

# Reflections on Future Collaborative Work(ing) Environments - CWEs

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**Abstract:** The delayed delivery of the AIRBUS A380© demonstrates the challenges to be faced in the field of cross-company collaboration today. On the one hand, available CWE platforms are used insufficiently. On the other hand, they do not yet support collaboration in a completely adequate way. This paper illustrates the current state of CWE practice by way of a sample company, its internal and external collaboration processes and the services used. Improvements provided by major vendors in the domain of commercial CWE platforms and the current techniques of Web-2.0 are analysed with regard to the concept of context-based communities that ought to be applied within any CWE efforts according to this paper.

## 1 Introduction

Global markets and the economic pressure arising from them urge companies to improve their cooperative working provisions within their supply chains or product development departments in order to reduce factors as, for example, lead time. Examples like the delay of more than one year concerning the delivery of the *AIRBUS A380*© show that even experienced and well-established companies like *EADS*© have deficiencies in the field of collaborative working (see [1]-[3]). One source of difficulties in this context is that the CWE software systems available today mainly support cooperative working within a company. Adequate solutions for cross-company or inter-organisational cooperation do not really exist (see [4]).

This paper investigates the current state of CWE practice referring to tools and their usage within companies, and describes the present situation of implementing internal and external communication processes, referring to the example of a leading IT-company in Germany. Furthermore, it sketches the evolution of CWE IT support looking at the solutions provided by major vendors like *IBM*© and *Microsoft*© as well as referring to Web-2.0. Finally, this paper presents the concepts of the so-called '*Context-based Communities*' (CC) as a possible solution for problems of cross-company communication.

## 2 General Assessment of Current CWE Practice

In recent years, significant progress has been made in order to provide and improve quite advanced tools supporting collaborative working of non-co-located teams (e.g., Marratech [5]-[8], ISABEL [9], BSCW<sup>1</sup> [10], etc). However, the use of these tools in the industry is still limited.

The reasons for this are manifold. At an individual level, the lack of usability of the existing tool support is very often preventing a wider range of usage. In companies, the inability and/or unwillingness of organisations to change their traditional ways of working often represent major obstacles to the establishment and deployment of IT for CWE (see, among others, [11]).

In many cases, 'office-based' organisations, which are suitable candidates for implementing efficient and appropriate tele-working ('home office'), refrain from putting this into practice. In Germany, for example, many companies have not yet developed sufficient trust in tele-workers, as they still believe that managers are better at controlling the performance of their employees when working in their company offices (see [12] or, for more recent observations, [13]; however, [13] as well as [14] report and expect significant improvements with respect to tele-working in Germany in the near future). Similar observations are reported from other larger European countries, i.e. the industry at large is still far away from using the benefits which are associated with CWEs.

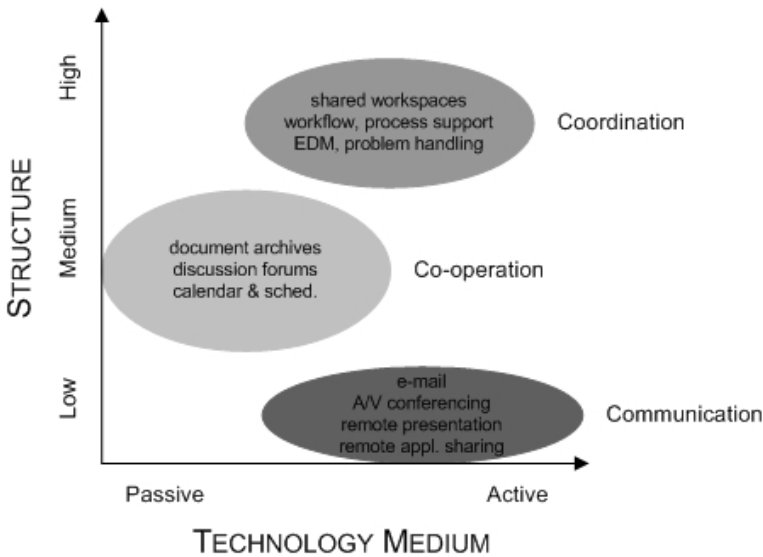


Figure 1: Categories of Collaboration Services (see [16])

<sup>1</sup> BSCW = Basic Support for Cooperative Work

However, both the need for cost reduction (e.g. by reducing capacities for office spaces) and the pressure arising from competition, partly, as mentioned above, due to globalisation, will force companies sooner or later to change their mentality and, hence, their ways of working (see again [13]). In addition, to name a further example, in the automotive industry the term of '24-hours-of-engineering' is reflecting the need to reduce the time to market for new cars. Some software companies already work on one software development or reengineering project in three coordinated teams 24 hours a day. For this purpose, they have established business premises appropriately distributed all over the globe with appropriate CWE provisions in place.

