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# Intellectual Asset Management for Collaborative Business Support

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## Abstract

*Globalization, customer-specific bundling of expertise and the consideration of expertise as “intellectual assets” are taking place in the financial sector all together. This enables new forms of mobile workspaces, which cover the whole value chain from the formation of a service team within an organization, the generation of information to solve problems and the seamless support for the expert in the field.*

*Focusing on how to support the selection of experts for collaborative work, we have adopted the concept of Intellectual Asset Management (IAM) and developed the collaborative business support system TeamEnabler, which incorporates the formation of optimal teams.*

*TeamEnabler is based on the use case of the “Family Office”, used in the context of Finance as the business model for advice intensive services. The concepts and architecture of TeamEnabler are explained with respect to the support of mobile Customer Relationship Management (mCRM) as a generalizable approach for team work support in the context of eBusiness-scenarios.*

**Keywords:** Team Formation, Intellectual Access Management, Collaborative Systems.

## 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, (2) information phase, (3) negotiation phase, (4) transaction phase and (5) partnership phase (Steimer, 2001).

Information and Communication Technology (ICT) increases considerably the number of communication channels, intermediaries and customer interactions in 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 mobile CRM (mCRM). Here, the main goal is the improvement of coordination for the execution of business CRM tasks, combined with the utilization of mobile computing. Our research objective is on the support of this kind of business case: supporting mCRM by providing a mobile application that enables ad hoc formation of experts and serves as mobile workspace for heterogeneous teams. In this paper, we present the concept of the “Family Office” for mCRM as the business model to support our objective: Centered on a single contact person, called the client advisor, further

experts (e.g. legal advisors, art expert etc.) join an advisory team in order to manage optimally and efficiently a complex financial portfolio.

Our work on collaborative business support is conceptually related to the “3C Collaboration Model” (Communication, Coordination, Cooperation) as devised by Fuks (Fuks et al., 2004), and with knowledge persistency (Lichtenstein, Swatman, 2003) in the context of Intellectual Asset Management (IAM) in Finance. Concerning the formation of a team of experts, the approach is transformed into a problem of constraint based optimal resource allocation. Team formation is thus seen as a process, that deals with the process of finding the right experts for a given task and allocating the set of experts that best fulfils team requirements (Petersen and Divitini, 2002; Petersen and Gruninger, 2000).

Thus, the concept of collaborative business in the context of our objective, as defined earlier, is tailored to environments, which particularly support team collaboration (e.g. between a client advised, the back-office of an organization, and the client itself) and the use of IAM for e-Business scenarios. Here, added value by collaborative systems support can especially derive from the ad-hoc (spontaneous) consulting of the required experts, the bundling of team activities by shared workspaces, and finally from the capturing of the work results. This requires, that the expert profiles are available to a mediator/broker, that the work in progress can be shared, and that the results are added to a knowledge, respectively intellectual asset pool for subsequent use. In terms of Finance, these explicit descriptions of profiles and work results constitute assets, respectively the tacit knowledge of an organization. “Intellectual Asset Management” transfers the concept from Finance, where assets are deployed/managed within a financial portfolio according to defined targets. Based on Modern Portfolio Theory (Fabozzi and Markowitz 2003), this reduces the risk exposure and thus increases results. Applying the notion of IAM and team formation for TeamEnabler, this approach enhances the level of trustworthiness in collaborative business environments by the allocation of the best set of experts for a specific task. Our work on TeamEnabler, with the team formation module TeamBroker, offers support by deploying (1) a Community-Ware and Content-Management for shared workspace support and the capturing of Intellectual Assets and (2) a brokerage approach for the ad-hoc formation teams.

The Family Office is based on the concept, that a group of people demands for a complex advice. This might concern for example financial, legal, or real estate advice. In this scenario, one advisor will be responsible for the overall contact with the family, for specifying their requirements, and for tapping the organizational expertise. This aim of this is the offering of a consolidated proposal for the client. In order to do this, the advisor has to pull the required experts into an advice team. This advice team might work internally within the organization, such as a bank or an insurance company, or form a virtual team across formal organizational boundaries. The consolidated proposal is subsequently explained to the family by the advisor. This business model is adopted for TeamEnabler in the context of mCRM. The concept of IAM for collaborative business support relates directly to the adoption of new technologies and services in advise intense market, where content/product and infrastructures use are closely related.

