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ENHANCING COMPUTER MEDIATED COMMUNICATION BY DESIGNING AN EMAIL PROTOTYPE: A CASE STUDY

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ABSRACT

In today's modern world, computer supported cooperative work (CSCW) and computer mediated communication (CMC) are central and most crucial in the activities of organizations and in their success in achieving their goals and purposes. Organizations are established to achieve goals that one person cannot accomplish alone, and the knowledge that is collected by individuals should be reserved for the general use of the organizational community. Now, organizational workers need more than ever to share the knowledge they each gather, and they are involved in joint activities that need the support of information systems. Communication between individuals is at large extent in the form of computer mediated cooperation, and computerized applications ascribed as groupware (group support systems) include shared environments, whiteboards, electronic group calendars, chat rooms and more. Groupware systems support groups of people that work together by facilitating communication between them and by improving coordination. The overall success of organizations is certainly dependent on computer mediated communications that need to be designed to achieve a high level of mutual understanding and minimal occurrences of communication breakdowns. Perhaps the most widespread mode of CMC at work is email. Organizational workers are engaged in this asynchronous communication on a daily basis, having multiple contacts and the ability to preserve exchanged messages in an archive for future use.

This study examines the possible ways to enhance CMC among users exchanging email messages in a company named Artigiani that specializes in manufacturing handles, hooks, hangers, and bathroom accessories. We closely examined communication in

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Artigiani, and conducted content analysis of email messages. We were particularly interested in the exchanging of messages between customer service representatives (CSRs) and their customers which are professional workers such as carpenters, contractors, architects, interior designers and personal customers. CSRs in Artigiani are in great pressure to respond quickly to emails, and they feel stressed by the high volume of incoming messages, and by the fact that they tend to lose important items when they need them (such as previous messages exchanged, and items that they wish to attach to new messages). In addition, we identified communication breakdowns and misunderstanding that mainly result from differences in knowledge and perspectives of communicators.

We follow previous work in CMC that stress the need for reinventing the email client, and put our focus on a communicational strategy called *contextualization*, which is the activity of providing the explicit addition of contextual information to a core message to ensure effective communication. We present a prototype for an email user interface that puts contextualization as a central component for enhancing effective CMC and for effectively managing and controlling organizational activities, especially the ongoing management of product ordering, and related decision making.

INTRODUCTION

Rohall et al. (2001) explain why users are so frustrated with their electronic mail. They feel overwhelmed by the high volume of messages, and it seems that current structures within email clients, such as folders, prove inadequate, especially for high-volume email users. They claim that there is need for reinventing the email 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 email inboxes are a key piece of the solution.

Communication Breakdowns

In the current research we focus on task-oriented communication. Communication problems are potentially present in organizational processes, which involve cooperative work between groups of workers coming from different occupational backgrounds. Differences in language and knowledge, deriving from their different backgrounds 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 its failure.

Research has shown that communication is more efficient when people share greater amounts of common ground. Communication processes which involve individuals who come from different organizational occupations and hold different kinds of knowledge, like engineers and managers, impose certain demands and requirements on the form of messages exchanged between them (Schein, 1996). Communicational problems are seen quite clearly in the relations between people who come from different domains or methodologies (Sommerville, Rodden & Dix, 1996). 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 misunderstanding and communication breakdowns may be reduced by contextualization, i.e., providing the explicit addition of contextual information to a core message to ensure effective communication. In other words, contextual information is the information that the message sender has and that may affect the receiver's interpretation of the core message (Katz & Te'eni, 2007). 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).Communicators adapt by engaging in contextualization behavior in order to overcome communication difficulties arising from perspective differences. 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 (Katz & Te'eni, 2007). It is important that email authors send messages that minimize the sender-receiver distance to prevent communicational breakdowns and to enhance mutual understanding. Although the degree of context required in an email message depends on the e-mail recipient, it is the author who must determine the context that the message provides, as well as its depth. The adaptive behavior of contextualization is at the sender's discretion. A message sender who senses a problem in communication and attributes it to differences in perspectives or

domain knowledge has motivation to contextualize to gain reduction of the likelihood of misunderstanding (Fussell et al. 2000).

