TeamEnabler: Towards ad hoc mCRM

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Abstract. Mobile computing technology has reached a level that makes a seamless integration of communications and data processing in m-Business applications possible. The ”connected economy” challenges organizations to reconsider their business models.
The momentum of the changes can be well-studied in the financial sector where globalization, customisation of expertise and its consideration as ”intellectual assets” are taking place all together. This enables new forms of mobile Customer Relationship Management (mCRM) that covers the whole value chain and offers new working modes: formation of geographically dispersed teams of experts for spontaneous feedback and back office work.
In this paper, we have approached the problem of supporting mCRM in a business domain requiring dynamic teams of heterogeneous experts. We explain how mCRM can offer ad hoc collaboration spaces to solve complex problems. We consider the concept of the ”Family Office” used in the context of finance as the business model for CRM-support. We propose a CSCW (Computer Supported Collaborative Work) environment called TeamEnabler which is able to form teams and to support team work in the scenario of the ”Family Office”.

1 INTRODUCTION

Customer Relationship Management (CRM) concerns the life cycle of customer relations. It deals with questions related to the optimisation of channels, the improvement of customer acquisition, customer retention, after-sale contracts and services. Generally, CRM is a cyclic process consisting of five phases which are (1) collaboration phase (defined as point of repeated contact), (2) information phase, (3) negotiation phase, (4) transaction phase and (5) partnership phase [Steimer and Spinner, 2001].

Information and Communication Technology (ICT) increases considerably the number of communication channels, intermediaries and customer interactions in the contexts of CRM. At the same time, CRM is confronted with new challenges concerning aspects of Collaborative Computing that lead to the progressive emergence of mCRM (mobile CRM). Here, the main goal is the improvement of coordination for the execution of complex business CRM tasks with the support of mobile computing.

This investigation focuses on supporting mCRM by providing a mobile application that enables ad hoc formation of experts and serves as the mobile workspace for heterogeneous teams. In this paper, we propose the concept of the ”Family Office” for

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mCRM as the business model to support: Centered on a single contact person, called the client advisor, further experts join an advisory team in order to manage optimally and efficiently a complex financial portfolio. The system supporting this business scenario is called TeamEnabler. Before introducing the TeamEnabler system, let us develop advanced understandings for the ”Family Office” as a business model.

2 THE FAMILY OFFICE FOR AD HOC MCRM

Suppose *SAM & associates systems, Inc.*, an organization of experts, is member of a worldwide heterogeneous network of financial consultants. Michael M., employee of this company, is expert on insurance questions. The consultant is now in conference with a customer. Because of the complexity of the problem and the need of advanced expert knowledge in different domains, Michael M. has decided to connect to the headquarter in order to have support in some fields. In this case, the later have to form a team of experts that will assist him. Given that Michael M. is equipped with a mobile device, he would interact directly with the team. For this purpose, an environment for Computer Supported Collaborative Work (CSCW) is required. It should allow the creation of a (1) shared workspace, provide (2) assistance for the team formation process, support the (3) management of the content (documentation of information produced and used) and enable (4) community support for synchronous and asynchronous collaboration processes. These requirements encompass (1) structured support of the team formation, (2) semi-structured support of content management and (3) weakly structured support of the collaboration activities. Given that experts solving the problem are geographically dispersed, mobile technologies should be incorporated. This leads particularly to scenarios for knowledge intense services that require seamless and spontaneous use of organization’s expertise.

With TeamEnabler, we want to provide an environment that is able to support the formation and collaboration of such teams, i.e. team of experts formed in an ad hoc way to solve information-driven problems in a short time. We call this use case the ”Family Office”. The ”Family Office” is a system the inputs of which are customer information needs that are transformed into knowledge (contextual information as solution of an information specific problem). The business process consists of the following 5 steps.

Request for support. When a personal client advisor, called agent, acting for a company discovers a problem, he/she defines a request that is sent to the headquarter. The request consists of the description of the problem, the partial definition of requirements that experts who are going to solve the problem should satisfy and deadlines.

Workspace initialisation. The responsible for the request initiates the creation of a team-space. Here, the responsible has to specify the requirements by (1) defining roles that the future team members have to play and (2) the requirements that the profiles of the candidates should satisfy in order to be eligible for a given role. Furthermore, he/she has to provide a detailed description of the problem, to develop a partial team schedule and to assign rights and permissions to the roles.

