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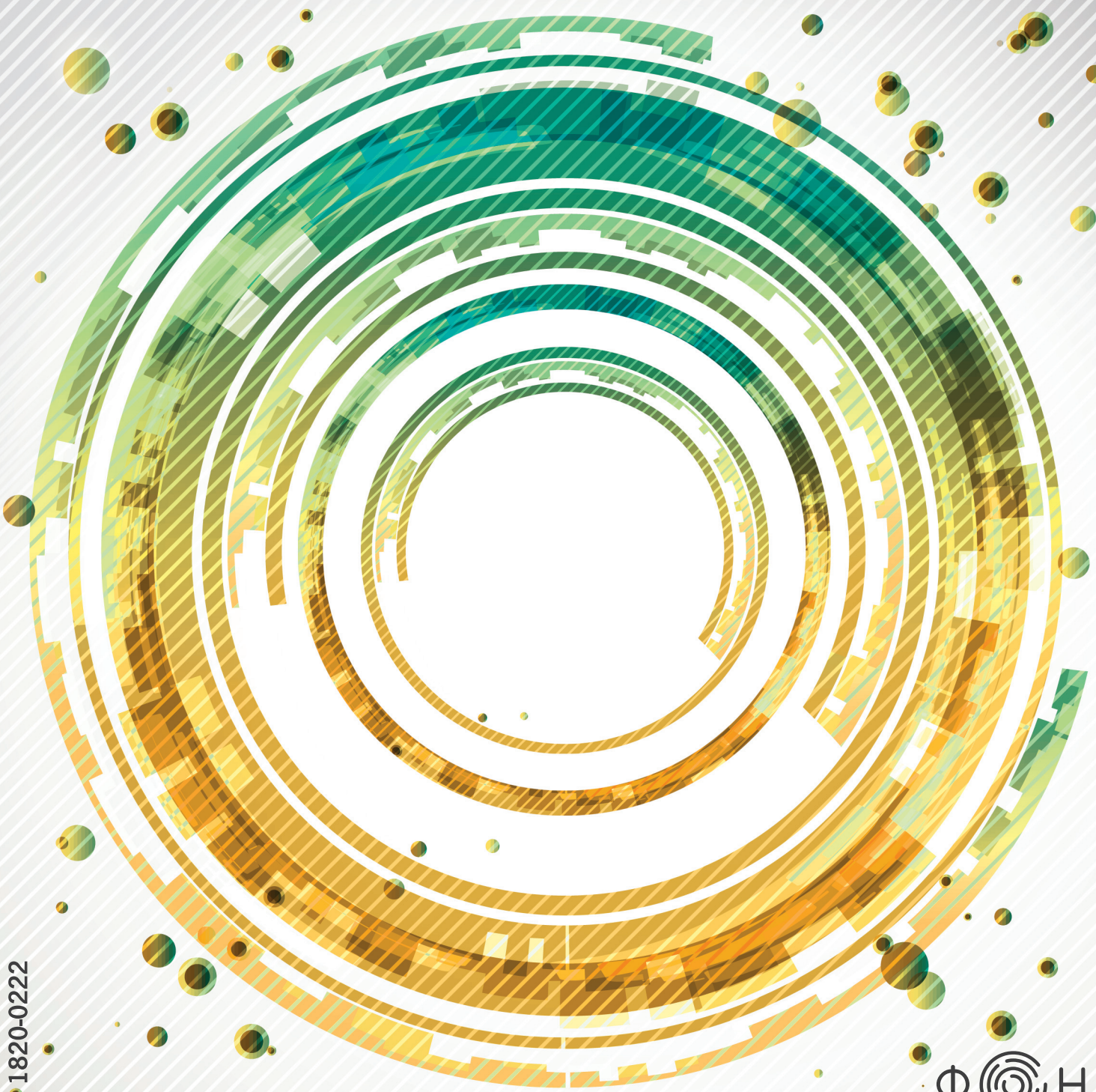
Management



