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# Identifying the Potential of Web Services for Collaborative Business Networks

**I.T. Hawryszkiewycz**
School of Systems, Management and Leadership
University of Technology, Sydney

## Abstract

*Business networking is now almost essential to obtain access to the specialized expertise or service needed to develop products and services. Business networking takes many forms. One of the most frequent examples are supply chains. Supply chains are evolving into new forms that require greater flexibility and collaboration. The trend is to collaboration where partners form supply chains by jointly deciding the contribution to be made by each partner. This includes the ability to find new partners, and rearrange local activities to meet emerging customer needs. The paper describes the kinds of collaborative structures needed to implement the evolving supply management arrangements and the knowledge requirements in the different structures. The goal is to identify the services needed to support such business networks. To do this the paper describes the need to consider collaborative supply chains from a number of perspectives in particular social structures and knowledge and the services needed to integrate them into supply chains. The paper describes the supply chains using a model and uses this model to identify potential services. Customization of such services suggests the need for an infrastructure that allows supply chain managers to themselves set up and customize the services. Some potential infrastructures are defined emphasizing the use of Web technologies.*

## 1 Introduction

There is an increasing trend to business networking. This includes reducing silos in large enterprises, joint business ventures, getting expert services and sharing services. This trend to business networking is diagrammatically shown in Figure 1. It illustrates the greater emphasis on collaboration both within and between businesses. According to Cova and Salle (2000) a typical business network in the emerging environment is towards co-creation where solutions are created through collaboration between supplier network and the customer network. Often there is a major supplier who originated a project and who then builds and coordinates a network of providers and customers to develop solutions that can provide continually evolving services and co-created services to customers.

Most early supply chains can be viewed as business networks with workflows as their main perspective. The most common evolution of business networking is through supply chains. These depend on stability of process found and usually supported by ERP systems. They appear in many industries as for example telecom (Berchet, 2005, Heikkila, 2002) and automotive (Howard, 2006) industries. Each partner is often one component of the workflow and required to provide a service for

a continuous period of time. The services are negotiated between two partners at each interface. In collaborative supply chains the services are negotiated jointly and can change frequently. The emergence of collaborative supply chain arrangements requires perspectives other than workflows to be considered, in particular social networks and knowledge as a way for continuously developing new knowledge to optimize and rearrange supply chain processes. Rye (2008) for example calls for knowledge hubs to be established at all supply chain transitions. Pralahad and Krishnan (2008) also argue that social networking will play an increasingly important role in such coordination. In many cases coordination is through the exchange of knowledge, much of it of a tacit nature, created by process participants. The importance of social interactions is thus increasing and becomes a major component of any design. This requires clear definition of role responsibilities and interactions between them.

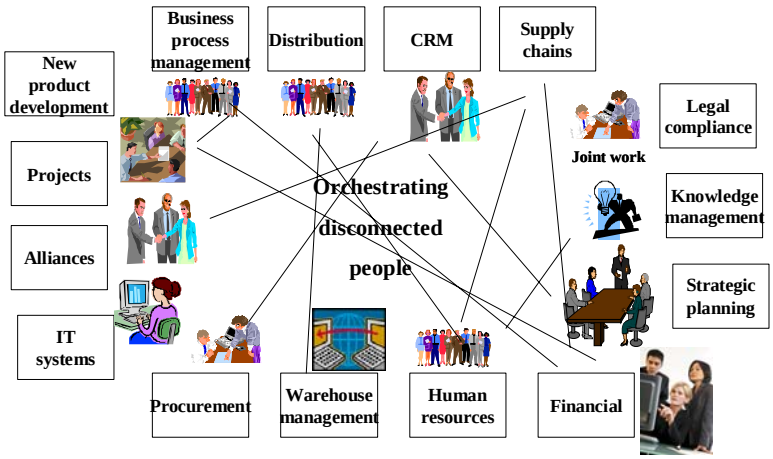


Figure 1 – The process ecosystem

This paper proposes ways to select the collaborative support to be provided for a particular network both within and between organizations. The question addressed is how to choose the collaborative architecture for a particular business network and how to support it with technology. The paper distinguishes between business architecture, collaborative architecture and collaboration infrastructure. In this terminology:

- Business architecture are the way business activities are combined to work towards a particular objective,
- The collaboration architecture are the ways that business entities are to collaborate within the business architecture to achieve business goals,
- The collaboration infrastructure to support the collaboration infrastructure including technology support through social software

## 2 General Networking Characteristics

This paper suggests that the trend in collaborative supply chains is to more complex and knowledge intensive environments. The complexity arises for two main reasons:

- The need to consider design from more perspectives than just workflows and consider the social networks and evolving knowledge, and
- The increasing complexity of the connections.

Most services to date have supported workflows and been provided by ERP systems or ERP-like systems. These assume flows of goods through the supply chains and manage flows through the planning and manufacturing process. The flexibility of changing flows, product characteristics is often difficult to implement. These include some systematic way to describe and support change. The approach used in this paper is to draw to support management in terms of different perspectives.

### 1.1 Business Perspectives

The approach of this paper is to manage complexity through seeing processes from a number of perspectives. Change is then managed through the different perspectives but with a clear relationship of effects of change on other perspectives. The proposed perspectives are:

- The business activities and their actions and what they create,
- The process workflow or sequence of activities and the interdependence between activities,
- The social structure that describes roles and responsibilities and the assignment of roles to individuals,
- The knowledge created and used during the activities, and
- The technology and how it can be adapted to the system.

These provide a cognitive structure to change systems from different perspectives. For example a change in activity will be viewed in its effect on the social structure and knowledge requirements. At the same time the ideal is for the perspectives to appear in the foreground and background as users adjust the process. In other cases the change may be perceived as a need to change the social structure, as for example bringing in a new expert.

These perspectives provide a cognitive structure to create and change systems. For example a change in activity will be viewed in its effect on the social structure and knowledge requirements. The usual design approach is to develop models of systems from these different perspectives.

Following on from Gordijn and others (2006) responsibilities for setting up the supply chain are usually the responsibilities of different organizational units. Each of these units often considers one perspective. The organizational perspective is usually the role of management, the business activity, social structure, knowledge and

workflow are the responsibility of business architects, whereas the cognitive issues and technology are usually the responsibility of information system architects. A systematic approach to designing supply chain arrangements can be based on organizing the sequence in which perspectives are considered. Figure 2 shows the proposed sequence. The definition of roles is important. Many such chains operate in distributed ways and as described in (Lee-Kelly, 2008) clear responsibilities must be defined to ensure smooth collaboration. The modelling method is informal and lightweight and draws from ides of soft systems methodologies. It was described earlier (Hawryszkiewycz, 2005) and focuses on collaborative concepts of activity.

## 1.2 Concepts for modeling the business architecture

The concepts for business activities can be used to define business activity diagrams. This can both serve as a specification or as a cognitive view of the business system. Figure 3 illustrates a business activity diagram. Here the clouded shapes represent activities, black dots represent roles, and disk shapes represent artefacts. Figure 3 is a model of a typical process of an organization responding to a tender. The main activities are:

- Developing a technical solution, which may be a building a road design,
- Developing the cost response part,
- Development of an implementation plan including fitting in with local factors such as construction rules and environmental standards.
- Assembly of the three parts and their combination with the personnel records of people who will be involved in the response, and the track of the responding organization.

