FACTORS CONSTITUTING SUCCESSFUL ONLINE COMMUNICATION:
Human or technical?

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Abstract
Human-computer interaction replaces human-to-human interaction in web-based electronic business systems. Successful systems require a focus on both users' needs and the business imperative, necessitating an in-depth understanding of the communication aspects relevant to customer behaviour as the user navigates through a web-based system.

The paper explores the attributes of successful online communication and the implications for the design and use of web-based applications. We suggest a development method based on user profiling and story boarding, with one method to discover user profiles and stories being communication analysis. This is used to address typical human-to-human interaction in the application domain and to classify typical communication barriers. We argue that using localisation abstraction and metaphors may help to alleviate, if not overcome, communication barriers implying that their use may enhance the user's understanding and navigation through a web site. On-line loan systems are used in illustration.

Introduction
Technological achievements like the World Wide Web cause new kinds of information systems (IS) such as Web-based IS (WIS) to exist, creating challenges, opportunities and threats in both development and use. The use of IS, and WIS in particular, follows a linguistic model. Customers choose linguistic expressions which are transferred to the WIS for processing as inputs, in three steps. Firstly, the linguistic expression is analysed, then a response generated that fits as well as possible to the customer and finally the response is presented to the customer.

Web-based Electronic Business systems replace human-to-human interaction with human-computer interaction. Thus, satisfying customers' needs and meeting the expectations of the service providers requires anticipating users' behaviour. Only if the system is accepted by a large range of users can expectations regarding business

goals such as cost reduction or attracting new customers be met. Acceptance and use by customers is also important as customers dissatisfied by the offered web-based system might be lost to the business as a result of finding an alternative system that suits them better.

The pilot study reported in (Wallace, 2002) sought to understand the ways organisations use the Internet, i.e. web pages, intranets and email, for their various business functions. It showed that those success factors with the greatest impact on an organisation's successful Internet use are more strongly related to human factors than technical aspects. Closer examination revealed that they were more specifically concerned with communication and customer service. The strongest factors, in descending order of importance, were: having a plan for dealing with site related communication, meeting customer demand, regarding the web site as part of overall communication strategy, considering marketing aspects of the site, and updating and refocusing of the web site.

The pilot study implies that communication aspects of design, development and implementation of organisations' web presence are key to successfully using web technology. This article elaborates on the problem of how to shift the emphasis in the development of electronic business systems towards the communication aspects.

We begin with the conceptual modelling aspect of describing users' behaviour. This requires forecasting the actual process of system use that will be made. A reasonable design approach will be to identify user types, referred to as *user profiling,* and their most likely occurring behaviour patterns. User types are characterized by the users' goals and intentions, their application domain knowledge, their information technology abilities, etc. Recent interviews with companies show that user profiling is already in practice, but companies treat the profiles used as strategic intellectual property. The term *story boarding* refers to user behaviour pattern analysis, and is a holistic, user-centred and agile approach to the requirements elicitation of WIS. The story board describes the way users will navigate through a system, which (optional) web-pages they will look at, which level of detail they like to see on these pages, etc.

The problem we address is providing guidelines on how to develop story boards. Two interleaved activities dealing with *communication analysis* and *linguistic analysis* could be used, but we will only deal with the first.

Communication analysis addresses typical human-to-human interaction in the application domain. The human communication abilities that staff applied in the traditional way of operating must now be partially realised by software, making it important to understand how this communication works. Various techniques are used in the communication literature to audit and review communication strategies, including questionnaires, incident reports, observations and network analysis. A common way of discussing communication strategies with participants and researchers is by referring to a range of metaphors such as client-server, the queuing model, the shopping trolley etc. These models can be either implicitly or explicitly developed and discussed with participants.

We try to classify typical communication barriers following the work in (von Thun, 2000), as the general literature on business communication (e.g., see Dwyer, 1993, Francis, 1987, and Guffey, 1997), seems to focus on the issue only in terms of intra-organisational communication rather than customer-staff communication. We argue

that using localisation abstraction and metaphors can help to overcome communication barriers, implying that their use may enhance the user's understanding and successful navigation through a web site.