A *perspective* is a person's point of view, including his beliefs, opinions, attitudes, frames of reference, or roles (Krauss & Fussell, 1991). Perspective taking is the process of taking someone else's point of view and assessing what others know (Krauss et al., 1995). The phenomenon that speakers attempt to ensure the listener's comprehension by taking his perspective into account is well-known in the literature (see overview in Roβnagel, 2000). Taking the perspective of others lies at the heart of shared understanding and successful communication, but it is a cognitive skill that varies among individuals and requires cognitive effort (Dickey et al, 2007). People tend to rely on their own perspective when communicating because it requires less cognitive effort (Keysar et al., 2000), or to overestimate the degree to which others' perspectives mirror their own (Krauss & Fussell, 1991). Although addressee-based perspectives are easier to comprehend, speakers find messages from egocentric perspectives easiest to produce (Schober, 1993). 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 (Roβnagel, 2000; Horton & Keysar 1996). The cognitive effort required for information transfer in CMC, especially the transfer of complex information, is less efficient than in richer media (Kraut et al., 2002). Katz and Te'eni (2007) found that the impacts of contextualization on mutual understanding and on performance are contingent on whether communicators share or differ in their perspectives: Contextualization increases mutual understanding and performance in cases of different perspectives, but it does not increase mutual understanding and even decreases performance in situations of shared perspectives. In other words, contextualization is only effective when needed and counterproductive when not needed. However, message senders are not always effective communicators, and are not always aware of the difference in perspectives with their recipients and therefore can use contextualization inappropriately.

In a customer service situation, there may be a deliberate attempt to hide the personal identity of the customer service representative (CSR), who may use fixed, pre-defined 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 communication effectiveness. 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, sessions can break down and end without resolution (Dickey et al., 2007).

Contextualizing with Embedded Links

Knowledge organization deals with the 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 for them at each task. The idea of tying knowledge to action is aroused from the fact that knowledge 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 email is 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, and therefore serves as a window to OM, to achieve successful communication. KMail was designed to enhance computer mediated collaboration by helping it's users to appropriately adapt to communication, by assessing perspective differences. In kMail, each time a user authors an e-mail message, the system creates a new OM view that consists of OM concepts relevant to the concepts from the e-mail, related to the context of the user's activities. The system first presents the author with this view, in the form of links to knowledge items from concepts in his message, for the purpose of confirmation, validation, or modification and then sends the validated view to the kMail recipient along with the kMail message. In other words, when a user types a message, kMail dynamically offers hypertext links to the OM, and the sender needs to confirm before transmission.

Contextualization with Message Threads (Conversational Trees)

Messages should be viewed as elements of a conversation rather than as independent elements. An email 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). New messages are not solitary, but often related to older ones. This interconnectedness is not fully exploited in conventional email clients. (Kerr & Wilcox, 2004). Kerr claims that conversation threads in email allow users to see a greater context of the messages they are reading, remind users that a conversation is in progress,

recording the state of a discussion, collating related messages automatically, and reducing messages displayed in inboxes (Kerr, 2003). A full visualization of a message thread, in a way that clearly displays a message along with all its previous related messages 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 relevant elements and issues that were already discussed prior to the current message; in other words contextualization of the communication history. Threading is useful for both author and recipient. Threading serves as reference for the author of the common ground achieved in the conversation until the current point, and allows him to expend less effort in building the current message. This allows a relatively parsimonious and economical mode of message exchange for message authors. At the recipient's side, contextual information reduces the likelihood of misunderstanding the meaning of messages. Contextualization by thread visualization also reduces cognitive demands on memory by eliminating the need to recall past issues, arguments and other conversational elements.

Venolia and Neustaedter (2003) go beyond the limited context preservation by threading that appear in current email programs, and design an interface that aids understanding by showing the names of the conversation originator, participants and recipients of messages. Remail, an innovative and integrated email client, copes with the problem of limited context for new messages by using visual separators in the Inbox list in a way that lets users see each message within its context using "pivoting" and threads. Remail, chunks the date information into days with date separators that make it easier to see messages from a given day as a group (Kerr & Wilcox, 2004). Email is often time sensitive; an important and valuable attribute of electronic mail is the time when a message was received. It is the way most users see messages arrive in their inboxes and therefore chronology is important (Kerr, 2003). Rohall et al. (2001) combined a tree based model with a timeline model to produce a useful tracking of conversations. Threading messages on a timeline help users better manage their tasks and relationships.

Artigiani as a Case Study of CMC

We examined communication in Artigiani, a company that specializes in designing and manufacturing affixing (metal fixtures or accessories), such as handles, hooks, hangers, and bathroom accessories. We found a massive activity of email message exchange going on in Artigiani. Email in Artigiani is a communication channel to handle various

organizational activities (e.g. negotiating with suppliers, orderings products, price offering, scheduling the supply and installation of products, etc.). We were interested in the exchanging of messages between CSRs and their clients which are professional workers such as carpenters, contractors, architects, interior designers, suppliers and especially customers. Inasmuch profitability of businesses depends on their customers; customer service is an important part of every business organization. Customers are satisfied when they receive personal and prompt service. The current study is about designing effective CMC that enhances good communication in Artigiani with a focus on communication between CSRs and customers.