## **2. The Family Office for ad hoc mCRM**

Let us suppose, *SAM & Associates Systems Inc.* is an organization of experts, which is a member of a worldwide heterogeneous network of financial consultants. Suppose Michael M., employee of this company, is an expert on insurance questions. Michael M. is now in conference with a customer in order to process questions concerning the advice services. The problem requires different expertises. Because of the complexity of the questions and the need for advanced expert knowledge in different domains, Michael M. has decided to connect to the headquarter in order to have support in specific fields. For this purpose, in the headquarter a team of experts has to be formed that will assist him. Given that Michael M. is equipped with a mobile device, he would interact directly with the team in order to solve the problems.

### ***2.1 Team Formation within Collaborative Business***

For the above business scenario, a collaborative business environment is required for several support dimensions. It should allow the creation of a shared workspace, provide assistance for the team formation processes, provide content management support for the problem solving and documentation processes, and enable community support for synchronous and asynchronous collaboration processes. Assistance dimensions encompass three kinds of activities: structured support for the team formation activities, semi-structured support for the content management activities, and weakly structured support for the collaboration activities. In order to include team members in a problem solving process independent of their location, mobile technologies have to be incorporated. This leads particularly to new scenarios for knowledge intense services, where seamless and spontaneous use of knowledge/intellectual assets and experts from the back-office of an organization are required.

With TeamEnabler, we aim to provide an environment that supports the formation of such teams, i.e. team of experts formed in ad hoc ways to solve information-driven problems in a short time. The system is also a workspace for this kind of teams. We call this support the “Family Office”.

### ***2.2 Phases in the “Family Office” Business Process***

The “Family Office” is a system, the inputs of which are customer information needs that are transformed into knowledge (contextual information as the solution of an information specific problem). The underlying business process consists of the following 5 steps:

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

**Workspace initialisation:** The responsible person for the request initiates the creation of a team-space. Here, the responsible has to further 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 the team. 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 identification and the invitation of experts will be supported by a computer-assisted constraint based approach to team formation, which is operating in expert profiles.

**Scheduling:** Team timer (task coordinator): While collaborating in the team-space, the elected members of the new team define 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 of this listing of tasks will be to provide each task with a context. Context information relates tasks to the overall goals within a team-space, events and activities required.

### ***2.3 Modules of TeamEnabler***

The team-space, or the workspace, of a team is the basic system for the “Family Office”. It consists of the following basic modules outlined in Figure 1, illustrating the main subsystems and their interrelations:

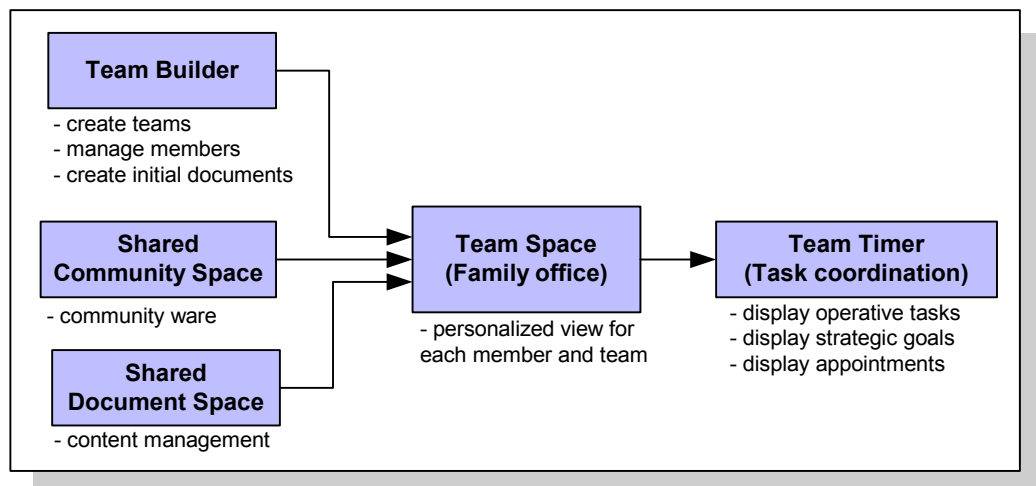
**Shared Document Space:** CMS-space (Content Management System) for the management of content in teams, e.g. the draft of an insurance contract.

**Shared Community Space:** Multi-channel communication space for team interactions during the work on a task. Similar to a chat-based system, 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) event notifications to experts, and (3) references from the Shared Document Space to the Community-Space and vice versa.

**Team Timer:** Definition and presentation of tasks (team and individual) and appointments, e.g. shared calendar and task/responsibility lists.