Team building. Based on the roles, schedule and specifications defined in the previous step, the real formation is made automatically by the system. In fact, the identifi-

cation and the invitation of experts will be supported by a computer-assisted constraint based approach to team formation operating in expert profiles.

Scheduling. Team timer (task coordinator): While collaborating in the team-space, the elected members defined strategic tasks, operative tasks, detailed schedule and milestone for both, the whole team and single members.

Working. Members work in the team as well as individually in order to produce results which are listed in the team-space. A team-space or individual workspace of team members consists of a team view with the strategic goals and a personalized view of the tasks, schedule, deadlines and deliverables. Currently, in the TeamEnabler environment, tasks are simply listed. A future extension would be to provide each task with a context which relates tasks to the overall goals within a team-space, events and activities.

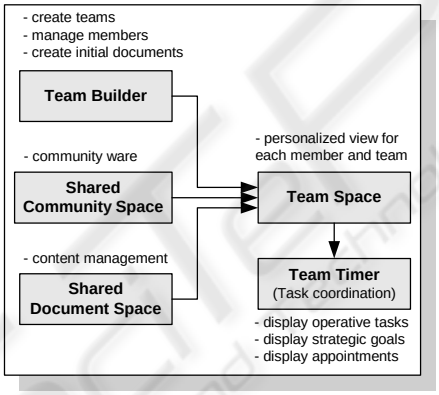

Fig. 1. Modules of TeamEnabler.

The infrastructure supporting the ”Family Office” consists of the following basic modules outlined in Figure 1, illustrating the subsystems and their interrelations.

Shared Document-Space. A (Content Management System) CMS for the semi-structured management of documents produced and used by the teams; e.g. offers, insurance contract and strategies.

Shared Community-Space. Multi-channel communication space for team collaboration. Similar to chat-based systems, messages exchanged in the team-space share a communication context. This context manages (1) the bundling of all messages related to a given task, (2) events notified to experts and (3) references from the CMS to the Community-Space and vice versa.

Team Timer. Definition and presentation of tasks and appointments, e.g. shared calendar, list of tasks etc.

Team Builder. Management of a Team-Space. Within this module, the team manager, defines roles, access rules, requirement specification of the project and a partial team schedule.

The workspace is active until the team terminates its activities. The results, mainly produced documents, are handed over to the requester, in form of hyper-links to the shared document space of the CMS. The life-cycle of a the team will be characterized by two kinds of membership: experts executing management tasks like definition, planning and coordination of activities and those who are invited in a ad hoc way to solve specific problems. The membership of the first class of experts is fixed while for the second one, it is rotating on and off according to tasks requirements.

3 INFRASTRUCTURE AND ARCHITECTURE

3.1 Enabling technologies and applications

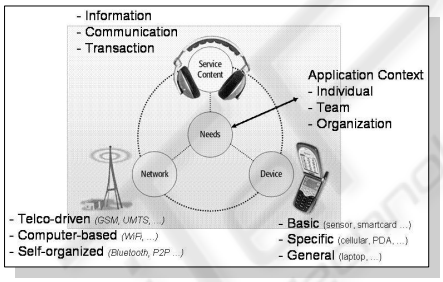

Fig. 2. Business Needs.

With the emergence of new and less expensive Internet-compliant hardware and software products targeting on mobile computing, one can expect that m-business scenarios rapidly gain importance. In the specific case of mCRM the emergence concerns the following four basic interdependent aspects, illustrated in figure 2.

Content. The content, in the context of the ”Family Office” or ”Intellectual Assets”, is understood as tangible knowledge like an insurance policy proposal, a client profile or the contact and schedule information for experts. The ”Intellectual Assets” exists in form of documents, messages or transactional information like the support of the team-formation process and general support of workflow processes. Concerning the dimensions ”Information” and ”Communication”, TeamEnabler is based on textual and graphic information. In the future, multi-modal contents such as voice and video streams will be available for mCRM-scenarios both, for the knowledge bases and for the collaboration itself.

Network Devices. Organizations experience the large-scale use of handheld and wireless devices in business. Predictions [Wireless-Foresight, 2002] support that the diffusion curve for m-Computing is similar to the one of laptops and the internet into the workplace.