ISSN 1820-0222

УНИВЕРЗИТЕТ У БЕОГРАДУ
ФАКУЛТЕТ ОРГАНИЗАЦИОНИХ НАУКА

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Enhancing Computer Mediated Communication by Applying Contextualization to Email Design: a Case Study

UDC: 005.53:[007:004.451.6 ; 005.94:004.9)
DOI: 10.7595/management.fon.2012.0021

XIII International Symposium SymOrg 2012, 05 - 09 June 2012, Zlatibor, Serbia

This paper deals with communicational breakdowns and misunderstandings in computer mediated communication (CMC) and about ways to recover from them or to prevent them. The paper describes a case study of CMC conducted in a company named Artigiani. We observed communication and conducted content analysis of e-mail messages, focusing on message exchanges between customer service representatives (CSRs) and their contacts. In addition to task management difficulties, we identified communication breakdowns that result from differences between perspectives, and from the lack of contextual information, mainly technical background and professional jargon at the customers' side. We examined possible ways to enhance CMC and accordingly designed a prototype for an e-mail user interface that emphasizes a communicational strategy called contextualization as a central component for obtaining effective communication and for supporting effective management and control of organizational activities, especially handling orders, price quoting, and monitoring the supply and installation of products. Designers of systems that support distant communication and collaboration may find practical ideas to apply.

Keywords: Computer-Mediated-Communication (CMC), Computer Supported Cooperative Work (CSCW), e-mail design, Communication Breakdowns, Miscommunication, Contextualization, Mutual Understanding

1. Introduction

Computer supported cooperative work (CSCW) and computer mediated communication (CMC) are most crucial in the activities of today's organizations. Organizations need to achieve goals that one person cannot accomplish alone, and knowledge that is collected by individuals should be reserved for the general use of the organizational community. Now, workers need more than ever to share knowledge, and are involved in joint activities that require the support of information systems. Communication is to a large extent in the form of computer mediated cooperation, and computerized applications ascribed as groupware (group support systems that include shared environments, whiteboards, electronic group calendars, chat rooms and more) facilitate communication and improve coordination. The overall success of organizations is certainly dependent on CMC that need to be designed to achieve a high level of mutual understanding (hereafter MU) and minimal communication breakdowns.

Although e-mail is the most widespread mode of CMC at work, e-mail client software is poorly suited to support the collaborative quality of the organizational tasks, which results in a pernicious problem of people suffering from email overload (Bellotti et al., 2005; Whittaker, 2005). Users get frustrated with their e-mail because they feel overwhelmed by the high volume of messages. It seems that current structures within e-mail clients prove inadequate, especially for high-volume e-mail users. There is need for reinventing the e-mail client, moving it from the current electronic analog of physical mail to a tool that allows users to manage all of their digital communications. New visualizations of the information contained within e-mail inboxes are a key piece of the solution (Rohall, 2001).

The Problem of Communication Breakdowns

Communication problems are potentially present in organizational processes, which involve cooperative work between workers coming from different occupational backgrounds. The differences in language and knowledge eventually create a situation of distance between individuals who need to communicate in order to complete their tasks successfully. Therefore, the organizational process could be facing a problem of miscommunication that might lead to low performance and therefore to its failure.

On the one hand, collaboration between workers who come from diverse functional backgrounds is essential in organizations (Fischer, 1981). On the other hand, communication processes that involve individuals who come from different organizational occupations, domains or methodologies and hold different kinds of knowledge, impose certain demands and requirements on the form of messages exchanged between them (Sommerville et al, 1996). Research has shown that communication is more efficient when people share greater amounts of common ground and when integration between individual member contributions is achieved. However, achieving integration will be more challenging if group members start from different practical realities - e.g. come from different functional backgrounds. Common to all situations requiring the communication of contextual information is the likelihood of being misunderstood because of information the speaker possesses but the listener does not. Such situations are more likely to occur in computer mediated team work than in face-to-face teams (Cramton, 2001).