Beyond the collaborative working of persons or teams within a company, inter-organizational collaborative working takes place, for example, with customers, in supply chains, with partners, etc. In order to remain competitive in the future, companies will be forced to support the daily work in cross-company cooperation by way of appropriate communication, cooperation and coordination technologies, or better, services (see Figure 1 for a categorization of collaboration services). In this context, 'appropriate' means that both the perspective of individuals and the perspective of collaboration in teams are to be considered.

At this stage, the 'travelling issue' comes into view:

One major aspect concerning the steadily growing globalized markets is that traveling efforts should not be growing correspondingly. CWE means can be one way of keeping time and cost under control.

Time management is absolutely necessary to provide people with a balanced work life and thus who otherwise will be steadily busy traveling with minimize the risk of burn-out and private conflicts with partners or families.

In addition, the future risk of being late for a meeting because of flight delays or traffic jams should be judged higher than the risk of loosing quality through the use of poor electronic communication services for electronic meetings. At this point, however, it needs to be noted that the fulfilment of the 'better-than-being-there' paradigm of the MATES project ([15]-[18]) is still waiting for its conversion into daily practice.

### **3 CWE Practice Today - A Typical IT Industry Case**

The sample IT-company analysed for this paper has been a quite successful software and system vendor for more than 25 years, and has originally only been active in the German market. Its procedures, processes and ways of working can therefore be considered justifiably as somehow effective and efficient. But the question is, whether these procedures and processes should (or have to) become even more effective and efficient by employing advanced CWE techniques in order to remain competitive or to be even more successful. This is of increasing relevance especially due to the growing number of employees and the size of the company's more than 20 premises spread across Germany and the neighbouring European countries. Of course, these processes and procedures need to be improved in order to face the challenges of a growing organisation with widely spread sites and teams!

How does the sample company collaborate today?

In answering this question we have to consider on the one hand the internal collaboration between its employees and, on the other hand, external collaboration with its customers, partners and suppliers.

#### **Internal CWE Practices**

Apart from employing 'classical' communication services like surface mail, fax, (mobile) telephone and e-mail communication, cooperation and coordination within and across premises are partly supported by the services available via the company's intranet. These are mainly administrative services for ordering travelling means, for vacation planning, for the electronic registration of working hours and for the organisation of meeting rooms, etc.

In addition, reports of the economic status of projects and units and other accounting reports are available via the intranet on a monthly basis. Besides, archives for partner contracts and previous customer offers (incl. CVs for consultants to be included in future bids) exist, and all the documents and templates of the company's QM system are accessible via the intranet.

All company employees are registered within the intranet with their contact details, a photograph, information on the location of their offices etc. It is possible to dial the telephone number directly or to send an e-mail by clicking on each employee's phone number or the e-mail address. The company's skill manager system, also accessible via the intranet, allows to register and to update skills and expertise of each employee.

Internal information on the company structure, teams, units and their activities and tasks, on the company portfolio - products and services - and a general news board can be found in the intranet as well. A monthly newsletter, distributed to all employees by e-mail report about projects and successful sales deals and provide general information from the company management on the company organisation, business strategies and goals.

Thus, the company's intranet provides a wide range of services as described above, and telephone and (Web-cam-based) video conferencing (incl. Web-casts) are part of the daily collaboration practice. However, as confirmed by [11], quite a number of physical meetings which require travelling of participants must still be held, especially for managing purposes. Obviously, this number needs to be reduced for numerous reasons. It is, nevertheless, also widely accepted that not all physical meetings can/should be generally replaced by electronically held ones – physical presence also signals interest and respect to the other parties present; meetings being of incentive character, e.g. for selected employees, which are to be honoured for excellent performance, cannot be replaced, etc. (see [11]).