Needs. Consideration of the application context for ”Individual, Group and Organization”. Application scenarios supporting the notion of ”Intellectual Asset Manage-

ment" will be based on the seamless transition between individual work and group activities, both tapping the resources and expertise of the entire organization as required.

Figure 2 shows the dimension "Network" as the 3^{rd} dimension that affects future application contexts. The spectrum of these technologies is enriched from the traditional Telco-driven [1] infrastructures towards computer-based and self-organized infrastructures. In addition to cellular networks like GSM [2], GPRS [3], EDGE [4] , UMTS [5] and various emerging technologies [Malladi and Agrawal, 2002], there are several other overlapping wireless technologies like Bluetooth and WLAN [6], which can be used in an integrated way for mCRM.

Given the importance of seamlessness for the mCRM scenario supported by TeamEnabler, the system should support cellular networks and other wireless technologies like Bluetooth and WLAN. Based on this brief outline of the technology contexts of TeamEnabler, the functional components of the layered architecture are explained subsequently.

3.2 TeamEnabler: Architecture

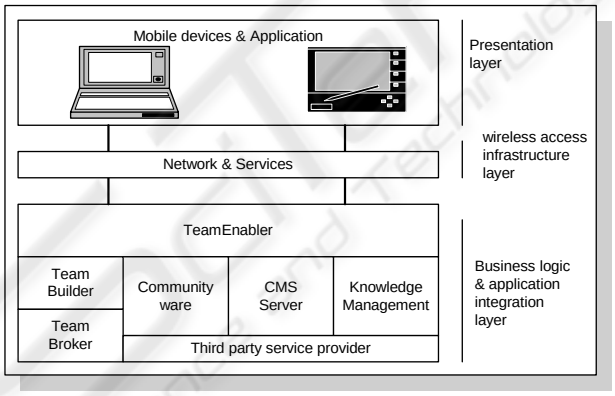

Fig. 3. TeamEnabler Architecture.

The architecture of TeamEnabler is outlined in Figure 3. It is organised into a presentation layer, a wireless access infrastructure layer and a business logic and application integration layer. The core system consists of the modules described in section 2 (figure 1). TeamEnabler implements a CMS and collaboration framework using the Zope [Zope, 2004] application server and the CMF/Plone portal [Plone, 2004].

[1] Telcos: Telecommunication Companies
[2] GM: Global System for Mobile Communications
[3] GPRS: General Packet Radio Service
[4] EDGE: Enhanced Data Rates for GSM Evolution
[5] Universal Mobile Telecommunications System
[6] WLAN: Wireless LAN

Zope is an open source application and Web server based on the programming language Python. It offers a CMS-framework for the efficient creation of dynamic web applications. Interacting with the Appache Webserver, Zope supports database access, LDAP-access and others open standards like XML-RPC.

Plone, a portal solution, used for the presentation layer, offers a complete CMS solution. Like Twiki, Plone supports seamlessness offering user management and database features of Zope. The content Management Framework adds services to Zope in order to enable community or organization based content management. Plone-Chat is used to develop the Community-Ware; i.e. the bundling of communication in the team space. Particularly, the seamlessness between information provision, information access and information modification of Plone fit well into the concept of TeamEnabler. However, TWiki offers some support for user management including access permissions, which is needed for the ”Family Office”.

The identification and the formation of teams into a work space is realized in the TeamBuilder module.
This module has an extension, called TeamBroker [Karduck and Sienou, 2004], that matches the requirements specification of the team with profiles of potential members of the future team. TeamBroker is described subsequently.

4 FINDING EXPERTS

The team formed in order to provide expertise in the business model of the ”Family Office” is a virtual one. Basically, virtual teams are networks of people bound by a common purpose, who work across organizational and temporal boundaries in a collaborative environment supported by information technologies [Lipnack and Stamps, 2000] like CSCW systems.

Team formation is the process of identifying and the selecting candidates for each activity of the project in question. Here, the selection of candidates is based on (1) economical factors like cost, (2) organisational factors like availability and (3) intellectual factors like competencies and interests. Subsequent to the identification and the conceptualisation of factors affecting the formation process, we have considered the following model to support the formation of teams: the business case is subdivided into tasks able to be carried out by single experts. A task, in order to be performed, requires a set of competencies and interests. Experts are entities with interests and competencies who are looking for positions. Team brokerage consists of finding experts for a task so that the positions, the competencies and the interests match. In this model, the team initiator defines tasks and requirements while experts provide information concerning their interests, their competencies and the positions in which they are interested.