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

The shared workspace is active until the team terminates the requested task. 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 “Family Office” is dissolved as soon as the task is completed. “Intellectual Assets” are understood in the context of TeamEnabler as tangible knowledge, such as an insurance policy proposal for a client, a client profile, or the expertise, contact and schedule information for experts.



**Figure 1:** Modules of TeamEnabler

### 3. Infrastructure Context and Architecture of TeamEnabler

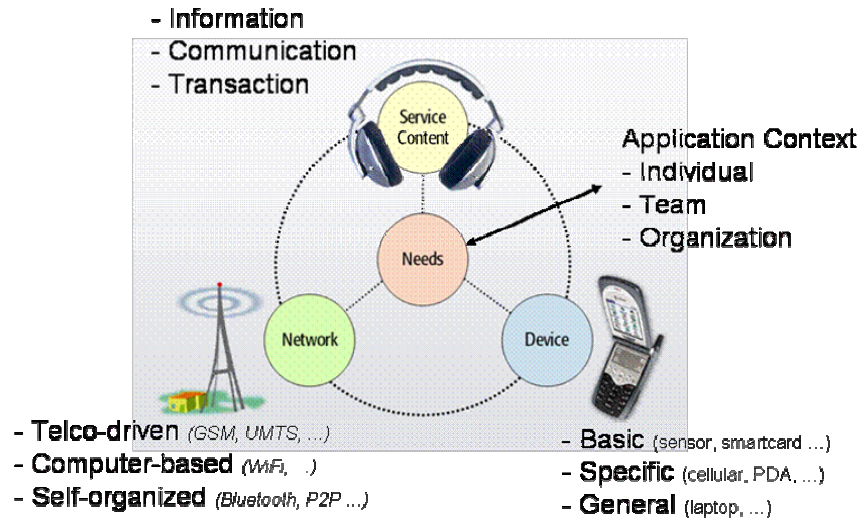
#### 3.1 Enabling Technologies and Application Context

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 “Intellectual Assets” in form of documents, messages and transactional information, such as of team-formation process support and general workflow-support. 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.

**Devices:** Since last year, organizations experience the large-scale use of handheld and wireless devices in business. Predictions made in (Wireless Foresight, 2002) support, that the diffusion curve for m-Computing is similar to the one of laptops and the Internet into the workplace. Predictions are based on the assumption that the costs of wireless communications and the appliances will be affordable in the same way as the Internet itself. In addition to technology and operational challenges, CRM is also a management challenge, that can be faced mainly with the support of ICT.

**Need:** Consideration of the application context for “Individual, Group and Organization”. Application scenarios supporting the notion of “Intellectual Asset Management” 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.

