

Managing Critical Incidents in the Fine-Paper Supply Chain through Mobile Collaborative System

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ABSTRACT

Most of the CSCW innovations related to mobile technologies are at the research stage and have been launched commercially, as they are developed within labs and lack direct practical relevance. This paper reports the findings of a case study on real-world companies operating in the fine-paper supply chain and places emphasis on the requirements for supporting mobility within specific collaborative settings. A mobile web-based system for managing customer complaints in a collaborative group work environment is described, which we have designed and developed for the fine-paper industrial setting. The benefits - including stronger customer relationships, lower operating costs and better use of human resources - are available to any complex customer care activity that follows activity-centered collaboration and seizes the initiative via a web-based system with mobile access.

Keywords: collaboration, mobile system, complaint handling, paper industry

1. INTRODUCTION

The ever-increasing spread of mobile communications, rapid development of sophisticated smart phones and forthcoming future of IP convergence make it possible to adapt computer-supported cooperative work (CSCW) applications to mobile devices. Our motive for this study is twofold. We are witnessing the emergence of networked organizations that are based on flexible business processes and rely upon the dynamic work of teams that temporally coalesce. Increasing business velocity and mobility require collaborative applications and systems in B2B settings. One of the most time-sensitive fields in every business operation is internal and external customer service. Therefore major software providers, vendors and consulting companies offer various mobile deployment options for their CRM products [16]. Despite the contribution of such systems to supporting remote activities, these solutions are unwieldy and mobility in collaboration is often overlooked. Secondly, we aim to address an issue that has recently emerged within CSCW and still received relatively little attention – the requirements and conditions to support mobility in B2B collaborative activities. A growing number of studies exist on mobility in collaboration that offer findings about the actualities of mobile work in general and characterize the problems of mobile work [1, 11, 6, 15]. However, only a few of them have presented actual prototypes for mobile CSCW, featured them in empirical studies of work and communication [13, 3, 7, 12] and provided enough evidence of the implications for supporting mobility and enhancing collaborative work in corporate settings. As a number of authors have commented, activity-centered research on collaborative work is now beginning to emerge [8, 10]. This paper is based on the latter concept and presents a mobile collaborative system that places a strong emphasis on the requirements for supporting

mobility within specific collaborative settings. We report on studies of communication and collaboration in a vertical corporate market of the fine-paper industry, and discuss the implications of the horizontal mobile solutions for supporting collaborative work in the complaints handling process and more generally enhancing customer relationships.

2. CRITICAL INCIDENTS IN THE FINE-PAPER SUPPLY CHAIN

The case study reported here centers on three real-world companies, participating in the supply chain for high-quality fine paper. It aims to reveal the general condition of customer care that are specific to the fine-paper industry and focus on what is needed to improve the handling of complaints via a CSCW system. The fine-paper business within the pulp & paper industry produces a multitude of paper-based products. The industry is complex and depends on good customer relations with a great variety of players, ranging from paper mills and printers to retailers and consumers. A successful commercial publication is a sum of elements: content, layout, illustrations, font and, often very crucially, the paper and print quality. Despite the complexity, there are some key elements to becoming more successful on the market. In the fine-paper supply chain you need your customers' business. Most customers today want more flexible service concepts and more transparency in the supply chain and are willing to work more closely in production planning, logistics, etc. to get that. In the fine-paper industry, there is a lot of talk about customer service focus within manufacturing settings, but surprisingly few companies have envisioned where to start from and how to accomplish this. Our case is no exception, and critical incidents are often overlooked. Critical incidents related to fine-paper products consist of feedback and claims, which together

are referred to as complaints. There is no room for setting up a call center, since to resolve the conflict requires group decision-making and follows complex checkup procedures on the part of the technical customer service (TCS) working at the mill and of the personnel maintaining the printing machines at the customer site. Besides being a complex activity that requires group decision-making, coordination and information sharing, handling complaints related to fine-paper products is also a seasonal activity, which puts additional pressure from time to time on both customers and TCS. Another factor is related to the timeliness of the product to the end user, i.e. the consumer. Moreover, to keep abreast of market demands, printing houses aim to incorporate state-of-the-art technology. In the era of the mobile internet, this means customers in the fine-paper industry will be equipped with modern and efficient terminals, will submit their complaints and questions to the paper mills and expect to be answered promptly. In concluding this section, we stress that handling complaints in the fine-paper supply chain is a complex, group-work activity that under seasonal time pressure requires a high degree of collaboration.