We roughly distinguish between two purposes for contextualizing in Artigiani:

1) **Task management**: Contextualization for improving the user's ability to effectively manage his organizational activities and tasks, and to improve related decision making.

2) **Communication**: Contextualization for improving CMC, i.e. achieving a high level of mutual understanding and minimal occurrences of communication breakdowns.

We now describe the difficulties of task management and communication in Artigiani.

Task Management Difficulties of CSRs in Artigiani

One of the most commonly performed activities in email is management of pending tasks. The term *pending task* is used to denote any activity that is to be performed in the future (Gwizdka, 2002).An email client that supports easy access to contextual information, that is related to pending tasks can be of great help for managing the overwhelming high volume of incoming messages.

In Artigiani, communication of CSRs with clients and customers via email is preferable, especially because of its ability to document and to maintain written proofs for orders. CSRs in Artigiani are involved in various parallel activities related to customer service such as management of customer files and documents, telephone response, and monitoring orders. Artigiani CSRs are in great pressure to respond quickly to emails, 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. They are required to manage ongoing activities over time and they 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 a customer is not continuous. This makes the task of managing orders and treating clients and customers cognitively demanding.

For the sake of tracking and managing customer orders, important information is filed into physical office folders. The process of collecting and filing in physical folders is inconvenient, requiring 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 office folders, CSRs constantly arrange files in their email inboxes and in other folders on their computers for further reference and must retrieve their location whenever needed. These activities are tedious, time consuming and cognitively demanding. In some cases, CSRs accidentally assign the wrong file to an email message, and in other cases they totally forget that a relevant and probably useful file existed. It is clear that CSRs in Artigiani have problems of maintaining and effectively using various types of knowledge, thus the value of the information is lost. CSRs do not have a clear and immediate 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. To reach this kind of information, they need to tediously search their email inboxes, outboxes and other folders they have created. Clearly, difficulties to reach information in a timely manner (when workers do not have the ability to quickly associate items, events, files or messages to ongoing orders or certain clients and customers) affect work quality, especially the quality of customer service. Because email communication is a-synchronic in its nature and not continuous, it is difficult to keep track of orders and to effectively handle them.

Communication Difficulties of CSRs in Artigiani

To evaluate CSRs' communication processes, we borrowed only the idea of the "Wizard of Oz" (WOz) method, which is usually used in the realm of HCI in the prototyping phase. In a much earlier stage, we borrowed the idea of intervention without the user's awareness, to examine communication breakdowns in Artigiani and to find the types of contextual information that help resolve these breakdowns. We observed CSRs while they exchanged emails. We identified occurrences of communication breakdowns

(focusing on breakdowns derived from misunderstandings), and we identified contextual information that are likely to build the bridge over the gap between communicators (cognitive distance between them that leads to misunderstandings) and encouraged CSRs to contextualize this additional contextual information. This way, we became involved in the exchange of email messages without the awareness of other communicators (besides CSRs) to examine the types of contextualization acts that may solve communication breakdowns. At this point we also collected email message exchanges for further reference, to conduct text analysis for identifying the main categories of communication interests in Artigiani, and the main activities of CSRs. This phase of communication observation and intervention and of collecting email messages started at the summer of 2009 and lasted about two months. During this period, sixty email messages were collected. We found that the main activities of CSRs are handling orders facing customers and suppliers, stock checking, price quoting, and answering technical questions. Text analysis discovered that the main source of communication breakdowns is the differences between the perspectives of CSRs and their contacts, derived especially from different jargons and different professional backgrounds. In some cases, communication failures damaged the ability to effectively treat an order, and the whole deal was canceled. Cases as such undoubtedly harm the organization's profitability.

Text analysis revealed that CSRs tend to use egocentric and standard expressions when communicating with clients. Keeping in mind the cognitive effort required for contextualization and the fact that it is time consuming, we claim that the aforementioned cognitive overload of CSRs, influences their little tendency to contextualize.

DESIGN

We now present several screen layouts of a prototype for an email user interface designed for CSRs which puts contextualization as a central component for enhancing effective CMC in Artigiani.

Contextualization must rely on organizational knowledge for two components:

1) Knowledge to provide the additional context layers around action;

2) Knowledge to identify the conditions in which to contextualize messages (Schwartz & Te'eni, 2000).