However, apart from administrative and managerial provisions for supporting collaborative working, there are no more sophisticated collaboration capabilities in use within the sample company at the present stage. In particular, cross-functional teams mostly come into existence by mere chance or in an unstructured way, and their constitution is in most cases based on the initiative of individuals. When the work of such teams has been accomplished, the team breaks apart very often, and therefore, unfortunately, its knowledge is lost – a typical scenario in the industry today, as reported by [11].

### **External CWE Practices**

The 'classical' services like surface mail, fax, (mobile) telephone and e-mail are also used for collaboration with customers, partners and suppliers. In addition, telephone and (web-cam-based) video conferencing (incl. web-casts) are used to communicate with external parties, however with less intensity than for internal purposes.

As in internal practices, the number of meetings held physically is very high within external practices, especially in projects with more than two parties involved. In comparison to internal collaboration, the importance of physical meetings with customers as part of an appropriate customer relation (or so-called account) management nevertheless needs to be noted.

In case of trouble with IT solutions or products supplied by the company, customers can submit trouble tickets by using a web-form. Customers are also able to keep track of the processing status of submitted tickets via the same interface.

Software product development and project execution, for example, will also take place more and more across distributed sites. Involved in the projects are partners (incl. all kinds of 'X'-shoring<sup>2</sup>) and customers. This requires CWE engineering process support, i.e. corresponding cooperation and coordination services in addition to the above mentioned communication services as stated, for example, by [19].

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<sup>2</sup> off-shoring, near-shoring, very near-shoring

Nevertheless, the need for a substitute for informal, ad-hoc communication in the 'cyber space' does exist. This would also avoid the sometimes humorous conclusion of participants of an accidental meeting stating that “it was good that we have coincidentally met each other and have talked about this subject” (before things might have gone wrong).

What if those people had not met?

## 4 CWE Platforms

### IBM and Microsoft

Both vendors - *IBM*© and *Microsoft*© (MS) - dominate the American and European markets of commercial CWE software [20]. As a result, the solutions and features implemented in their products mainly influence the innovation with respect to CWE software.

The new CWE client provided by IBM – codename 'Hannover' – implements improvements within the main CWE elements like e-mail, calendar (including scheduling) and contact management. For example: Using the display of an author of any information object (like an e-mail), the actual state of availability is shown at the same time. The e-mail's recipient is able to contact the author directly by chat or an IP-phone (if the author's state is set to 'available'). Speaking in the language of IBM, this functionality is called 'context-based online-cooperation'.

Using a new type of categorization, it is possible to build up individual contact structures within contact management. Recent projects linked to a person are presented in an appropriate view. By way of 'activity-based online-cooperation', co-workers within a project are able to access all project-related documents, meeting minutes, voice mails, etc. if these are centrally stored. In addition, cooperative revision of text documents or presentations is possible by using the 'Open Document Format' (ODF). As it is common practice when using portal software, it is possible to configure an appropriate GUI on the client, which is able to present several applications within one screen (see [21]-[23] for further information on IBM products).

With reference to *MS Exchange 2007*©, the integration of voice- and fax-messages into the server's e-mail-application represents the main innovation. This solution for unified messaging may also be managed by several clients and mobile clients within a single application of the Exchange 2007 server-mailbox.

Microsoft also offers *MS Office Groove 2007*© as a platform for synchronous peer-to-peer cooperation. There are two variants available: a client-server-application called *Groove Server 2007*© and a web-based solution hosted by Microsoft called *Office Groove Enterprise Services*©.

MS Office Groove 2007 provides a 'context-based working environment', which uses a container-based information-storage to release information and support collaborative working. Information may be structured based on appropriate forms, but may be stored in unstructured files as well. This data is locally stored by each individual co-worker and is synchronised by the server. The working environments are organized as folders.

MS Office Groove 2007 is a Win32-application. As a result, every co-worker has to install the appropriate components locally on his own computer. This proceeding is comparable to a product called *Sametime*© provided by IBM. However, IBM just offers a client-server-application (see [24] and [25] for further information on Microsoft products).

Even though both IBM and Microsoft speak of 'context-based techniques', it must be mentioned that the means of presenting and using information are only extended, but not innovated at this stage. There is still a lack of solutions allowing the user to adapt information to the context. Furthermore, the techniques mentioned above are only accessible at certain parts in the client GUI, neither everywhere nor at all times.