Since multiple experts may apply to a given task, based on multiple criteria decision making, we have conceptualised factors affecting the formation of teams by defining models and metrics able to evaluate experts and teams. The metrics process the performance value of a team as an aggregate value of the criteria that really matter during the formation stage of teams. Based on the conceptualisation of performance values and the formalization of constraints imposed by the project that a team has to carry out,

we have transformed the problem of forming teams into a single resource allocation problem that has been solved by extending the iterated hill-climbing search strategy.

The TeamBroker system has been realized as a distributed system consisting of Java RMI (Remote Method Invocation) [Sun Microsystems, 1999] servers.

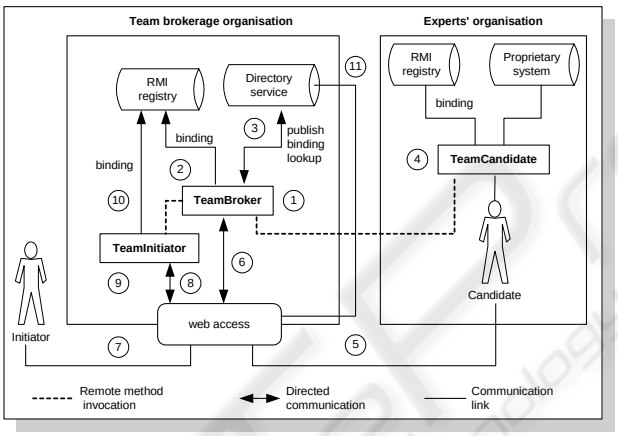

Fig. 4. Architecture of TeamBroker.

Figure 4 is the architecture of a technical environment supporting team formation. The business of the team brokerage organization consists in forming teams of experts that fulfil requirements defined by initiators. It runs TeamBroker RMI servers (1). Services provided by TeamBroker are published in a directory server (3). Using this information, experts identify and select (5) the suitable TeamBroker to which they send requests for registration. Upon reception of these requests, TeamBroker stores the reference of the server into its directory (3) by using the RMI registry service provider for JNDI [Sun Microsystems, 1999].

Experts' organizations are networks of experts looking for positions in virtual teams. Each of them runs a TeamCandidate (4) server, which is extensible to wrappers able to convert profiles described in proprietary formats into the one used in TeamBroker.

The initiator is an organization asking for virtual teams. It is responsible for the specification of requirements that the team should fulfils. Initiators access the brokerage system by using a web-interface (7,8,9). TeamInitiator is a RMI server that represents a human initiator. For each initiator requesting a registration, the system starts a TeamInitiator (9), which is bound (10) to the naming service of the broker.

The actual team formation is an interaction between TeamBroker, TeamCandidate and TeamInitiator. The formation protocol starts when an initiator request the broker to find a team. The team formation protocol is a set of communication messages shared by TeamBroker, TeamInitiator and TeamCandidate. As outlined in figure 5, it consists of the following steps:

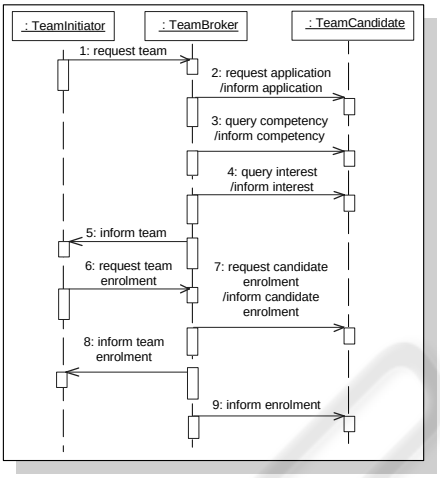

Fig. 5. Team formation protocol.

Request team (1). The TeamInitiator requests the TeamBroker to form teams which fulfils requirements defined in the content of the message. The message contains the list of required positions, schedule, constraints, skills, experiences, interests and budgets.

Request application/Inform application (2). The TeamBroker identifies all potentially interested experts by searching in the directory. In a next step, it requests TeamCandidate to explicitly apply to the position within a deadline. The message addressed to the experts contains information concerning the position and the schedule. Instances of TeamCandidate answer by sending an application message. This message contains the state of the application, the hourly wage and the level of commitment of the expert. The state of the application is either ”accepted” or ”rejected”. If the state is ”accepted” TeamBroker continues the formation process with the TeamCandidate. Otherwise, this one is no longer considered as a candidate.