Contextualization

Current communication theories suggest that communication breakdowns may be reduced by contextualization, i.e., an adaptive communication behavior of providing the explicit addition of contextual information to a core message to ensure effective communication. Communicators contextualize in order to overcome communication difficulties arising from perspective differences. The lack of contextualization has been named as one of the most frequently occurring problems in communication between distributed workers (Cramton, 2001; Hinds & Bailey, 2003). The decision to contextualize involves trade-offs between the benefit of gaining better communication and the costs in terms of the cognitive resources it requires. The cognitive effort required for the act of contextualization is particularly heavy on the e-mail author in CMC, because information transfer, especially complex information, is less efficient than in richer media (Kraut et al., 2002). Although the degree of context required in an e-mail message depends on the recipient, it is the sender (author) who must determine the context that the message provides, as well as its depth. Hence, the adaptive behavior of contextualization is at the sender's discretion. A sender who senses a problem in communication has motivation to contextualize in order to gain mutual understanding.

It has been reported that the impacts of contextualization on MU and on performance are contingent on whether communicators share or differ in their perspectives: contextualization increases MU and performance in cases of different perspectives, but it does not increase MU and even decreases performance in situations of shared perspectives. In other words, contextualization is only effective when needed and counterproductive when not needed (Katz & Te'eni, 2007). However, message senders are not always effective communicators, and are not always aware of the difference in perspectives with their recipients and therefore may use contextualization inappropriately.

In order to contextualize appropriately, a speaker needs to be engaged in an additional communication behavior, perspective taking, which is metaphorically depicted as the act of stepping into the shoes of the addressee. In task-oriented situations, one's ability to orientate to the perspective of the other person enables him to assimilate and integrate information using the other's frame of reference and leads to higher MU (Tan, 1992). Perspective taking is a cognitive skill that varies among individuals and requires cognitive effort (Dickey et al., 2007). In addition, people tend to rely on their own perspective when communicating because it requires less cognitive effort (Horton & Keysar, 1996; Keysar et al., 2000), or overestimate the degree to which others' perspectives mirror their own (Krauss & Fussell, 1991). It was found that cognitive load has a detrimental influence, as it disrupts monitoring and adjustments and leads to rather standard messages that are not adapted to the perspectives of the addressees (Ro□nagel, 2000; Horton & Keysar, 1996).

In customer service situations, customer service representative (CSR) may use fixed, predefined messages to present a generic corporate image to those outside the organization (Adria & Chowdhury, 2004). This makes it difficult for strangers to develop shared understanding of context, which is crucial for communica-

tion effectiveness (Dickey et al., 2007). In addition, customers are sometimes unable to take a CSR's perspective because the CSR refers to things outside the customers' experiences. In such cases, meetings can break down and end without resolution.

Contextualization in e-mail Communication

In our work presented above we discussed CMC that stresses the need to reinvent e-mail, and put our focus on contextualization as a central component for enhancing effective communication. We concentrate on two existing features from previous work, embedded links and visualization of message threads and added additional features (introduced in the design section).

Contextualizing with embedded links

Knowledge organization deals with issues of how to best store knowledge so that it can be retrieved when relevant. Users need to get to the right knowledge at the right time, and must be aware of the relevant knowledge that is available to them at each task. The idea of tying knowledge to action is aroused from the fact that workers do not have the time to actively seek organizational knowledge, and therefore it would be far more effective if the knowledge could find them (Schwartz & Te'eni, 2000).

KMail, a knowledge-enhanced e-mail designed to enhance collaboration, is a remarkable example of a tool that ties organizational memories (OM) effectively to organizational actions using contextualization (Schwartz, & Te'eni, 2000). KMail is a URL-based OM that enables the linking of knowledge to ongoing communication to achieve successful communication by helping users to appropriately adapt to communication by assessing perspective differences.

Contextualization with message threads (conversational trees)

Collaborative tasks are not discrete but iterative. As a task evolves, users have to combine task related information in incoming messages with prior relevant information. Prior messages are important because they contain context that is critical for interpreting the current message (Whittaker, 2005). Messages should be viewed as elements of a conversation rather than as independent or solitary. An e-mail conversation, also known as a *thread*, is typically defined as the tree of related messages that arises from the use of the reply operation (Venolia & Neustaedter, 2003). This interconnectedness of e-mails is not fully exploited in conventional e-mail clients. Conversation threads in e-mail allow users to see a broader context of the messages they are reading, remind users that a conversation is in progress, record the state of a discussion, and collate related messages automatically (Kerr, 2003). A full visualization of a message thread clearly displays a message along with all its previous related messages and therefore provides better context for understanding the meaning of the current message. Therefore we treat threading as a form of contextualization, since it adds layers of information about the communication's history.