1) Knowledge to provide the additional context layers around action

Figure 1 presents a screen layout of our email prototype. 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 email programs such as Microsoft Office Outlook. Messages are separated visually according to arrival dates, and only the basic information of each message is presented (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 icons that express urgency. Flagging selected messages are external representations of most urgent pending tasks. Messages that contain urgent expressions and punctuation marks (E.g. "critical", "urgent", "ASAP", "quickly", "!!" , etc.) and that are identified by the program as related to more urgent activities (such as orders) are most likely be considered high priority. The email program will parse incoming messages to find "urgent expressions" and will flag messages that satisfy certain conditions of urgency.

Message content

The message content pane resembles current email programs. The message is fully presented, that is to say: with header information (sender, receiver, and subject), the typed message, and with icons to click on for opening attached files.

Organizational memory (OM)

Our prototype imitates the main feature of kMail, which is the creation of OM views that consists of OM concepts relevant to the concepts typed in e-mail messages. Whenever a CSR will compose 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 to the recipient. We elaborate Schwartz and Te'eni's idea of OM views, and propose the creation of 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. Staying in line with the idea of tying knowledge to action, our new addition will help CSRs manage the numerous

pending tasks which arrive with the overwhelming high volume of incoming messages, by tying important knowledge items to incoming messages.

Message threads

Following previous work related to message threads, we designed graphical representation of the message threads to highlight the relationships among the people involved in each conversation. At a glance, a user can see all parties involved in a conversation, and has an easy access to the contents exchange in the conversation by each member. The nodes of a message on a thread are colored for an immediate recognition of all communicators. Since some threads involve many individuals, if each one is presented in a different color, then too many colors may overload the user. Therefore, we used different colors for different 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).

When a user selects a message node in the thread view pane, this selection is seen along with a preview of that message. Kerr (2003) found this ability of users to navigate quickly to other messages in the thread by clicking on nodes without having to use their inbox list, as one of the most useful aspects of the visualization's interactions. In addition, in the bottom of every message preview, we inserted a button to access the sender's profile for more details. This encourages the user to take the perspective of that contact before replying to him or before making relevant decisions. We will refer to profile cards later.

In designing message threading, we adopted from Kerr's (2003) list of key qualities, four characteristics that are most relevant and useful for effectively managing CMC at Artigiani: Chronology, Relationships, Compactness and Attribute Highlighting. Here we elaborate only on *attribute highlighting*.

The preliminary phase of text analysis of a message's contents helped us expose important attributes of a thread that are extremely useful. We highlight specific message attributes in a thread, including all messages sent by a particular person, all messages sent on a particular time range (day, week, month) and all messages that ascribe to a certain milestone (distinguished stages such as orderings, production and supply). Through out the design, we used colors to group and to distinguish between certain messages, contacts, and processes, for a quick and simple identification. Using similar colors for

elements groups them into collective entities (the well-known "Law of Similarity" of the Gestalt psychology), hence, helps reduce cognitive load. 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.

Figure1: Contextualization with Embedded Links and Threading Visualization
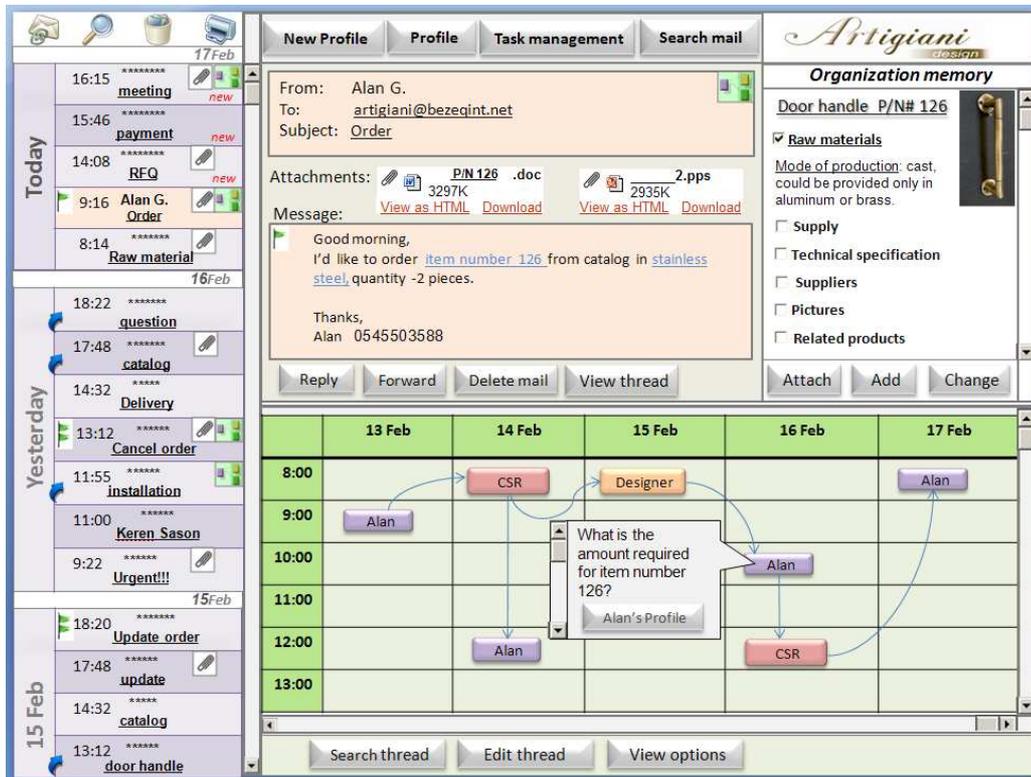
2) Knowledge to identify the conditions in which to contextualize messages