3. RESOLVING CRITICAL INCIDENTS WITH TRADITIONAL IS TECHNOLOGY

Design, development and implementation of collaborative systems imply an understanding of group processes, i.e. the essence of collaborative work. Before describing a suggested collaborative system for complaint handling, let us have a look at the existing communication and work structures of complaint handling.

3.1 Customer Service Tools for Handling Complaints

In traditional markets such as fine-paper products, customer complaints are considered an important source of information regarding areas of customer satisfaction and profitability. A recent study that examined complaints data [4] found that more customer dissatisfaction was generated by problems with customer service centers than by product failure. However, the first difficulty arises in the context of the fine-paper industry: what communication channels are most beneficial when trying to serve customers fast, individually and successfully? In the past few years online customer service has been receiving more attention, as the Internet has become a powerful tool for strengthening relationships between firms and their customers [17]. Recently, one of the paper mills' priorities has been to provide more online service for corporate customers. The paper-producing company has upgraded and improved its website. The new site offers a frequently asked questions (FAQ) section, and interactive discussion forum and a promotional goods section with marketing materials online. The FAQ page of an Internet producer's site provides answers to questions that are asked by customers on a regular basis. The disadvantage, however,

is just as clear: auto responders are standardized and can therefore not be called a customized service. When customers ask questions they will not be satisfied with a "canned" answer. Especially in complex processes, business customers want to communicate with humans. Auto responders can never be a substitute for a personalized answer and can therefore only be a subordinate part of a functioning customer care system.

While some researchers identify e-mail as one of the most pervasive collaborative technologies in organizations [18], others regard it as one of the worst communication media because of information overload and the interruption to work [9]. Even if the former can be proved, it does not seem to be an appropriate solution for handling complaints in the fine-paper supply chain. Failure to treat customer questions fast will result in dissatisfied customers and poor perception of the company. A rather popular customer care tool in the paper industry is an auto e-mail responder which is widely used especially when the technical customer service personnel is not available on line. The auto responder sends out a standardized reply to every incoming e-mail before any human looks at it. This means that one aspect of the customer relationship concept, instant customer care, is fulfilled. However in most cases the customer realizes that the service center on the supplier's side is a "dead end" providing usual apologies for a personnel being out of the office. Despite the modernization efforts and introduction of online customer service tools, there is a strong preference for face-to-face (F-to-F) interaction channels among technical service employees and management. "When we see people face to face, we really invest in the relationship", says a technical service manager at a paper mill. These moments of physical co-presence and F-to-F conversation are crucial to patterns of social life, but emphasis on meeting and thus the related delay in response time arising out of different modes and form of travel, as well as related traveling expenses may negatively contribute to the customer relationship. Many alternatives to traditional face-to-face interactions now exist without the need to travel to a common location. Mobile technology is the most efficient communication medium so far: it is real time, always and everywhere with the user, fast and easy to use, and customer service can indeed be reinforced by the mobile use of Web technology. When it comes to collaboration, 'togetherness' implies that group work takes place through the same artifacts. For certain processes in the supply chain, such as handling complaints, the cooperation takes place mainly through complex communication and understanding. This suggests that an interactive and efficient medium that enables instant information delivery, easy access to that information flow and sharing among participants should be considered an appropriate communication artifact for resolving industrial complaints. However, the picture becomes even more complicated in our case, as both tasks of complaint handling and individual difference

factors affect the way groups use the medium of their choice available to them.

3.2 The Study

In the case study reported here we have focused on developing new IS solutions and used constructive research methods based on action research methodology. Multiple data sources provided more accurate evidence of the complexity of the process. In our data collection effort, we used F-to-F interviews and documentary materials as the primary source of data. We conducted private interviews with each of the 10 focus group members from the paper producing company, customer printing houses and wholesaler. The official documents we received (a standard flow diagram and summaries of complaints handled in the year 2003) gave us a picture of how the complaints had been handled by the paper-producing company. As an independent external facilitator of the process, the author of this study conducted a series of expert surveys to enable customers, service technicians and management at the mill to provide data for defining problems and opportunity situations regarding customer service. Responses were obtained from 16 experts. Fragmentation of working time, information flow and working space were used as measures to uncover shortcomings within the existing process and potential areas for improvement, where combination of mobile and web technology served as an enabler. Data collecting process, covering the stages of feasibility and development through to preliminary experiment, took a period of one and a half years.

