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.

The communicative perspective on user interfaces has been helpful to assess the IT system's role within a social and an organizational context. Future work will 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. Note that 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.

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