We seriously consider the aforementioned findings that 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 elements that are aimed to ensure appropriate contextualization.

> The first element for contextualization to minimize the distance between communicators, was the previously described feature of creating embedded links to OM (that we borrowed from Schwartz & Te'eni, 2000), which uses metaknowledge about senders and receivers to match their profiles and estimate their distance. The embedded links are automatically created by the email program based on the distance detected.

We include another option for creating and viewing *contacts' profiles* in order to dispel ambiguity around the recipient's perspective. The contact's profile serves as an important reference to enable perspective taking when composing a message. Unlike the embedded links, which are system generated, contact profiles enables the user to access contact cards, to actively seek for relevant information about contacts, and then to consciously decide on to whom to contextualize what.

Figure 2 presents two print screens (a, b) of the contact profile of a message sender, which opens when the user clicks on the profile button. The upper section of the screen presents basic information about the contact, such as telephone numbers and address, and a place for typing additional information such as *situational context* (Schwartz & Te'eni, 2000). An example can be a comment saying that the customer is now building a house along with a suggestion to contact with him again around March 2010).

At the lower section of the screen, the profile card contains three tabs:

1) The *category* tab shows all the categories that the user checked in the "categories of interest" list in the upper section. If this customer will make contact in a couple of weeks or so, the CSR will be able to use this information effectively as common ground for a smooth and efficient communication, and for providing customer-centered service (See figure 2a).

2) The *contacts* tab presents the contacts of a customer (e.g. carpenters, contractors, architects, and interior designers) that often accompany him and give him advice. Some times those contacts are in direct communication (by phone or by email) with the CSR. Therefore, it is important to send them copies of emails (in CC) and to keep them posted when it is needed (See figure 2b).

3) The *files* tab shows all the files that were gathered for this contact.