3.3 Dimensions of Work and Resulting Requirements

One of the motives for using collaboration systems is that CSCW is more effective and efficient than traditional forms of teamwork. A group of team members has more information and possesses more knowledge than any individual member alone. Therefore groups are better than individuals at understanding problems, in noticing errors; as a result, more alternatives are generated for problem solving. A key concept of Systems Theory [4] can be applied in the complex industry of fine-paper products: the effectiveness of group work in resolving complaints and the quality of the corrective actions suggested can be larger than the sum of what is produced by an independent individual. But incomplete access to information can hamper successful completion of the group work. The group process can be time-consuming, costly and might even jeopardize good customer relations without appropriate coordination to integrate participants' contribution in solving critical incidents. Co-location, temporality and contextuality are not mentioned in the literature as variables of groupness, but they are one of the most essential characteristics of individual work. If not taken seriously enough, these dimensions of individual work may constitute barriers to group collaboration.

Spatiality. The existing complaints handling process suffers from coordination difficulties when the process actors are working remotely. These people are located at different offices across the continent and use various technological artifacts to communicate. But not all the actors have the same intensity and scope of mobility. Technical managers at the paper-producing company are key decision-makers in solving complaint-related problems, but they are highly mobile and work at least twice a week away from desktop computers. Engineers, on the other hand, are involved in routine work on the mill premises, which is characterized as micro mobility. These people are most often overloaded with customer's questions, are heavily involved in the communication process and need a good visual interface when describing laboratory results to the customers. Effective customer response should be immediate. No matter how mobile and where the customers are, they expect to have problem solutions on-line (PC and/or mobile device) and in real time. Wireless has value for managers on the move, whereas high-resolution desktop computers are mandatory for engineers.

Temporality. Systems such as electronic mail or mobile phone calls may have several advantages; they are likely to be a burden in the complex group work activity of handling complaints. The above systems are very intrusive by their very nature, especially in communication-intensive environments when people have to work under the pressure of time. E-mail is an asynchronous medium, but imposes information overload with risk of being unable to keep track of how the handling of the complaint is progressing. Another problem is related to telephone calls. While it is an extremely flexible medium, producing lots of unstructured and codified information, it also requires the user to do a lot of work by manually retransmitting that semi-structured information to the relevant team member. Knowledge workers in the paper-manufacturing company spent 15-30% of their day searching for information and lose about 6 working hours altogether per complaint because of interruptions to their work. People often became frustrated because they were unable to get to things via a single access point, as necessary information was often spread across different actors and communicated via multiple devices. Electronic media may lead to new patterns of communication, encouraging people to collaborate at the point of need with certain team members, perceiving each other's actions instantly but asynchronously.

Fragmentation of information. In our study the notion of information fragmentation refers to what and how activity relevant information is communicated, shared and stored by the group members. Variety in the communication medium used makes the information flow process slow and inefficient (knowledge workers spend a lot of time on requesting and providing information manually, a lot of copy/paste work is involved). The system fails to integrate and structure the

incoming information from the customers and leaves it optional for the customers to enter. This also makes it more difficult to perform statistical analysis of annual complaints and identify the various problems associated with it.

We mentioned earlier that collaboration implies that the object of work should be common to the actors, i.e. by having access to a common artifact. In our case this means that information should be shared. This raises the question of what type of information and how it should be shared in order to support effective communication and shared understanding between actors. We believe that structured information, visible flow and sharing constitute a first underlying requirement here.