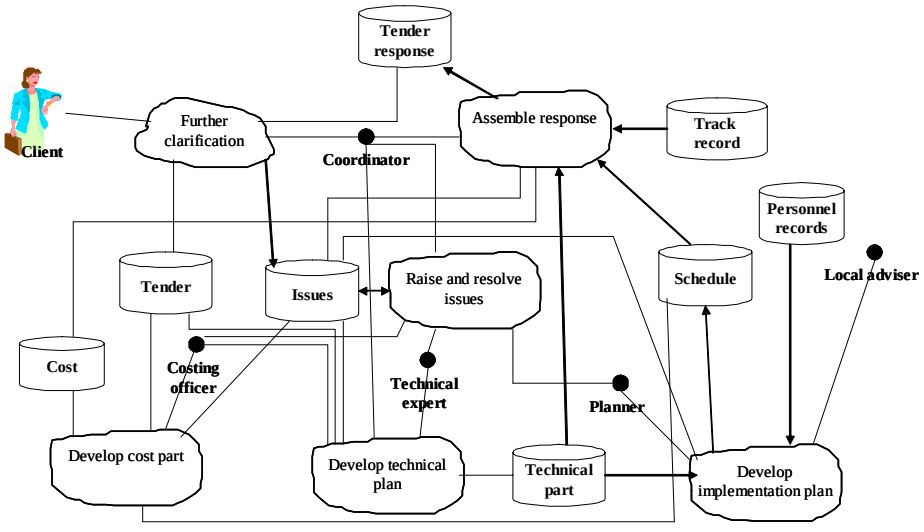


Figure 3 – Business activities in tender response

There are also formal collaborative activities such as resolving issues and ensuring consistency between the response parts. The degree of cooperation here is very high. Often there is need to get hold of experts in any of the three parts and to get clarifications from the client. The processes and activities can quickly change. There may suddenly be a need to make an environmental study or seek special approvals from local authorities. Figure 3 shows part of the knowledge and social perspectives. It shows the artifacts or explicit knowledge that is available. This is the tender, various personnel records, track record of previous projects and so on. It also shows the roles needed in each activity to organize the activity and produce the necessary outputs.

## 2.2 Concepts for the Collaborative Architecture

Social network diagrams have been widely used to model relationships between people. These have been extended in a variety of ways to suit different purposes. Business collaboration requires a clearer definition of what the people do and how they should collaborate in their work. At the same time, the chosen structures must naturally support the social acceptance of any new design. The extension is relatively simple. The link to business activities is through roles. The roles have defined responsibilities and the communication that forms part of these responsibilities is also included in the ESN.

Figure 4 shows the notation used in ESNs and Figure 5 is an example. Roles are shown by the black dots whereas individuals are shown as a face. Thus in Figure 4 X1 and X2 occupy roles A and B respectively and through their interaction create some knowledge. Often this created knowledge is based on interpretations by the individuals using their tacit knowledge. In implementation such created knowledge can be captured using the different Web 2.0 systems now becoming more commonly available.

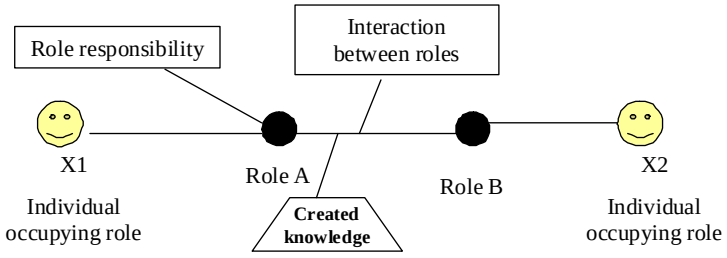


Figure 4 – ESN Notation

The ESN for tender evaluation is given in Figure 5. It shows the roles and their interactions and potential knowledge created during these interactions. The ESN is often derived from the business activity diagram. It shows the interactions that are required as part of the business activity. The ESN in Figure 5 shows the different roles as black dots. The lines between the roles indicate work connections, which define the essential communication paths for the participants. The labels attached to each role show the role responsibilities and the labels attached to the lines joining the roles show the interactions between the roles. Thus, for example, the planner is responsible for developing the environmental plan. The interactions that often capture much of the needed knowledge to be used in future decisions. Thus for example the

planner interacts with the local adviser to capture local planning issues and regulations.