Figure 2: Profiles: Contextualization of Contact Information
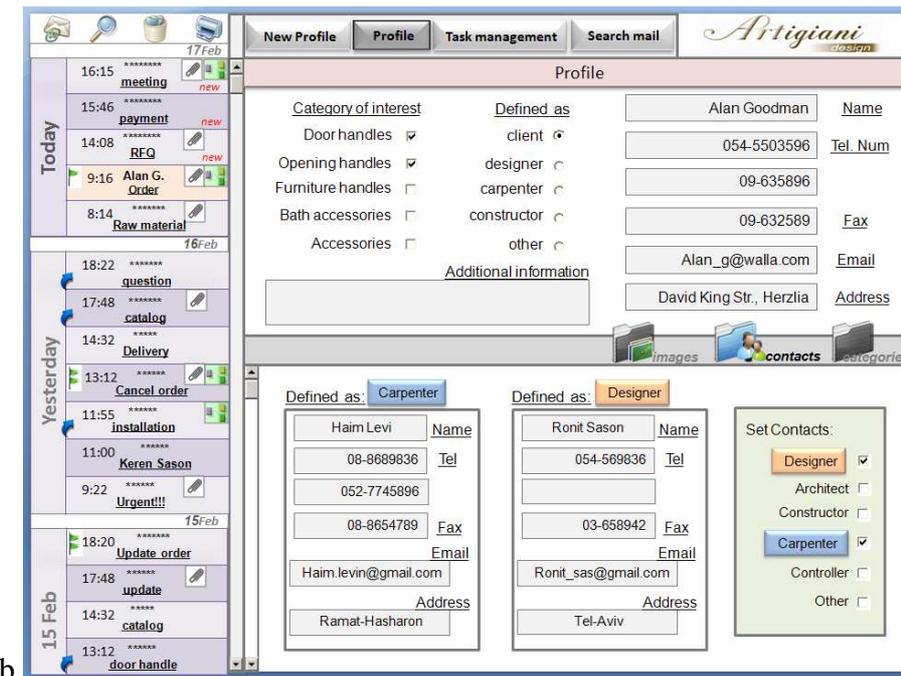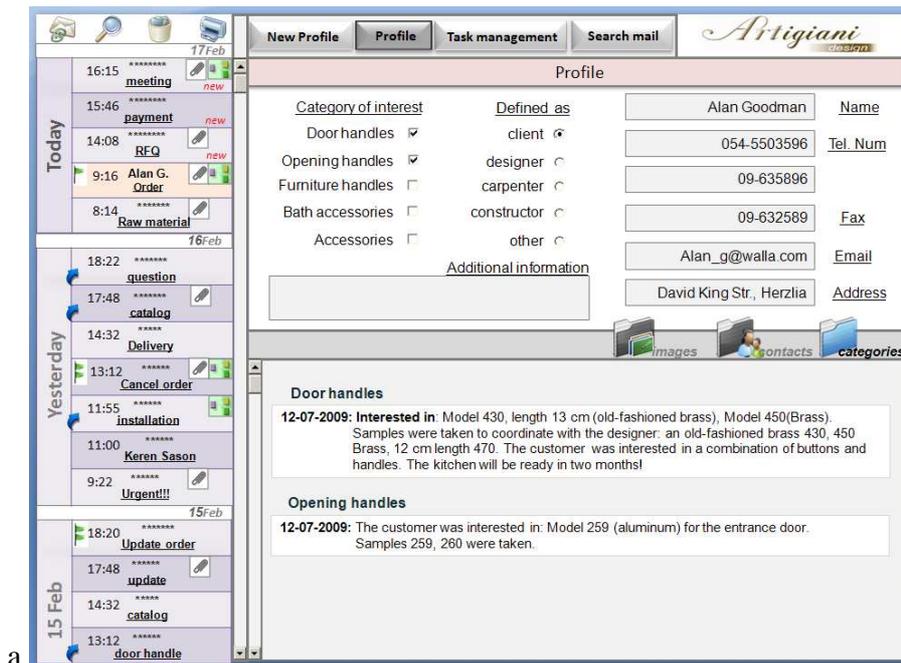

a

b

Figure 3 presents a search option for a quick access to information about contacts, communications, and organizational processes. The search screen is divided to four panes: 1) search area: a text box for typing the request and a search button (here, the user typed "Ronit Sason", and the program identified her as a designer; 2) a brief summary about the contact is presented along with a list of radio buttons and checkboxes for

choosing additional requested information.); 3) area for manipulation of display characteristics. The user can choose between a graphical and a textual display of information. He can switch resolutions of detail from a daily to an annual view, through weekly and monthly views. The user can also choose to present a specific time range. 4) The display: This is the pane that presents the information requested in the layout and form that were chosen by the user in panes 1-3. In the figure, the screen shows a graphical presentation of all of Ronit Sason's customers, at the year 2009, at a monthly view. When a user clicks on a customer in the fourth pane, a popup window appears, showing a preview of important information regarding that customer in different stages of his contact with the designer.

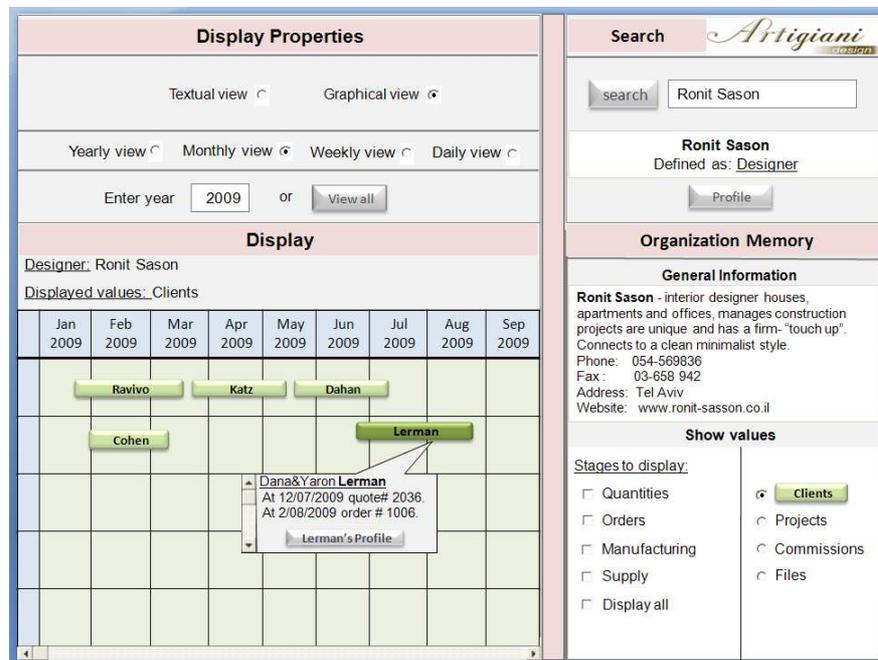**Figure 3: Search Option: Contextualization of Contacts**