Threading is useful for both recipient and author. At the recipient's side, contextual information reduces the likelihood of misunderstanding the meaning of messages. For both, contextualization by thread visualization reduces cognitive demands on memory by eliminating the need to recall past issues and other conversational elements. At the author's side, threading serves as reference of the common ground achieved in the conversation until the current point, and allows him to expend less effort in building the current message. The author assumes that the recipient already knows or has access to previous information and therefore can choose not to contextualize, sending only the core message and drawing the recipient's attention to relevant context whenever necessary. This allows a relatively parsimonious (economical) communication pattern, requiring less message exchanges and enabling the creation of shorter messages, because most of the information needed is already presented in the thread.

Innovative ideas that go beyond the limited context preservation by threading widely used in e-mail programs can be found in the literature. Examples are: an advanced email prototype with a complex branching reply tree (Venolia & Neustaedter, 2003), an integrated e-mail client with visual separators in the Inbox list using "pivoting" and threads (Kerr, 2003, Kerr & Wilcox, 2004), and a combination of a tree based model with a timeline model to produce useful tracking of conversations (Rohall et al., 2001).

2. Artigiani as a case study of CMC difficulties

The current study is about designing effective CMC to enhance good communication. Our objectives were to first evaluate communication processes between CSRs and their business clients, with a special attention to communication breakdowns to find the types of contextual information that help resolve breakdowns and miscommunications, and then find possible ways to enhance effective CMC and finally implement our ideas in the design of an e-mail prototype. We examined communication processes in an Israeli company named Artigiani, as a case study of an organization with massive email message exchanges. Artigiani specializes in designing and manufacturing affixing (metal fixtures or accessories such as handles, hooks and hangers).

Case Study Steps

To evaluate the existing communication in Artigiani, we conducted the following activities in a time range of about two months: observations; one-to-one interviews; and collection and text analysis of 60 e-mail messages.
Consequently, we roughly distinguish between two purposes for contextualizing:

- Task management: Contextualization for improving the worker's ability to effectively manage his organizational activities and tasks, and to improve related decision making.
- Communication: Contextualization for improving CMC, i.e. achieving a high level of MU and minimal occurrences of communication breakdowns.

Findings

The first meeting between a customer service representative (CSR) and a customer is face to face; the following communication is usually via e-mail. Although CSRs are in contact with customers and business clients via telephone and face to face encounters, there is a massive activity of e-mail message exchange. E-mail is the preferable communication channel to handle various organizational activities (e.g. negotiating with suppliers, ordering products, quoting, scheduling the supply and installation of products, etc.), especially because of its ability to document and maintain written proofs. We were interested in the exchanging of messages between CSRs and customers, and also with professionals such as carpenters, contractors, architects, interior designers, and suppliers. As well as profitability of businesses depends on maintaining current customers and attracting new ones; customer service is an important part of every business organization. Customers are satisfied when they receive personal and prompt service. The likelihood of a business to lose customers due to bad experiences with CSR reinforces the goal of achieving good communication between them. Although they are important, this study is not about developing and refining effective customer service skills, but is about designing effective CMC to enhance good communication between CSRs and business clients. We now briefly describe the difficulties of task management and communication in Artigiani.

CSR's Task Management Difficulties

CSR's in Artigiani spend much time in managing of pending tasks. They are involved in various parallel activities related to customer service and handling orders, such as management and documenting of customer files, responding to telephone calls, monitoring orders, negotiating with suppliers, quoting, scheduling the supply and installation of products and so forth. CSRs are in great pressure to respond quickly to e-mails, and the activity of managing their tasks is experienced as a stressful one, because of the high volume of incoming messages. They are constantly involved in deciding about priorities of activities, and in addition they tend to lose important items when they need them (such as previous message exchanges, and documents that they wish to attach to outgoing messages). They are required to manage ongoing activities over time and need to handle numerous schedules and reminders. The time range for an order is thirty days in average, and during this range communication regarding an order or client is not continuous. However, CSRs need to quickly associate items, events, files or messages to them. This makes the task of managing orders and treating clients and customers cognitively demanding.