Both providers' systems are based on the X.500 directory-services. The assignment of authorizations for information objects (documents, e-mails, contacts etc.) always takes place with reference to the accessing user object and therefore to the group guidelines attached within the appropriate domain. An assignment between user objects referring to different contexts is not implemented. The integration of single external user objects is only possible by repeated mapping of these objects within the appropriate directory service or by implementing positions of trust.

In summary, it is to state that current CWE software and platforms are not capable of implementing context-based working groups crossing the boundaries of systems and domains in order to support cross-company and interorganisational cooperation.

## **Web-2.0**

Providers of Web-2.0 services promote new possibilities of collaborative working by using the internet [26]. However, this collaborative working is restricted to the processing of text documents, tables and/or presentations. The patterns of usage are rather simple, regardless of the specific provider of such a service: The co-workers within a team register to an appropriate service provider and can start to work immediately. Therefore, the documents under study are uploaded to the provider's server using a local copy of the appropriate files. Currently, only a few document types, such as DOC, SXW, ODT and HTML<sup>3</sup>, are supported. After uploading the files to the server, the appropriate files are released for processing to all co-workers, who will thus receive an e-mail with an invitation. The processing of documents itself will be done rather

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<sup>3</sup> DOC = Microsoft Word, SXW = StarOffice respectively OpenOffice text files, ODT = Open Document Text, HTML = Hypertext Markup Language

comfortably by using a WYSIWYG<sup>4</sup> web-interface, without the need to install any application locally.

In technical terms, this is a rather simple cross-company solution for collaborative working. Mainly, there is the need to supply an appropriate server for data storage and for providing the web-services. Complex directory-services like X.500 and LDAP<sup>5</sup> are neither needed nor used.

Furthermore, most providers of web-services like the ones mentioned above have problems with the processing of complex data-structures (e.g. embedded pictures, tables, annotations). Even the simultaneous processing of documents by several co-workers – has not yet been properly implemented. The main reason is that there is no standardised system available which is able to restrict the processing of the same content at the same time.

As the described IBM and MS platforms, Web-2.0 services do not provide for 'real' cross-company cooperation. They are to support the processing of documents crossing the boundaries of companies' domains. A context-based presentation of information and the adaption of information also referring to a context are not provided for by these services.

### **Examples of cross-company Collaborative Applications**

Three candidates focusing on the cross-company approach will be presented below, as examples for real collaborative applications.

*Dassault Systems*© offers the product line *ENOVIA*© for cross-company collaboration. With ENOVIA as a basis, specific solutions like *CATIA*©, originally designed as single-user applications, can be used as comprehensive CAD<sup>6</sup>-applications by the whole company. Moreover, ENOVIA offers lifecycle management, based on management of different versions as well as a “Shared Desktop” as a group-related working environment. The allocation of authorizations also takes place based on the previously defined user groups and additionally in relation to every single user (see [27], [28]).

ENOVIA does not support the context-based presentation of information.

*Eclipse*© as a representative of the Open-Source-Community, originally initiated by IBM, serves as an *JAVA*©-based integrated development environment (IDE). The functionalities of areas of development can be expanded by means of Plug-Ins; among other aspects, this applies to the functionalities that support cross-company Collaboration. In this context, the support of implementation processes, codes, administration of different versions, tests as well as additional Plug-Ins is the main focus of attention (see [29], [30]). Like ENOVIA, Eclipse does not offer context-based presentation of information.

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<sup>4</sup> WYSIWYG = What you see is what you get

<sup>5</sup> LDAP = Lightweight Directory Access Protocol

<sup>6</sup> CAD = Computer Aided Design



*RPlan*© by *ACTANO*© is offered as a collaborative solution for project management, which completely implements the cross-company approach. The management of complex processes in the field of product development within company-wide development networks is the core functionality of *RPlan*.

On the basis of internet standards, all elements of the planning process that are relevant for the collaboration can be presented and modified by means of a browser. The decentralised administration of data takes place within databases belonging to each company involved. The encoded alignment of several databases can take place via the internet in real-time; at this, XML<sup>7</sup> serves as the format for data exchange.