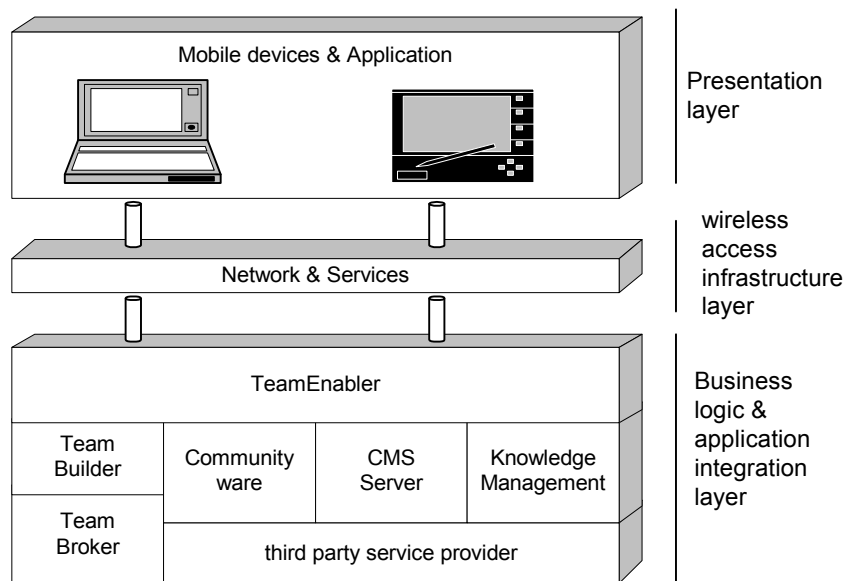


**Figure 2:** Business Needs in the dimensions Content, Infrastructure and Appliances

Figure 2 shows the dimension “Network” as the 3<sup>rd</sup> dimension that affects future application contexts. The spectrum of these technologies is enriched from the traditional Telco-driven infrastructures towards computer-based and self-organized infrastructures, as summarized in the following. General mobile business scenarios depend on network technologies, services technologies and applications like message systems. In addition to cellular networks like GSM (Global System for Mobile Communications), GPRS (General Packet Radio Service), EDGE (Enhanced Data Rates for GSM Evolution), UMTS (Universal Mobile Telecommunications System) and varied emerging technologies (Maladi, Agrawal, 2002), there are several other overlapping wireless technologies like Bluetooth and WLAN (Wireless LAN) which can be soon used in an integrated way for the mCRM scenario supported by TeamEnabler. In this paper, network-related issues are not elaborated any further. Based on this brief outline of the technology dimensions for TeamEnabler, the functional components of the layered architecture are explained subsequently.

### 3.2 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 application server and the CMF/Plone portal.



**Figure 3: TeamEnabler Architecture**

Plone, a portal solution, offers a complete CMS solution. Like Twiki, Plone supports seamlessness with regard to information provision, integrating the 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 for realizing 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.

The identification and the formation of teams into a work-space is realized in the TeamBuilder module. This module has an extension, called TeamBroker, that enables the constraint based brokerage of virtual teams like the one working in the “Family Office”. The TeamBroker component matches the requirement specification for a team with profiles of potential members of the future team.

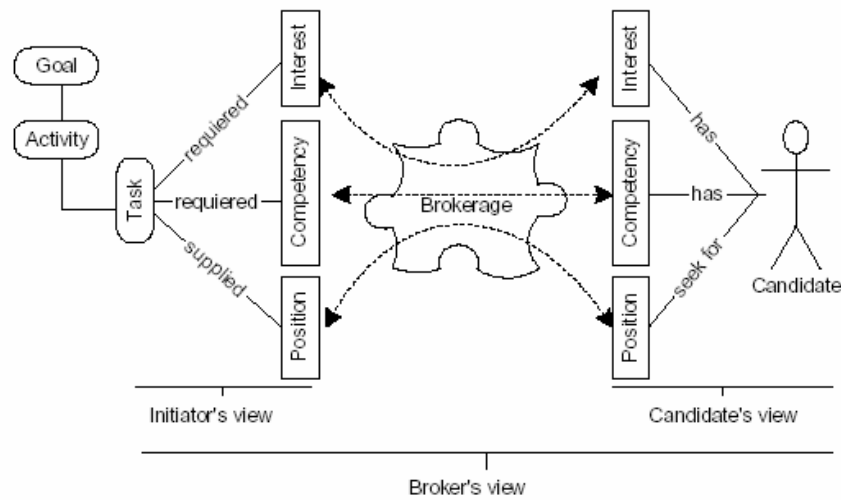
#### **4. Finding Experts with TeamBroker**

As supported in to the group development theory (Tuckman and Jensen, 1977), a team goes through the phases forming, storming, norming, performing and adjourning to get performed while producing results. During the “forming” step, members are brought together for the first time for a particular task.

##### **4.1 A Model for Team Formation**

We define team formation as the process anterior to the forming stage of the group development theory. It consists of the identification and the selection of applicants for positions in a given project. Consider the illustration of figure 4: In order to carry out a project, it is subdivided into tasks able to be executed by single experts.





**Figure 4:** A model for team formation

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 the right experts for a task. Allocating a set of resources (experts) to the set of tasks, defined in the context of a project, is therefore a Resource Allocation Problem.

The decision to select a candidate is based on how well his/her profile fulfils the requirement specification. This supposes the existence of criteria to be considered while analysing the profiles. Since the focus is on the formation phase, factors essential to start the “forming stage” of team development are those that really matter. In the literature, some factors have been empirically evaluated or applied to other teams (Anderson 1996) (Deborah and Nancy, 1999) (Lipnack and Stamps, 2000) (Tuckman and Jensen 1977) (Schutz, 1955). In previous investigations, the following factors which are considered to be the most critical one have been formalized in order to meet requirements for the formation of the optimal team (Karduck and Sienou, 2004):

Factors	Description
Interest	What the members desire
Competencies	Skills and experiences of members
Risk	The risk of having a member
Availability	When members are available
Commitment	Deliberate attachment to the team
Budget	Amount available for the project
Project constraints	Cost constraints

**Table 1:** Factors affecting team formation

The identification and the selection of candidates is therefore based on economical factors like cost, organisational factors like availability, and intellectual factors like competencies and interests. Since multiple experts may apply for a given task, based on multiple criteria decision theory, 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



formation protocol, which is a set of communication messages shared by TeamBroker, TeamInitiator and TeamCandidate.