For the sake of tracking and managing orders, information is filed into physical office folders. The process of collecting and filing is inconvenient, tedious, and requires the investment of time and consistency. Thus, workers tend to neglect this activity and as a result information can be lost. In addition to arranging information in physical folders, CSRs constantly arrange files in their metaphorical desktop folders on their com-

puters and in their e-mail folders. Mentally retrieving the location of needed information is cognitively demanding on the long term memory, and constantly searching for information in e-mail folders is tedious and time consuming. It is clear that CSRs in Artigiani have problems of effectively maintaining and using various types of knowledge, thus the value of the information is lost. CSRs do not have a clear visualization of all the parties involved in a conversation, nor do they have easy access to the contents exchange in the conversation by each member. Clearly, difficulties to reach information in a timely manner affect work quality, especially the quality of customer service. Because e-mail communication is a-synchronic in its nature and not continuous, it is difficult to keep track of orders and to effectively handle them.

An e-mail system that supports easy access to contextual information items that are related to pending tasks can be of great help for managing the overwhelming high volume of incoming messages and activities.

Communication Difficulties

Observations, interviews and text analysis of e-mail messages revealed that the main activities of CSRs are handling orders facing customers and suppliers, stock checking, price quoting, and answering technical questions. We discovered that the vast majority of miscommunications occur in communication between CSRs and customers, and that the main source of communication breakdowns are the differences between the perspectives of CSRs and customers, derived especially from the lack of technical background and jargon at the customers' side. While communication between CSRs and professional contacts such as designers and carpenters is more parsimonious, CSRs need to include a mass of contextual information in the message when communicating with customers. Often, it is necessary for CSRs to communicate with customers via telephone over cases in which communicators fail to overcome breakdowns that emerge in e-mails exchanges. In some cases, communication failures were so severe, that they damaged the ability to effectively treat an order, and the whole deal was canceled by the customer. Such cases undoubtedly harm the organization's profitability.

Text analysis of email messages demonstrates CSRs' tendency to use egocentric and standard expressions when communicating with clients. Keeping in mind that contextualization requires cognitive effort and is time consuming, we claim that the aforementioned cognitive overload of CSRs influences their hesitation to contextualize.

3. Design

In this section we present our prototype of an e-mail user interface designed for CSRs in Artigiani. Our e-mail design reflects an attempt to follow an avenue for reinventing e-mail, which was suggested after a survey of a vast body of work accumulated over the past 3 decades in the e-mail literature. The survey retrieved three perspectives that need to be assembled simultaneously to support activities in the design of future e-mail clients: *individual*, *communicative*, and *socio-organizational* (Ducheneaut & Watts, 2005). We will refer to the three perspectives when we describe our e-mail features.

Contextualization must rely on organizational knowledge for two components: 1) Knowledge to provide additional context layers around action; 2) Knowledge to identify conditions in which to contextualize messages (Schwartz & Te'eni, 2000). Accordingly, our e-mail design roughly distinguishes between two purposes for contextualizing, supporting task management and enhancing effective communication:

- Task management: Contextualization for improving the user's ability to effectively manage his organizational activities and tasks.
  We dealt with design issues of how to best implement the idea of tying knowledge to action; in other words, how to best organize and display knowledge so users can easily get to the right knowledge at the right time at each task. This purpose is closely tied to the Ducheneaut & Watts (2005) *individual* level reflected in the e-mail as file cabinet metaphor, in which e-mail design extends human information processing capabilities.