*RPlan* provides a way of limiting access to certain information for a defined user group, but there is no context bases approach to structuring and presenting information. Moreover, classic elements such as mail or calendar are no essential elements of *RPlan*.

The car, airplane and aerospace industries are the target markets of *RPlan*. Among the customers are companies such as *BMW*©, *Bosch*©, *EADS – AIRBUS* Germany, *DaimlerChrysler*©, *Rolls Royce*© and *Mitsubishi*© (see [31], [32]).

To sum up, one can say that several makers have devoted themselves to the cross-company approach and thus offer the respective products, but these solutions do not consider the aspect of context relations.

In order to compare the discussion of Future Collaborative Working Environments with the present European endeavours of research, the targets of the "Integrated Project ECOSPACE" will subsequently be presented. The conceptual work within the ECOSPACE-Project is based partly on the EU-Workshops "Industry-led FP7 consultations" (see [4]) and "Experts Group on Collaboration@Work" (see [4]) that took place in Brussels in 2006.

### **Research Project ECOSPACE**

The European research project ECOSPACE – eProfessionals Collaboration Space, under the leadership of the Fraunhofer Institute for Applied Information Technology (FIT), rates the usage of present CWE systems, according to the experience of a typical IT Industry Case as presented above: "Currently email is almost the only communication media that supports inter-organizational cooperation between different systems. Instant messaging, shared workspace systems, or application sharing have not yet reached a status where systems of different vendors can easily be integrated or combined." (see [33])

Thus, the development of a global, virtual working environment, where participants (eProfessionals) have barrier-free access to individual as well as community based working environments across the borders of organisations, is one of the main targets of ECOSPACE.

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<sup>7</sup> XML = Extended Markup Language

The description of the project mentions terms such as 'contextual social exchange', 'context specific needs', 'community context', 'activity functions' and 'activity oriented collaboration environment', but does neither explain the relationships between them nor give explicit detail. Besides, the reference to existing CWE platforms and their functions, as presented above under the heading "CWE platforms", is missing. A rough sketch is given on several levels, but no functional explanation has been added so far.

Only one paragraph mentions context-based aspects: "Based on a semantic integration of the cooperation activities as well as the services, users can organize the environment according to their projects, team or community contexts. Within such a collaboration context the cooperation services are offered through so-called activity-functions such as share, inform, notify, send but not as application like an email client, or a shared files browser. This approach is disruptive and it requires users to adopt a new collaboration paradigm that is not based on an application but on collaboration-activity and task oriented thinking." (see [33])

This is a very general statement; moreover, it refers to a new approach to collaborative platforms and not to the integration or linkage of existing CWE platforms containing elements such as mail, calendar, etc. Therefore, ECOSPACE has to be rated as an interesting approach to the solution of cross-company problems with context related elements, but the practical value has to be seen from a critical point of view, as existing and established CWE platforms are not being integrated.

## **5 Context-based Communities**

The main challenge for the IT-support of collaborative working is linking every single person's individual access to relevant documents, mails, dates, contacts, tasks, plans of product development and project schedules, etc., in an effective and efficient way, without barriers concerning the various corresponding contexts in which this person is working individually. This, of course, holds as well for collaborating teams acting in the respective context as so-called 'Context-based Communities', for which analogous functionality has to be provided to allow context-based access to a community's documents, mails, dates, contacts, plans of product development, project schedules etc.

Take as an example the process and the project respectively of the creation of the document at hand. Author 1 administrates his mails, contacts, documents etc. within the accordant infrastructure of his industrial organisation, author 2 analogically within the infrastructure of the university where he works. Members of company staff can, for example, make and administer appointments for author 1 in the respective group calendar, as well as the university staff for author 2. Within the scope of organizing, the project mails had to be exchanged, appointments had to be fixed, tasks had to be arranged and documents had to be dealt with and exchanged.

The infrastructures of these two organisations could not support any of these processes, with the exception of mail exchange. It would have been ideal, for example, if author 1 had been able to check his appointments as well as those of author 2 (not with the same details as the members of the university staff however) in a group calendar and to enter a suitable appointment, which both companies could then have seen and administrated in their group calendars. Both persons had to administer the multitude of documents, mails, dates, contacts etc. relevant for the project independently. It is impossible to control in how far the two persons' views of the project were in accordance with each other! In particular, the collective editing of the document at hand could either be completed together in one place, or independent of each other and thus sequentially. If relevant contacts changed, this had to be accomplished redundantly, provided that the change was visible for both persons at all. One person could only find out which status the accomplishment of a task/action by the other person had by explicitly asking for it via mail or phone, etc.