4. SYSTEM TO SUPPORT ACTIVITY-CENTERED COLLABORATION IN COMPLAINT HANDLING

4.1 Activity-Centered Collaboration

Malone [14] suggests that, in general, organizational technologies consist of production and coordination technologies that have implications for different processes. Complaints are regarded as service messages and clearly form part of management processes; they can therefore be enhanced by improved availability and communication of information. Work redesign can be based on the "object-oriented" modeling techniques discussed by Crowston et al. [5], where information flow can be streamlined by new technologies to provide necessary coordination among group members. In their recent study, Geyer and colleagues [10] introduced the notion of "object-centric sharing", where users collaborate in a lightweight manner, by aggregating and organizing different shared artifacts into larger collaborative activities with dynamic membership, hierarchical object relationships, and enable both real time and asynchronous communication. The "shared objects" paradigm of collaboration-aware content is very similar to Dourish's [8] notion of "placeless" documents, which define a set of people who are allowed to access the information, indicate who is currently looking at the content and allow broadcasting of data to members of the object. In our case, different actors involved in resolving the same complaint could use the data stored in one centralized data base and share a common virtual work environment accessible via different interfaces, rather than each having partial information or passing information among themselves. It is also argued that IT plays an important role in recent attempts to focus on core activities of reengineered business processes. The organization should be less centered on the process actors, and more on the activities they have to perform. The emergence of mobile communication technologies provides the relevant support for flexible forms of organization and temporal group work in producing a service. Systems for activity-centered collaboration which could also incorporate mobile technologies would appear to correspond and facilitate new forms of

customer service, offering the kind of support for all geographically dispersed group members.

4.2 Web-based System with Mobile Access

Nowadays the term IP technology convergence is quite popularly used. By this is meant a certain kind of fusion or close interaction of the Internet and mobile phone networks. This wireless access to the digital content of the Internet via mobile devices, including mobile phones, smart phones, PDA's, handheld computers (communicators) and portable PCs (laptops) is understood as the *mobile Internet*. From the convergence of Internet-based systems and mobile computing technologies, the term mobile Internet systems was derived, which is sometimes replaced by mobile web-based applications or M-commerce. Let us describe the architecture of the proposed complaints handling system with mobile functionality (see Figure 1). A web-based system is primarily built for a PC and GPRS-enabled smart phone, but is written with generic code and will in fact work on all html\xhtml-supporting devices.

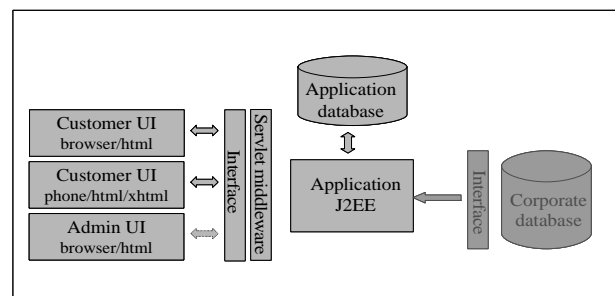


Figure 1. Architecture of the proposed system

Customer/Admin UI. The customer/administrator uses a web browser on a computer or a phone to access our system. The browser of a mobile device does not have to support xhtml, but it must support html. It means that we use html (html4-strict) instead of xhtml both for the PC and the phones. Since xhtml is easier to implement than html, it is usually the case that a smart phone browser that supports html also supports xhtml.

Servlet/interface. The interface between the browser and our system is based on servlet middleware or Java servlets and uses a template system, named "Velocity", to create the actual interface.

J2EE. The servlets use an abstraction layer that we have created and named "Knowledge Base", which accesses the J2EE-based core of the system. This is the application core, which is where all business logic is handled.

Application database. The application core stores all data in a database. All access to the database goes through an abstraction layer, which makes it possible to change the database to another brand without having to recompile the application.

The web-based complaints handling system can be accessed via a mobile device and the Internet accompanies its user everywhere, regardless of the type of device used. The system can work on any html/xhtml-supporting mobile device, but the Nokia 6600 was chosen for its reliability, faster navigation and cost efficiency compared with alternative smart phones. In a final product the web-interface and mobility feature should be integrated on top of the existing corporate ERP system.

4.3 New Communication Structures and Implications

The main users of the application will be key customers (resellers, purchasers, printing managers, plant manager) and paper-mill employees involved in the complaints process at the mills (engineer and manager of Technical Customer Service Center (TCS), director of TCS, logistics manager, production and operations managers, mill management and sales office personnel.

The main features of the proposed complaints handling system are traceability and structured information. Traceability will allow the user of the application to track the progress of complaints handling activities in real time, the ability to access and update the complaint file – a self-documenting and self-reporting common most important document within a system – via a PC or any other mobile device. When somebody is working on something with the complaint, the customer as well as other colleagues can see it. The principal value for the customer will be the transparency of the handling process, which is critical to them - the ability to track the complaint in real time and to have control over the process from the date the complaint was instigated.