- Effective communication: Contextualization for achieving a high level of MU and minimal communication breakdowns.
  We dealt with two questions regarding contextualization:

- When? We designed an e-mail prototype that would help users to identify the conditions in which contextualization is necessary and encourage them to do so.
- What? We designed an e-mail prototype that would help senders to identify what types of information is required for the receivers to understand the message. Metaphorically, senders should be able to easily build the contextual bridge above the cognitive distance between them and the receivers.

We present two screens (Figures 1-2) that show the main features that are designed to achieve effective task management and effective communication. For convenience, we separated between these two different purposes, but it is important to note that some features support both.

Task management: knowledge to provide the additional context layers around action

Figure 1 presents a screen layout from our e-mail prototype with an incoming message from a customer. The layout is divided into four panes: 1) incoming messages (inbox list); 2) message content; 3) OM related to the message; 4) thread view. When a message is selected in the inbox list (pane 1), different contextual information of that message appears in the three remaining panes.

Incoming messages (inbox list)

The incoming message pane resembles current e-mail programs. Messages are separated according to arrival dates, and basic information of each message is displayed (arrival time, sender and subject).

Three icons may appear next to messages: an icon of a message thread for messages that belong to a message thread, the familiar attachment icon, and flag icon that expresses urgency. The latter meets the need for effectively managing pending tasks and task prioritizing. The system parses the text of incoming messages and flags selected messages as most urgent, when identifying urgent expressions and punctuation marks (e.g. “critical”, “urgent”, “ASAP”, “quickly”, etc.) or when identifying content that is considered high priority (e.g. activities such as orders). Flags and priorities are considered as a design component of the *communicative* level in the Ducheneaut & Watts (2005) framework.

Organizational memory (OM) for tying context layers to action

Our prototype borrowed the main feature of kMail, which is the creation of OM views. The idea of tying OM to e-mail messages resembles the “contextual data” design component, related to the *socio-organizational* level in the Ducheneaut & Watts (2005) framework. We elaborated Schwartz and Te’eni’s (2000) idea of associating OM views to outgoing messages, by proposing OM views also for incoming messages. For example, in Figure1, an incoming message from a customer was parsed, and the words “item number 126” were associated with a memory item of a figure of a door handle, and therefore were hyperlinked to an OM view. Implementing the idea of tying knowledge to action, this addition helps CSRs manage the numerous pending tasks which arrive with incoming messages. Though we differentiated between effective task management and effective communication, OM supports both. In addition to helping CSRs to better handle their tasks, the probability for MU is raised by the fact that incoming messages are associated by hyperlinks to the relevant information needed for the CSR to understand their meaning.

Message threads

Thread visualizations are associated with the *communicative* level in the Ducheneaut & Watts (2005) framework. Following previous work, we designed graphical representation of message threads to highlight all parties involved in a conversation, and to have an easy access to the contents exchange in the conversation by each member. We used different colors for different professional groups (CSRs, carpenters, contractors, architects, interior designers, suppliers and customers). To produce a useful tracking of conversations, our threads are located on a timetable, following the work of Rohall et al. (2001). In figure 1, at the 4th pane, for each message on a thread we inserted a button to access the sender’s profile for more details. This encourages the user to take the contact’s perspective before replying or making relevant decisions. In designing message threading, we adopted from a list of key qualities characteristics that are most relevant and useful for effectively managing CMC and organizational activities at Artigiani: chronology, relationships, compactness and attribute highlighting (Kerr, 2003).

The preliminary phase of text analysis of a message's helped us expose important attributes that are extremely useful for quickly finding particular messages or assessing the state of a thread. Users can effectively locate all messages that were sent by a particular person; sent on a particular time range (day, week, month); or ascribed to a certain milestone (distinguished stages such as orderings, production and supply). Organizing information by categorization of the main milestones of customer care in Artigiani is an important feature for lowering the cognitive complexity sensed by CSRs. We used colours to group and distinguish between certain messages, contacts, and milestones, for a quick and simple identification. Using identical colors to group elements helps reduce cognitive load. Highlighting attributes by coloring nodes and locating threads on a timetable spare the need to click on messages on a thread to see who communicated, when, and at what stage.