Figure 4 presents a user request to see a more "drill down" presentation of Ronit Sason's customers. From the list of additional information in pane 2, the user chose several documents that belong to different milestones. This changes pane 4 and for each customer, there is a list of all the documents that were saved: quotes, orders, and production and supply documents.

Figure 4: Search Option: Contextualization of Contacts with a Drill Down to Additional Information
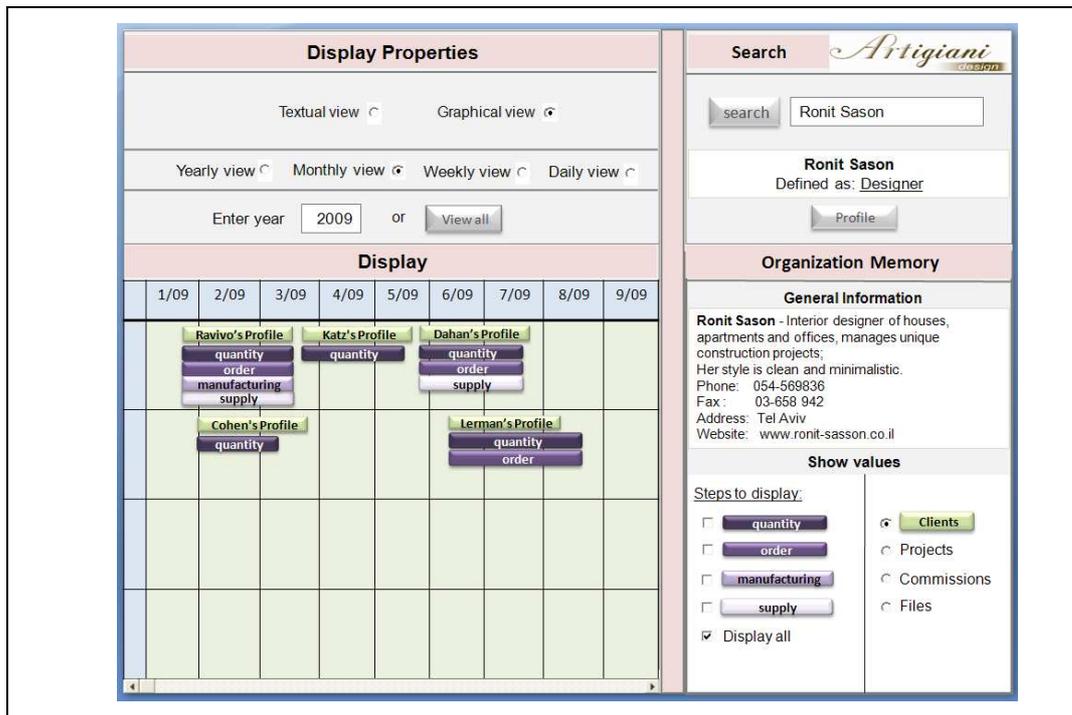
LIMITATIONS

The current study focuses on designing the features of an email to enhance CMC in the form of email and on gaining a better sense of the various contexts relevant for communication. Our prototype is in an initial stage and not a functional one. An additional limitation that is derived from the first is that we did not implement a threading algorithm (such as the algorithms existing in Netscape Mail; Fisher & Moody, 2001; Kerr, 2003) or message parsing for creating embedded links (Schwartz & Te'eni, 2000).

REFERENCES

[1] Adria, M., S. Chowdhury (2004). *Centralization as a Design Consideration for the Management of Call Centers*, Information & Management, 41(4), 497-507.