Localisation abstraction represents the whole space such that the user's location and neighbourhood is emphasized. Distant locations are suppressed, only sketched or also emphasised in case it is expected that they are of major importance for the user. Localisation abstraction should be combined with using metaphors to help users make appropriate decisions while using services.

Thalheim and Düsterhöft (2000) suggest metaphors are language expressions used in an unconventional language context. They can make reasonable what was previously complex and provide a structure for the experience of phenomena. Metaphors may also highlight key attributes and obscure others. Unmasking the dominant metaphor reveals the way it implicitly structures information and knowledge, thereby allowing the user to more fully understand the strengths and weaknesses of any particular concept or conception (Clampitt, 2001).

Communication as a Key Success Factor

The growth of web sites for businesses, institutions and individuals has led to a huge amount of advice about how to develop and maintain a successful site. More often than not, this advice is theoretical, prescriptive, based on conventions rather than evidence, or focused primarily on technical and commercial aspects of a site rather than its ability to engage with the site's visitors according to Durham (2000).

Some of the major communication faults of web sites are caused by not paying enough attention to the aims of the site and the audience's needs, leaving major choices concerning human-computer interaction and thus communication between the organisation and the customer to technical experts, an overly strong focus on the visual communication elements and lack of analysis about the communication effectiveness of the site. The poor quality of web sites is often due to missing "mission statements" according to De Troyer (1998). They suggest important questions such as "Who will use the service?", "Which user intentions and behaviour shall be supported?", "Which technical devices will be used by the users?", etc. have not been sufficiently taken into account. Though it is very important to ask and answer questions of this kind they indicate a deep flaw in thinking about Web systems development: in talking about users and not about customers these questions tend to draw attention to technical aspects of communication rather than business aspects.

Research documented in Durham (2000, p3) resulted in four general findings that can add to the body of knowledge about web sites, their communicative nature and effectiveness:

> *(i) The number of studies about web sites is growing. The interest however is still predominantly on other aspects of the Internet, including more ephemeral or informal writing such as email messages and chat room dialogue.*

> *(ii) The literature on effective web sites suffers from the same problem that until recently characterised writing in the technical writing field, that is, the popularity of unsubstantiated and idiosyncratic guidelines and the dearth of research-based information.*

(iii) Empirical studies about web sites, especially considering the web sites as texts, are still small in number but the results help to identify communication issues.

(iv) The current empirical studies often lack theoretical frameworks to help make sense of web sites and the communication choices that they embody.

A Pilot Study on Critical Success Factors

In a pilot study (Wallace, 2002) research was conducted to understand the ways organisations were using the Internet for various business functions. The research objectives were to identify the nature and extent of Internet based business activity by organisations in New Zealand, to examine the motives and impacts of these initiatives and to determine factors that contributed to the success of these endeavours.

A longitudinal case study methodology (Sarantakos, 1993) was selected to provide a rich source of material relevant to the desired research outcome. Assessment was made of best practice from these case studies. The methodology included observations and interviews over time with key participants. Relevant business records were examined and the planning, implementing and gaining an online presence process was documented.

Interviews were conducted with personnel concerned with the organisation including management, communication and human resource people, employees and customers. Comments were coded according to a predetermined five-point scale, all comments pertinent to that critical success factor were totalled and the means calculated. Data was analysed using principal component analysis (PCA), a data compression technique that summarises quantitative data into fewer key or principal dimensions allowing qualitative interpretations of these key dimensions.

Analysis showed that those critical success factors having the greatest impact on an organisation's successful Internet use were more strongly related to human factors than technical aspects. Closer examination revealed that they were more specifically concerned with communication and customer service. The strongest factors in descending order of importance were:
-plan for dealing with site related communication,
-meeting customer demand,
-web site part of overall communication strategy,
-consideration of site's marketing aspects and
-updating and refocusing of web site.

Various attributes were then examined to see whether they were affected by the critical success factors. The attributes of organisation type, organisation size, the amount of time the organisation had been online and the ways they were using the Internet as an organisation weren't associated with the critical success factors.