Obviously, author 1 and author 2 managed to solve the problems named here (by means of additional efforts, especially meetings and phone calls) – the document at hand can prove this. A bigger team, distributed over several organisational unities in different locations, would certainly have had to make much greater efforts in order to reduce the consequences of these problems in the same way. For larger teams distributed over several organisational units in different locations much greater efforts for supporting and implementing this have to be invested. A larger team of this kind can, of course, set up and use an IT-supported CWE platform adequate to the accomplishment of a project. However, this platform would once again be separated from the IT-supported working environment of each team member. Team members belonging to other teams/collaborative working groups, i.e. Context-based Communities (CCs), would have a working environment which would still be scattered and split instead of being integrated as described by figures 2 and 3.

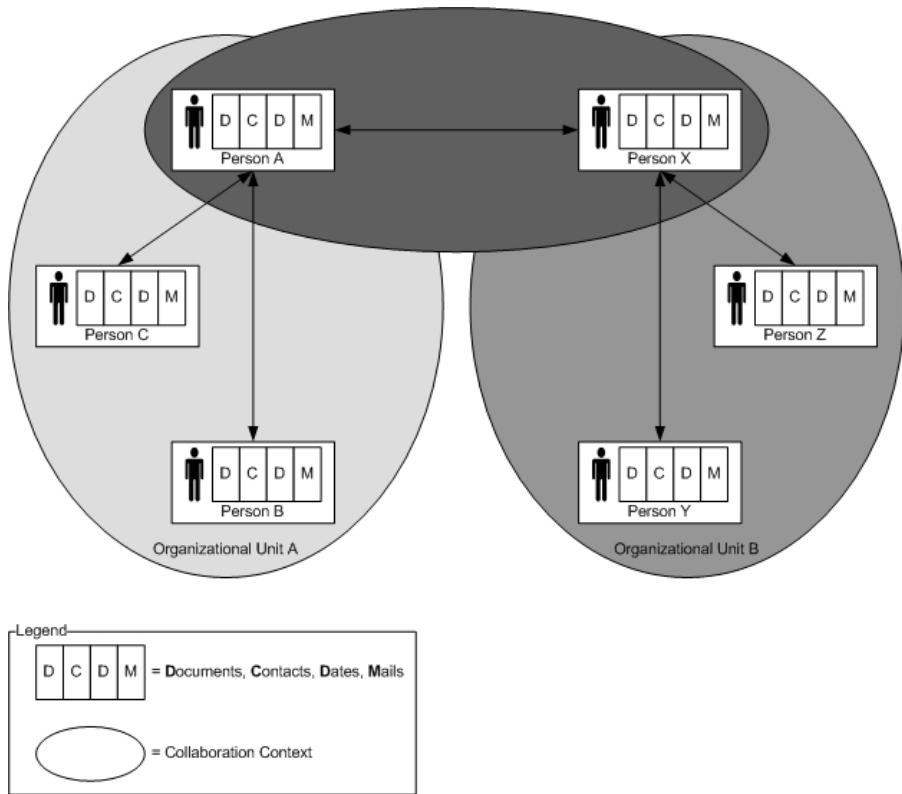


Figure 2: Collaboration Communities

Figure 2 shows the individual perspective of two participants A and X, who are situated in different contexts in relation to other persons and exchange CWE elements such as documents, contacts, data and mails within each context. The contexts that are presented vertically represent internal collaboration processes such as operational daily business. The context presented horizontally pictures cross-functional, context-based collaboration within the whole organisation. Within the framework of this collaboration process the two participants A and X also need to access organisations that are external from their respective point of view. The presentation of information varies, depending on the question if information originates in an external or internal 'source' or if it comes from an external or internal partner within the process of collaboration. For example, an appointment may be shown as "meeting for CCE article" for internal partners, but as "internal meeting" for external partners.

The scenario presented here, where participants are related to internal as well as external cooperation partners – frequently within one context –, can certainly be judged as the normal case in today's business life. Platforms for Collaboration Communities thus need to indicate the respective interdependences of context relations, and to offer the 'correct' individual perspective on CWE elements relevant to every single participant within a particular context.