Show all complaints
Show discussions (1)

Progress of complaint #000020004259 , summary

Time	Task	Status
16.6. 22:00	Complaint	Filed
16.6. 22:00	Samples	Received
16.6. 22:22	Technical statement	Made
16.6. 22:22	Studies	Completed
-	Final decision [Make]	Pending
-	Response	Pending

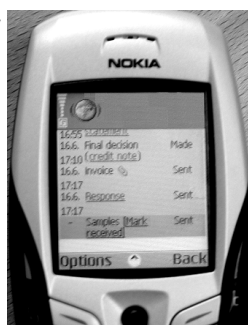


Figure 2. Traceability feature and system's visual outlook on PC and smart phone

Another important advantage of the web-based system is to have very structured initial information coming from customers. This also makes them think about the reasons before claiming and include additional info at the very beginning. A customer in an ideal case will create a complaint file at the very beginning of problem recognition, and should provide as much information as possible about the problem. The user will have the option of choosing a complaint type and filling in the required information fields, according to the reason for the complaint. In addition, we aim to ease the job of TCS at

the mill too. The system incorporates instantaneity and supports automatic notification; thus participants perceive each other's actions with no perceptible delay. Each group member is instantly notified by the system when a certain activity is finished or new questions arise. Depending on the work mobility, user may select whether he or she wants to receive e-mail notification or an SMS.

Usage scenarios. There are two scenarios for the modernized complaint system. In the best-scenario case, we have a direct link between a customer who files the complaint and the TCS (manager & engineer) at the mill. The second scenario is more applicable abroad only if language constraints do not allow the customer to send a complaint directly to the mill. In this case a sales office should register the complaint on the web during a phone call with the customer. A *password* will be required to log into the web-based system, so paper-mill employees working with complaints will know who the customer is. A *self-documenting and self-reporting* complaint file might include auto alerts in the form of an SMS or e-mail for actors performing at the end of the process, e.g. operations and productions managers, logistics managers, etc. At the end of the complaints handling process, the *auto summary* of the complaint file will generate a PDF file, and will allow the use of the well-structured information for various statistical analyses (beyond the current way of monitoring the success rate of complaint reply and closing time).

Referring to Figure 2, it is important to note, that the "visual outlook" on the smart-phones will be simplified, as usability of such mobile phones is limited and requires much more relevant and precise information than on a PC. We believe a smart phone serves merely as an additional tool and is not a replacement for a PC. It is meant to be used for information tracking, other checkups and decisions when a user cannot access the PC. Having the smart phone on hand, a user would simply be able to use the system when a PC is not an option. A PC/Laptop is also supposed to be the primary tool for customers filing complaints. However, they will also have the choice of making the best use of smart phones when checking the status of very urgent complaints.

5. CONCLUSIONS AND FURTHER RESEARCH

We have entered the field of research into what business currently needs and what consulting companies do not take seriously. In this paper we have described a mobile web-based collaborative system that we have designed and developed for managing complaints in the collaborative group-work environment of the fine-paper industry. The benefits - including stronger customer relationships, lower operating costs and better use of human resources - are available to any complex customer service activity that uses collaborative group work and seizes the initiative via an activity-centered collaborative system with mobile access.

First of all, collaborative customer service reduces costs while solving problems related to spatiality, temporality of working time and fragmentation of information. The math is simple. Just compare the cost of receiving and responding to several hundred phone calls and e-mails to the cost of sending a single, well-crafted message to a targeted audience. Secondly, a collaborative and always accessible system allows TCS to support more customers and resolve more complaints with existing staffing levels. With automated proactive service mechanisms carrying more of the burden, TCS no longer has to grow in proportion to demand. A well-structured and transparent way for handling routine issues also frees TSC staff to focus on more complex and/or urgent problems that truly warrant their personal attention and knowledge workers' skills. As a result, instant and transparent way of handling critical incidents is a key to a long-term customer relationship based on trust, customer empowerment and smooth service experience.

Despite the obvious positive effect of using an activity-centered collaborative system for handling complaints, various barriers do exist to its widespread adoption and use. The client of a new system is the worker at customer service and only indirectly the organization. A successful design is one that increases the group members' satisfaction and improves their attitudes towards work. The major barrier to introducing a state-of-the-art technology in an organization is the learning effort required: this is why we need "usable" systems and devices. On the other hand, people are likely to learn how to use new technology if they find it useful. Our future studies will focus on evaluating the usability of the working prototype in field experiments, depending on the type of devices adopted by different team members. This form of evaluation is needed to develop the system further and to make sure it is usable and easy to use.

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