Other factors found to have limited relevance to an organisation's successful Internet use were:
-Plan for the organisation's web site
-Development of an integrated Internet package
-Formal Internet policy
-Internet training given and updated

-Support from top management
-Positive relationship with Internet Service Provider
-Intranet in place
-Secure server
-Importance of a project champion
-Being aware of the competition
-Organisational culture responsive to change
-Engaging in electronic commerce
-Use of outside expertise
-Consideration of web site on business effectiveness

Doubtful Web Site Design Guidelines

Some guidelines about web sites appear to rely on web writing and design "folklore" with little substantiated evidence. One commonly mentioned example is readers should be no more than three clicks away from desired information but no rationale for this rule seems to be given. A similar comment is that while a site may contain 200 pages, the site is considered to work for users if they can find exactly what they are after by looking at two or three pages (Blyth, 1999). Other guidelines provide principles or prescriptions that are difficult to quantify. One source is cited by Durham (2000) that identifies "bad" web pages as those that are "unattractive" or "lack a logical organisation" and another that tells the web site creator to "write clearly".

Web writing styles were researched by Morkes and Nielsen (1997) who manipulated a web site's text to create five different writing styles and used readers to test for comprehension and reaction. They concluded that written material for the web needs to be concise, able to be read easily and objective. Usability analysis of a document's language and visual design choices can suggest its impact on readers' ability to orient themselves in the document, find information and process it effectively. Until recently, usability research has been focussed on technical elements such as browser capability and design elements such as colour and font choice. More recently, attention has turned to elements directly affecting the communicative nature of sites as they engage users (Durham, 2000).

A number of studies in the human-computer interface (HCI) field analyse how well web sites communicate with their users. These studies primarily focus on the presentation aspects. Research done on the development of metaphors by Carroll et. al. (1988) paid attention to what may be intuitive for users to comprehend and use when working online. Other HCI studies consider the breadth or depth of structure in a Web site (see Larson and Czerwinski, 1998) in terms of helping users to find and comprehend information. A study by Anderson et. al. (1998) of editing levels suggested what the authors called the "big-picture issues" such as audience definitions, information categories and hierarchies and screen layouts.

Communication Analysis

User profiling and story boarding are central parts of the co-design methodology for the development of web-based Information Systems (see Feyer et. al., 1998 and Schewe and Thalheim, 2001 for details). This approach aims at describing a system first in terms of the application domain, i.e. business processes are described by the activities in them, the data processed, the characteristics of the customers, the access

rights granted to customers, and the functionality customers may use and what data they may operate on.

Communication analysis can be used to model the story board. It addresses typical human-to-human interaction in the application domain and classifies typical communication barriers. We start with an analysis of communication dimensions abstracting from successful speech communication. This leads to identify possible communication flaws. We proceed by identifying different types of communication barriers, which influence the communication. Then we argue that using localisation abstraction and metaphors can help to overcome communication barriers, implying that their use may enhance the customer's understanding and successful navigation through a web site.

Communication Dimensions

Communication is an exchange of messages (Cragan and Shields, 1998). The question is what constitutes successful communication, i.e., when do both partners meet their communication goals. According to von Thun (2000, pp. 23-35) with respect to a spoken message we distinguish four main dimensions:

-*Content*, i.e., what the message is about;
-*Presentation*, i.e., what the speaker tells about the message and the sender;
-*Relationship,* i.e., what the speaker thinks about the receiver and their relationship;
-*Appeal*, i.e., what the speaker wants the receiver to do.

These dimensions also apply to non-verbal communication. We suppose that communication is not successful if at least one message with respect to its instances of the dimensions is flawed. We therefore distinguish the following message flaws:

-*Content flaw*, i.e., the speaker does not say what s/he wanted to say;
-*Presentation flaw*, i.e., what the speaker tells about him/herself is inaccurate;
-*Relationship flaw*, i.e., what the speaker thinks about her relationship to the listener is incorrect;
-*Appeal flaw*, i.e., what the speaker wants the listener to do is not persuasive.