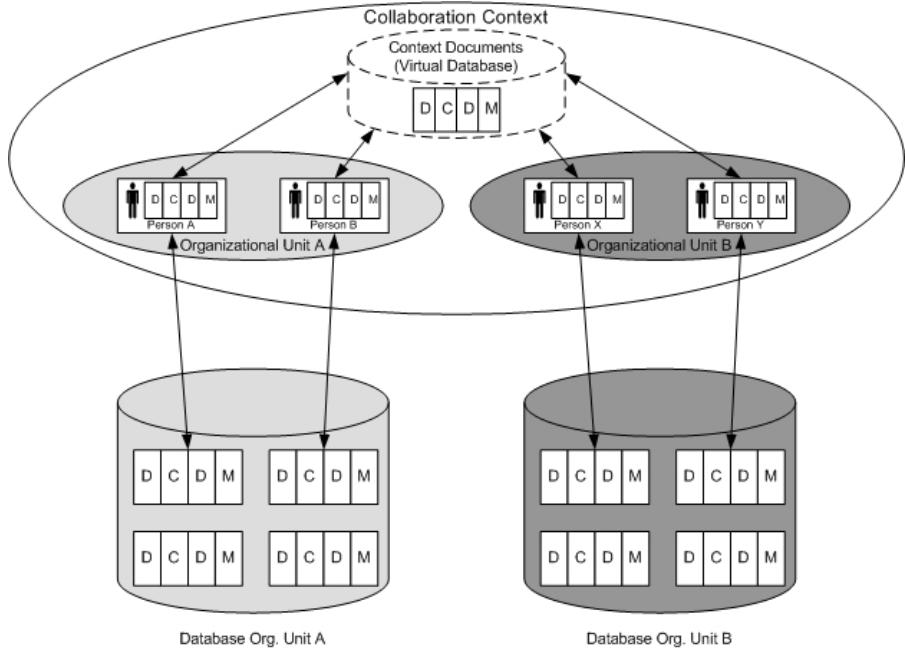


Figure 3: Collaboration Communities – Technical View

Figure 3 picks out aspects of technical implementation: co-operation partners within an organisation save their documents in the organisation's IT-infrastructure. For a collaborative context comprising the whole organisation, the respective documents must be accessible for all the participants within the organisation. This can be effected, for example, by means of a shared database with a replica in each organisation involved. One has to bear in mind that the respective mechanism of replication, unlike the mechanisms of former shared database systems, has to take into account the varying presentation of information as mentioned in connection to the example of an appointment (Figure 2).

For the reasons outlined above, we therefore consider advancing existing CWE systems to be necessary. They must be able to map the individual perspectives of every single actor as well as the integrated Context-based Community perspective with all its elements mentioned above.

Figure 4 clarifies once again the demand and the enablers relevant in this context:

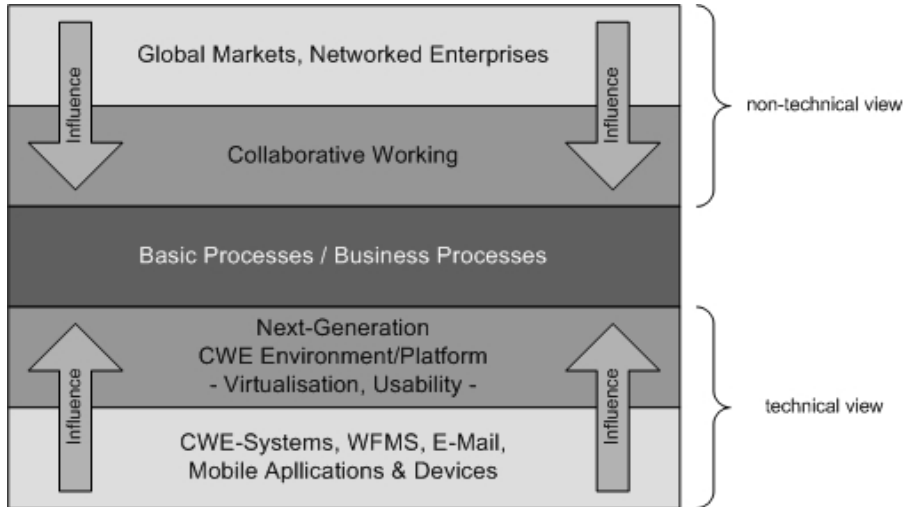


Figure 4: Layer Model

The internal and external networking of companies, as a prerequisite for their competitiveness within the global markets, enforces collaborative working within the company as well as beyond the company's boundaries. The next generation of CWE must be able to arbitrate between the infrastructure of the actors involved, the devices used (mobile phones, PDAs, laptops, etc.) and IT systems employed on the one hand (CWE systems specific to the organisation, workflow management systems, groupware systems, mobile implementations etc.), and the basic processes of a Context-based Community on the other hand.

Examples for the basic processes are among others:

- attending to and providing of contact data
- (distributed) working on documents/files
- management of appointments
- specific flow of information/specific communication (with selected actors of the Context-based Community)
- status management
- task/workflow management
- project management.

The task of 'arbitrating' means that the 'actual state' of the (distributed) execution of basic processes of a Context-based Community is mapped for all actors involved within their respective individual working environments.

This mapping must enable the respective person to accomplish her/his tasks in the whole context within the different Context-based Communities as effectively as possible concerning the (HMI) support for the single tasks in terms of improved usability. What is required here is an individual working portal offering a comprehensive view of all Context-based Communities the person is involved in – as well as an holistic Context-based Community view. Within the comprehensive view, among other things, the setting up of a working schedule corresponding to the deadlines and priorities of the tasks that have to be accomplished within the separate Context-based Communities, must be supported.

On the other hand, the holistic Context-based Community overview has to 'exist', and has to be able to implicitly archive the 'knowledge' involved, especially after the completion of the respective task or project. In addition, this Context-based Community overview has to be available as an individual and independent knowledge base for the companies involved.

## **6 Future Research Topics**

The discussions above hint to challenges in addition to those already known which will have to be answered in order to solve the problems referring to the conceptional design and implementation of adequate CWE platforms and tools. Especially the mentioned basic processes have to become known in more detail, and the data-structures have to be revised. As part of these tasks, the problem of designing a flexible and system-independent data-structure of Context-based Communities has to be solved. Furthermore, it has to be investigated, which events have to be assigned to the basic processes in order to guarantee explicit system states and consistent transitions within a distributed system. Additionally, the issues related to synchronization as well as appropriate communication channels and corresponding interfaces have to be taken care of. These include the design of a possible implementation as a part of any directory-service – such as X.500 – or as an extension of these.

In order to better understand the needs for these, use-cases for various application scenarios have to be designed. For example: usage of Context-based Community techniques in a dynamic software development team, Context-based Community as a base to build up virtual companies, Context-based Community as a representation of dynamic customer-provider-relationships etc. Furthermore, there is the need of a systematic evaluation of how to implement the different views of any Context-based Community user in a machine-oriented way, in order to enable the technical support of a Context-based Community for any user as well as for the whole community.

In summary, it has to be stated that there are still a lot of challenges to be overcome and issues to be resolved pertaining to the implementation of adequate CWE platforms and tools which have not been looked at so far. The *NESSI*-project<sup>8</sup> – keyword: 'business process collaborations' – demonstrates the European interest and need in this case [34].

## 7 Conclusions

This paper illustrates that there still exists a huge difference between internal and external – especially cross-company – cooperation processes nowadays. Several providers as IBM and Microsoft offer some 'context'-based features within their CWE software systems. At the present stage, these features are implemented rather rudimentarily and do not support an independent cross-company usage.

Cross-company applications such as CATIA, Eclipse and RPlan support crossover cooperation within a company, but not in a context-based way.

Thus, the usage of information objects in assignment to a context is not yet properly implemented. The only approach to this made by ECOSPACE has not presented any serviceable practical results so far; besides, it does not take into account that CWE platforms have already established themselves in many companies. Thus the further development of existing platforms seems to be a lot more promising than the development of completely new systems.

In comparison to this, the holistic Context-based Community attempt charges the elementary information objects of CWE software systems and tries to enable a context-based usage by implementing a new type of structure within information objects.

By employing a Context-based Community it is possible to use a CWE in a much more flexible way and according to cross-company co-operation needs.

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<sup>8</sup> NESSI = Networked European Software and Services Initiative



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