Query competency (3)/Query interest (4). During this process, TeamBroker communicates with instances of TeamCandidate having accepted the application by sending an ”inform application” message qualified ”accepted”. TeamBroker queries instances of interested TeamCandidate for level of competencies and experiences. The responses are ”inform competency” and ”inform interest” respectively.

Inform team (5). At this stage of the formation protocol, TeamBroker has collected all information necessary to form teams. The result (teams and performances) is sent to the TeamInitator.

Request team enrolment (6)/Inform team enrolment (8). TeamInitiator selects the best team and requests TeamBroker to enroll it.

Request candidate enrolment (7)/Inform candidate enrolment (9). TeamBroker requests single experts to confirm the enrolment. When an instance of TeamCandidate receives this message, the expert represented by this instance should decide whether to join the team or not. If all members agree in the enrolment, the team is definitively

formed and all entities (initiator and candidates) are informed about the success. Otherwise, a fail message is broadcasted (9).

In TeamBroker, we have emphasized on the formation of virtual teams of humans by defining the problem as an optimal resource allocation. We have adopted a brokerage approach consisting of mediating between experts and the team requestor.

5 RELATED WORK

Parlano [Parlano, 2004] is a commercial enterprise collaboration environment, that closely matches to the concept of the Community and Content Management features of TeamEnabler. Initially, it has been focused on instant messaging between traders, including filter mechanisms, persistence, alerts and icon menus for the organization of workspaces. It's work-space consists of a message exchange space (task oriented community) and content management space. Similar to TeamEnabler, here the bundling of message exchanges constitutes an additional communication channel e.g. to simple Email-systems.

TeamEnabler enhances the model of Parlano with the concept of the "Family Office". This concept, derived from Finance, supports the formation process of a team of experts, based primarily on the expertise required to solve a task. The ad hoc formation of a team is supported by inviting experts into the work-space or by automating the process through the TeamBroker-mechanisms. Referring to mCRM, in contrast to existing systems, TeamEnabler supports experts working directly with a customer. Supporting the whole lifecycle of CRM by integrating seamlessly team formation, cooperation and advise oriented processes is, as far as the authors know, a novice business case for CRM systems.

6 CONCLUSION

The work on CSCW-support for the "Family Office" concept will be extended according to the *"3C Collaboration Model (Communication, Coordination, Cooperation)"* [Fuks and de Lucena; C. J., 2004]. Especially coordination will be investigated in two aspects: *awareness* of the team members concerning the individual activities and *commitment* in terms of the delegation of individual responsibilities. Advanced investigations are necessary in order to integrate these aspects in the business case. This should enable dynamic and continuous activities of coordination during experts' cooperation.

Technically, we plan to extend the current TeamEnabler by enabling interactions with a directory service. Within the directory server, organizational structures and responsibilities will be managed in standardized infrastructures.

In the context of TeamBroker, we have (1) conceptualized factors and performance values affecting the formation of teams, (2) formalized constraints imposed by the project that a team has to carry out, (3) transformed the problem of forming teams into a resource allocation problem and (4) solved it by using methods of constraints programming. We plan an higher integration of TeamBroker into the TeamEnabler environment by adopting a service oriented architecture.

The current version of TeamEnabler supports reduced spectrums of the ”Family Office”: it offers a simple collaboration environment. In future work, we intend to track information of the team space ”for ever” by providing an environment the content of which evolves with the customer lifecycle. That means, old team spaces are not going to be deleted; they should rather be considered for future consulting sessions of the same customer (even if the consulting teams differ). By the same way, the result of team work should flow into the profiles of the experts in order to facilitate automatic selection of experts. It should be therefore possible to update experts profile while working in the team space and to develop a dynamic history of customer's lifecycle. The new features will lead us to position mCRM within the context of Knowledge Management. Instead of Knowledge Management, we will use the term of ”Intellectual Asset Management”, borrowed from the financial domain. In Finance, Asset Management is the key activity for managing a financial portfolio according to the defined risk profiles and targets of a client. In the long perspective, we try to apply gradually this approach for collaborative work support.

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