Clearly the above mentioned dimensions of message understanding are not really independent in a formal sense and neither are the flaws. But as can be seen below, they help to formulate and classify communication barriers that appear to be realistic.

Communication Barriers

The transition from human-to-human interaction to human-computer interactions can be thwarted by a number of barriers. Transactions that were traditionally performed over the counter in a branch of the bank were aided by face-to-face communication using voice intonation, questions and answers in real time, feedback loops, eye contact, observance of nonverbal communication such as reference to computer screens or printed material for records. Online transactions are significantly lacking in verbal indicators and query possibilities. We introduce four types of communication barriers, content, navigation, presentation and technical, and illustrate design problems arising from them. Some authors attribute these failings to designer-centred site development (see Thalheim and Düsterhöft, 2000).

Content type barriers may consist of information over- or underload. Both of these can be stressful and lead to service delivery being perceived as unsuccessful. Other content barriers include overuse or inappropriate use of jargon and terminology such as formal legal disclaimers being repeatedly displayed before the user reaches useful pages. Use of unnecessary concepts and terminology to explain to users his or her options or the actual state of affairs also belongs to this type as well as usage of appropriate but insufficiently explained concepts and terminology.

Navigation type barriers can be attributed to three main causes. Users may not know where they are located in the web application space, how to reach a desired location, or what functionality is required and where is it located. Examples include broken or badly labelled links, too many layers to "drill down" for information, "dead ends" when moving to the next step in a process, lack of ability to search the site with keyword, lack of an intuitive "look and feel" to the site, and insufficient overview information pointing out to the user what is available where.

Presentation type barriers may include poor choice of colour scheme, cluttered layout such as too much information on a page, lack of white space, inappropriate font size or typeface and no order to the links offered. An example of a site that is difficult to read would be red or dark green text on a black background as identified in the Bank Direct web site by Matthews (1998). It is further worth mentioning for this type the popping up of advertisements and the blinking and flickering due to graphical objects changing colour, intensity, shape or position on the screen.

Technical type barriers include barriers that interfere with service delivery including non-recognition of user names and passwords, systems being "down" or out of service and lack of integration with the ledger and other accounting systems. Users may also be excluded from communication due to them using the wrong vendor's browser or a version of a recognised vendor, which is considered to be too old. Slow down of communication speed especially in remote or rural situations may result in users becoming impatient or the connection dropping out. Often it is not so much the actual computing speed as the perceived speed of the service due to either overloaded networks, servers or modems of insufficient quality that contribute to this barrier occurring. More than half of all attempted Internet transactions are abandoned out of frustration (Collier, 2002).

Improving Communication via Localisation Abstraction
Mediated human-to-human communication is addressed. Various kinds of knowledge and ability have been represented inside the web application as data or a program. The application chooses the data or program best fitting to the user's inquiry. This requires having a model of the customer represented inside the web application such that a sufficient distinction can be made. A reply to the inquiry results in the specified data or a processed version of it. Access to operations or data might require the customer being positioned at a particular location in information space. Navigation thus occurs and must be tool-supported to avoid navigation type barriers.

Navigation functions in information space are:
-*Position signalling*, signifying the actual customer position.
-*Position determination*, determining the location of specified data or operation.
-*Heading determination*, determining path and suitable means to approach a location.
-*Short range scan*, exploring the immediate neighbourhood of a location.

-*Long range scan*, exploring distant regions in information space.

Localisation abstraction can support these functions: A customer type dependent space view is displayed as a graph. Its vertices represent locations; its edges connections between these. Operation- or data specifications label the vertices. Moving in and navigating the space implies efficient algorithms updating the graph.

Improving Communication via Metaphors

Answering ill posed questions is difficult. Proper inquiries thus must be targeted by system design. This can be aimed at by using metaphors since they can help simplify communicating complex ideas (Thalheim and Düsterhöft, 2000). Understanding the information space, its structure and offered services requires support. Metaphors defined as language expressions used in an uncommon language context Thalheim and Düsterhöft (2000) can provide this support. Using them may help reusing knowledge or abilities.