[2] Cramton, C. D. (2001). *The Mutual Knowledge Problem and Its Consequences for Dispersed Collaboration*, Organization Science, 12 (3), 346-371.

[3] Dickey, M., Burnett, G., Chudoba, K., Kazmer, M. (2007). *Do You Read Me? Perspective Making and Perspective Taking in Chat Communications.* Journal of the Association of Information Systems, 8 (1), 47-70.

[4] Fisher, D., Moody, P. (2001). *Studies of Automated Collection of Email Records*, University of Irvine, Technical Report, UCI-ISR-02-4.

[5] Fussell, S. R., Kraut, R. E., Siegel, J. *Coordination of Communication: Effects of Shared Visual Context on Collaborative Work*, Proc. CSCW2000, ACM Press, New York, 2-6, 2000.

[6] Gwizdka, J. *TaskView - Design and Evaluation of a Task-based Email Interface.* Proc. CASCON 2002. IBM: Toronto, Canada. 136-145, 2002.

[7] Hinds, P. J., D. E. Bailey. (2003). *Out of sync: Understanding conflict in distributed teams .*Organization Science, 14(6), 615-632.

[8] Horton, W. S., Keysar, B. (1996*). When do Speakers Take into Account Common Ground?* Cognition, 59, 91-117.

[9] Katz, A., Te'eni, D. (2007). *The Contingent Impact of Contextualization on Computer-Mediated Collaboration .*Organization Science, 18(2), 261-279.

[10] Kerr, B. (2003). *Thread Arcs: An Email Thread Visualization*, IEEE Symposium on Information Visualization (INFOVIS 2003), October 211-218.

[11] Kerr, B., Wilcox E. *Designing Remail: Reinventing the Email Client through Innovation and Integration*. CHI 2004, April 24–29, 2004, Vienna, Austria, 837-852.

[12] Keysar, B., Barr, D. J., Balin, J. A., Brauner, J. S. (2000) *Taking Perspective in Conversation: The Role of Mutual Knowledge in Comprehension*, Psychological Science, 11 (1), 32-38.

[13] Krauss, R. M., Fussell, S. R. (1991). *Perspective-Taking in Communication: Representations of Others' Knowledge*, Social Cognition, 9, 2-24.

[14] Krauss, R. M., Fussell S. R., Chen, Y. (1995). <u>Coordination of Perspective in Dialogue: Intrapersonal and Interpersonal Processes</u>, In I. Markova, C. G. Graumann & K. Foppa (Eds.), *Mutualities in Dialogue*. Cambridge: Cambridge University Press, 124-145.

[15] Kraut, R. E., Fussell, S. R., Brennan, S. E., Seigel, J. (2002). <u>Understanding Effects of Proximity on Collaboration: Implications for Technologies to Support Remote Collaborative Work</u>. In P. J. Hinds, S. Kiesler, (Eds.), *Distributed Work*. MIT Press, Cambridge, MA, 137–162.

[16] Roβnagel, C. (2000). *Cognitive Load and Perspectives-Taking: Applying the Automatic-Controlled Distinction to Verbal Communication*, <u>European Journal of Social Psychology</u>, <u>30</u>, 429-445.

[17] Rohall, S., D. Gruen, P. Moody and S. Kellerman (2001). *Email Visualizations to Aid Communications*, <u>Proc. InfoVis 2001,</u> <u>IEEE</u>, 12-15.

[18] Schein, Edgar H. (1996). Three Cultures of Management: The Key to Organizational Learning. Sloan Management Review, 40-51.

[19] Schober, M. F. (1993). *Spatial perspective-taking in conversation*, <u>Cognition</u>, <u>47</u> (1), 1-24.

[20] Schwartz, G. D., Te'eni, D. (2000). *Tying Knowledge to Action with kMail*, <u>IEEE Intelligent Systems</u>, <u>15</u> (3), 33-39.

[21] Sommerville, I., Rodden, T., Dix, A., *Systems Development and Co-operative Work: Methods & Techniques (SYCOMT)*, <u>CSCW Symposium</u>, March 1996.

[22] Te'eni, D. (2001). *A Cognitive-Affective Model of Organizational Communication for Designing IT*, <u>Management Information Quarterly</u>, June 1-62.

[23] Venolia, G. D., Neustaedter, C., *Understanding Sequence and Reply Relationships within Email Conversations: A Mixed-Model Visualization*, <u>Proc. SIGCHI2003</u>, <u>5</u> (1), Ft. Lauderdale, Florida, USA, April 5–10, 2003, 361 - 368.