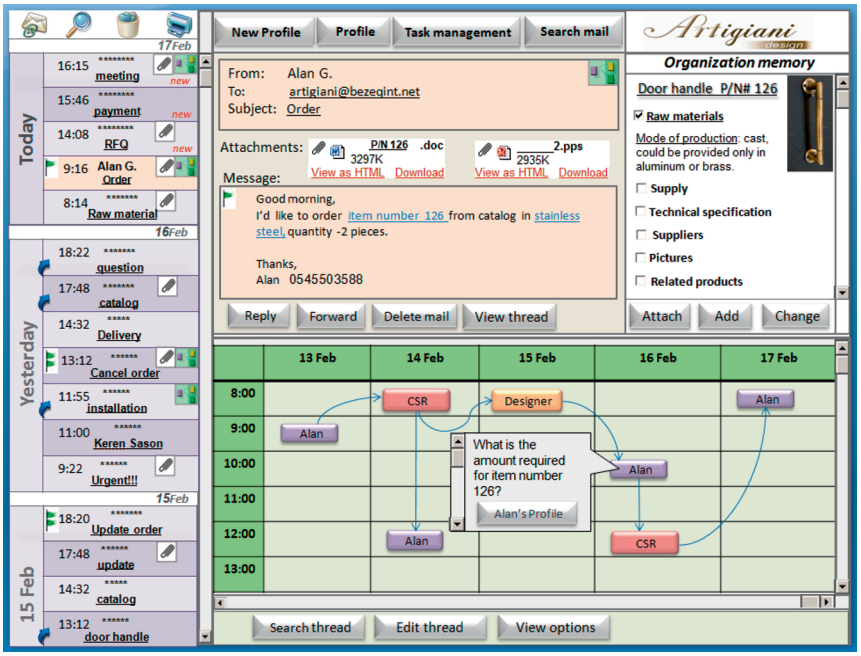

Figure 1: Contextualization with Embedded Links and Threading Visualization

Effective communication: knowledge to identify when and what to contextualize

As aforementioned, contextualization is only effective when needed and counterproductive when not needed. We are also aware of the fact that message senders are not always effective communicators and are not always aware of the difference in perspectives with their recipients. Therefore, our prototype includes two main elements that are aimed to ensure appropriate contextualization.

Organizational memory (OM) for effective communication

Whenever a CSR composes a message, the system will retrieve all the relevant information from the OM and will offer hypertext links to the OM for the CSR to confirm validate or modify before message transmission. At the recipient's side, the message will arrive with hyperlinks to relevant OM views. As kMail, there is use of knowledge about senders and recepeints to match their profiles and estimate their distance. Embedded links in outgoing messages are automatically created based on the distance detected. When calculations of sender-receiver distance find similar profiles, MU can be achieved with a relatively economical message exchange, with few embedded links, if any. Embedded links to OM not only encourage contextualization when necessary, but also helps users contextualize what is necessary.

Profile Cards

"Profiles" can offer in-depth information about each individual an e-mail user is corresponding with, to enrich the understanding of whom they are dealing with (Tyler & Tang, 2003). We implemented profile cards to minimize the distance between communicators. An example is shown in figure 2. Users can create con-

textual information about contacts, and then use it as an important reference in order to dispel ambiguity around their perspectives when composing messages to them. Unlike embedded links, which are system generated and therefore formed automatically, profiles enable the user to actively seek for relevant information about contacts, and then to consciously decide on what to contextualize to whom. In addition to basic customer information, profile cards contain the customer's "categories of interest". The CSR can use this information effectively as common ground for a smooth and efficient communication, and for providing customer-centered service; for example, he may identify the preferred design style of the customer and offer him complementary products. Also, profile card contains attachments to all the files that were gathered for this contact.