#### ***4.3 Toward a Protocol for Team Formation***

The protocol shared by the broker, the candidates and the initiator, outlined in figure 6, consists of the following six steps:

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

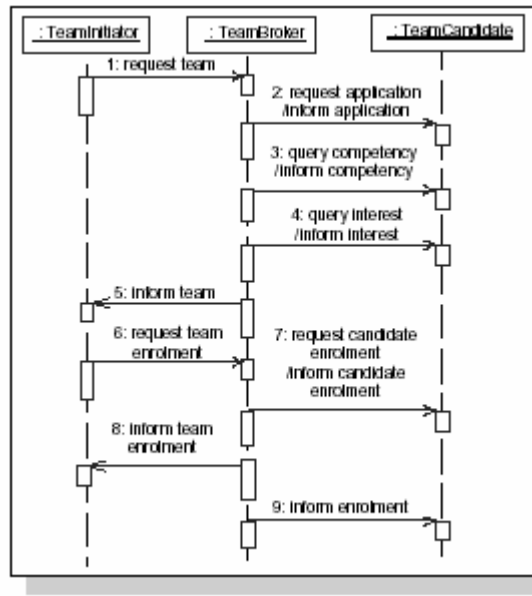
**Request application / Inform application (2):** The TeamBroker identifies all potentially interested experts by searching in the directory. In a next step, it requests TeamCandidate to explicitly apply to the position within a deadline. The message addressed to the experts contains information concerning 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 a "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 TeamInitiator.

**Request team enrolment (6) / Inform team enrolment (8):** TeamInitiator selects the best team and requests TeamBroker to enrol 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).



**Figure 6:** Team formation protocol

In TeamBroker, we have emphasized 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 team requestor. Here, the formation process is a behaviour of a configurable mediator called broker, which is able to use multiple taxonomies of knowledge description and different metrics to appraise candidates and form teams for the requestor.

## 5. Related Work

Regarding the Community and Content management features, Parlano (Parlano, 2004), a commercial enterprise collaboration environment, is similar to TeamEnabler. Derived from research in the area of CSCW-support (Computer Supported Collaborative Work) for trading floors in Finance, it has initially focused on instant messaging between traders.

TeamEnabler enhances the concepts underlying Parlano by considering the business model of the “Family Office” for collaborative business. This concept, derived from Finance, supports the formation process of a team of experts, based primarily on the expertise required to solve a task. It also provides a collaborative workspace for experts bound by a common goal.

This degree of life-cycle support throughout an advise oriented process is also missing in CRM systems like Vignette (Vignette, 2004). Vignette V7, a system that manage customer relationships throughout the user’s lifetime, consists of a content management system and delivers a combination of profiling, personalization and reporting services to create a work context for the user. Nevertheless, none of the known mCRM systems support the concept of the seamless team formation and cooperation approach as proposed by the “Family Office”.

Concerning the team formation support, works related to our project are the ones from (Rub and Vierke, 1998) and (Petersen and Divitini, 2002; Petersen and Gruninger, 2000). In contrast to the first concept, which supports the configuration of virtual enterprises, we have emphasized the formation of virtual teams of humans. Both concepts share the aspects of optimal resource allocation.

## 6. Conclusion and Outlook

The work on collaborative business support for the “Family Office” concept will be further extended according to the “3C Collaboration Model” (Communication, Coordination, Cooperation) as devised by Fuks (Fuks et al., 2004). Especially the aspect of 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. We plan to add additional features to the “Family Office” concept with respect to “awareness” and “commitment” as already deployed in the TeamBroker module.

In the current version, TeamEnabler has been limited to a reduced spectrum of the “Family Office”: it offers a collaborative business environment, which is dissolved when the team is adjourned. In future work, we intend to track information of the team space “forever” by providing an environment, the content of which evolves with the customer lifecycle. This means, that old team spaces are not going to be deleted, but 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 be possible to update experts profile while working in the team space and to develop a dynamic history of customer’s lifecycle.

The model of the “Family Office” will be deepened in the future with respect to risk/result-correlations as applied in Modern Portfolio Theory in Finance (Fabozzi and Markowitz, 2002). We expect, that transferring these concepts will lead to new perspectives for requirement analysis, project management in general, and team formation in particular.

Over all, the adoption of the concept of IAM for collaborative business support is expected to lead to significantly enhanced business productivity in advise intensive markets such as Finance.

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