Human communication essentially is metaphorical. Traditional human-computer interaction -neglecting metaphors- is likely to cause communication barriers. Incorporating well-chosen metaphors into this interaction thus may remove them.

We believe no engineering procedure can be found providing usable metaphors at a sufficient rate and cost. We therefore attempt designing applications such that metaphors can be easily, cheaply and quickly added, deleted, modified and substituted. Implementation of such design then by prototyping and perfective maintenance can help finding, using and improving metaphors.

Respective applications impose several roles of language to occur. These are:
-*information language*, to signal semantics of data and operations;
-*tool language*, to signal how to operate the application;
-*metaphor language*, to signal the actual state of affairs and options.

Example metaphors are given in Schewe et.al. (2002).

Communication in Loan Applications

Refining the scenario requires more details. This is, where the communication analysis comes into play. We may assume that banks and their staff are sufficiently experienced in loan application processing, so we restrict our attention to the mentioned message flaws to those that may occur from the applicants' perspective. We then propose means to deal with these flaws so that the applicants will benefit immediately and the bank in the long term.

Clearly the system should be set up in a way that it can be used by all bank customers. These, however, are not a homogeneous group. The respective distinguishing characteristics are apparent in face-to-face communication and to some degree can be dealt with by experienced bank staff. The design problem raised by replacing human-to-human interaction by human-computer interaction thus is the simulation of human communication skills by the system. According to our approach we restrict our study to the above mentioned message flaws and propose means to deal with them in the above sense.

Content flaws
- Customers have a variety of knowledge levels concerning loan types offered, their application areas, the terms and conditions, the assessment criteria, etc.
- Customers may or may not have a clear picture about what the loan is needed or going to be used for. Some may have only a vague idea of the purpose.
- Customers may-depending on their level of education-easily understand the differences between loan types and their respective suitability or not.

Presentation flaws
- Customers may have a clear idea about their financial capability and thus be able to set up a reasonable budget. Others may over or under-estimate their capability to afford the payments that will be required in case of application approval.
- Customers may have sufficient computer literacy to handle an electronic system without difficulties or need a lot of help in doing so.
- Customers might-due to their insufficient language fluency-need specific support while filling the application form.

Relationship flaws
- Customers might-due to their personal background-tend to uncritically follow bank staff's advice.
- Customers might-due to their cultural background, or family related reasons-not dare to apply for a loan.

Appeal flaws
- Customers might-due to their insufficient understanding of banking business or their difficult state of affairs- just appeal for help and overlook the fact that the bank only in rare cases can afford not to make profit from accepting a loan application.

From the message flaws we derive customer characteristics and turn them into customer dimensions: education, banking knowledge, loan knowledge, clarity about the application itself, clarity about their own financial situation, computer literacy, their cultural and family background including employment status and language fluency. It appears not to be difficult to invent scales for these dimensions. Note that we propose to have a broad view of the `customer' notion whereby a person becomes a customer as soon as data describing the individual is available to the bank.

Conclusions
Communication and collaboration are the critical success factors when building a successful knowledge enterprise (Raisch, 2001). Building an open communication climate between employees, customers and partners is critical. One way of achieving this is via an organisation's web site that serves as a communication channel. Reducing barriers whether content, navigation, presentation or technical is essential. The main implication from the case study research is that design methodologies for web sites should start with the human factors rather than the technical issues.
In this paper we addressed the communication aspects in the development of electronic business systems. Our approach is based on a conceptual model approach centered around user profiling and story boarding. We argued that setting up an adequate story board requires two interleaved activities: communication analysis and

linguistic analysis. In this article we emphasised the communication analysis part. Communication analysis addresses typical human-to-human interaction in the application domain. We could show that localisation abstraction and the use of metaphors are two promising techniques to overcome communication barriers. This implies that their use may enhance the user's understanding and successful navigation through a web site.

We used a typical banking application, on-line loan systems, as an example to illustrate our method. We will continue exploring such banking applications to refine the methodology centered around communication and linguistic analysis.

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