Transition between views presenting different layers of context

Users can quickly transfer between different layers of context by manipulating the display characteristics. As shown in Figure 2, a user can choose between a graphical or textual display of information, switch resolutions of detail from a daily to an annual view, through weekly and monthly views, and also choose to present a specific time range. A user can request to see more "drill down" presentations to access documents that belong to different milestones (for example, regarding an order, CSRs can see all documents that were saved: quotes, orders, manager approvals, manufacturing, etc.) Sorting documents by themes that are derived from critical organizational activities (milestones), is in line with the notion of "Thematic components" that connect *communicative* and *socio-organizational* levels (Ducheneaut & Bellotti, 2003; Ducheneaut & Watts, 2005) and with "Workflow systems" that are appropriate for organizational tasks that have a predictable structure (Whittaker, 2005). Users can transfer between views that display threads of e-mail conversations, specific messages and e-mail attachments. In Figure 2, a CSR chose to display all messages exchanged with a customer on a thread, highlighted by the milestones they belong to.

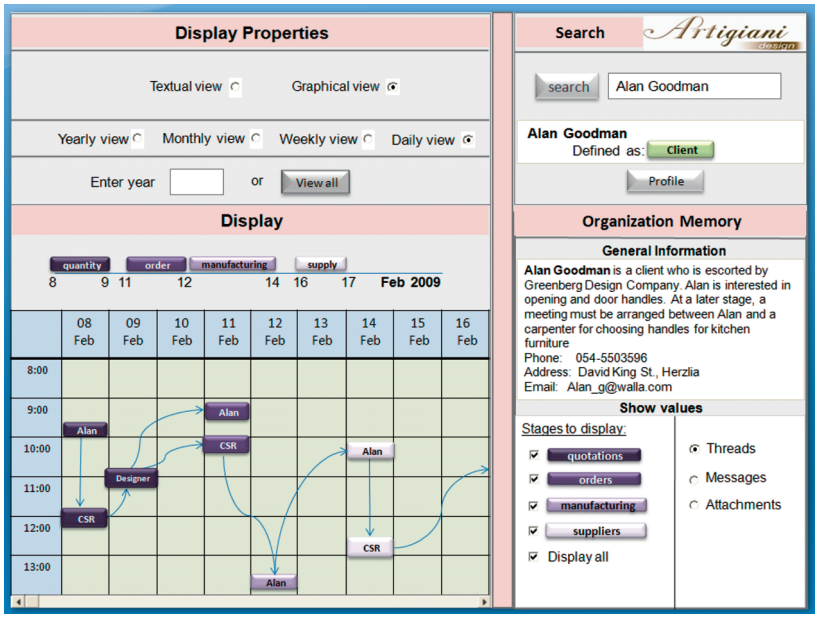

Figure 2: Contextualization of Contacts (Customers)

Conclusion

We focused on gaining a better sense of the various contexts relevant for communication and task management to design an effective e-mail prototype. Our first objectives were to evaluate communication processes between CSRs and their business clients, and to find the types of contextual information that help resolve breakdowns and miscommunications. Then, we examined possible ways to enhance effective CMC and finally we implemented our ideas in the design of an e-mail prototype. Since we are interested in receiving initial feedback from potential users prior to establishing a working prototype, our prototype is in an initial stage and therefore not yet a functional one. An additional limitation to our prototype derived from the former is that we did not implement a threading algorithm (such as the algorithms existing in Netscape Mail; Fischer & Moody, 2001; Kerr, 2003) or message parsing for creating embedded links (Schwartz & Te'eni, 2000).

We presented the prototype to potential users and received very positive feedback. CSRs stated that the e-mail is most relevant for their daily work and were particularly excited about presenting conversations visually and about the embedded links to OM. They expressed their enthusiasm about the ability to do things faster and more conveniently and also about the attractiveness of the design.

Our ideas are not limited only to the realm of customer service, but can be implemented to tasks and e-mail exchanges of other organizational roles and areas, such as purchasing and manufacturing. Our e-mail prototype follows an avenue for reinventing e-mail, which was derived from a vast body of work accumulated over the past 30 years in e-mail literature (Ducheneaut & Watts, 2005). Prototype features that we implemented, such as profiles, thread visualization and embedded links to OM connect components from three levels at which e-mail operates: the individual; communicative; and socio-organizational, respectively. We believe that a multi level approach will support a variety of organizational tasks performed using e-mail.

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Receieved: September 2012.
Accepted: April 2012.

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