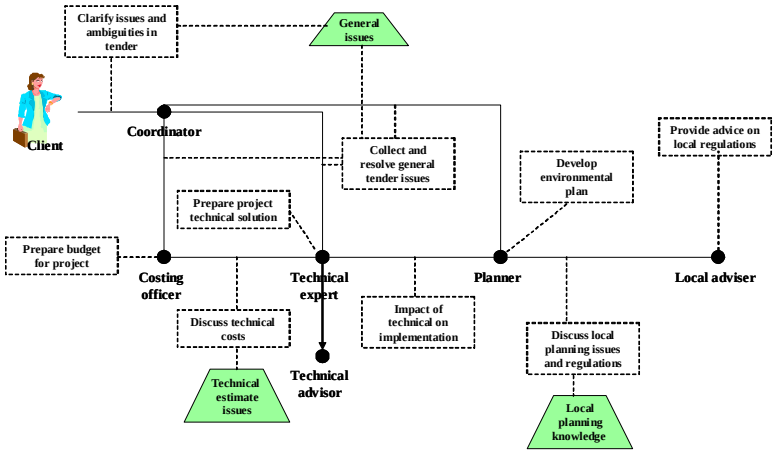


Figure 5 – ESN for tender evaluation

## 3 Infrastructure requirement

Technology requirements here are classified into the infrastructure and the interfaces provided to users. One requirement is a social database that stores the relationships illustrated in Figure 6. There is usually a division between that part of a technology infrastructure that supports business activities and that which supports social structures with knowledge often shared between the two. Business activities are usually supported by ERP systems together with databases that hold the explicit knowledge. Social activities are usually supported by workspace systems or Web portals and often contain knowledge captured as part of social interactions. Increasingly social software is used to support role interactions.

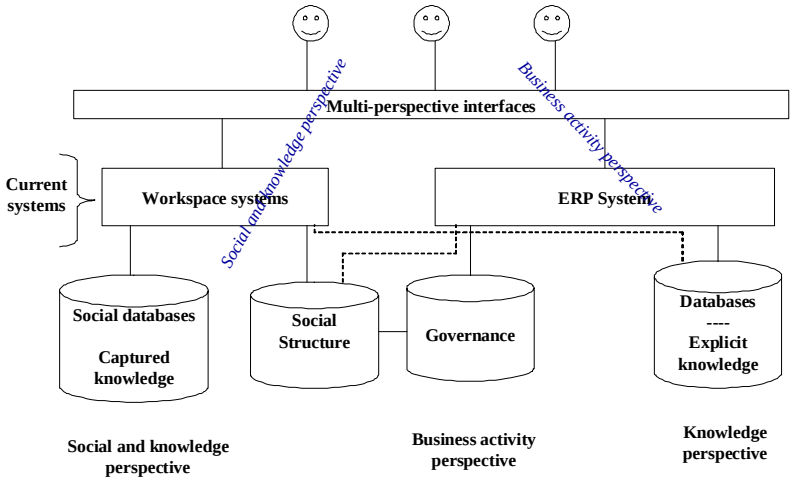


Figure 6 – Current technologies

One challenge is to somehow capture the knowledge created in the social interactions and combine it with ERP to create an integrated structure.

### 3.1 Selecting services for the collaboration infrastructure

The ESN provides the guidelines for creating an infrastructure for knowledge capture. Figure 78 illustrates the approach. Its goal is to use the services increasingly provided through the trend to Web 2.0 and map them to the social interactions identified in the ESN. Typical services include blogs, WIKIs or discussion databases. They also often include task oriented services such as program boards to keep track of tasks in a project, or e-Portfolios to keep track of related documents. Communities of practice are another service often developed by enterprises. Figure 7 illustrates the mapping of interactions to web services

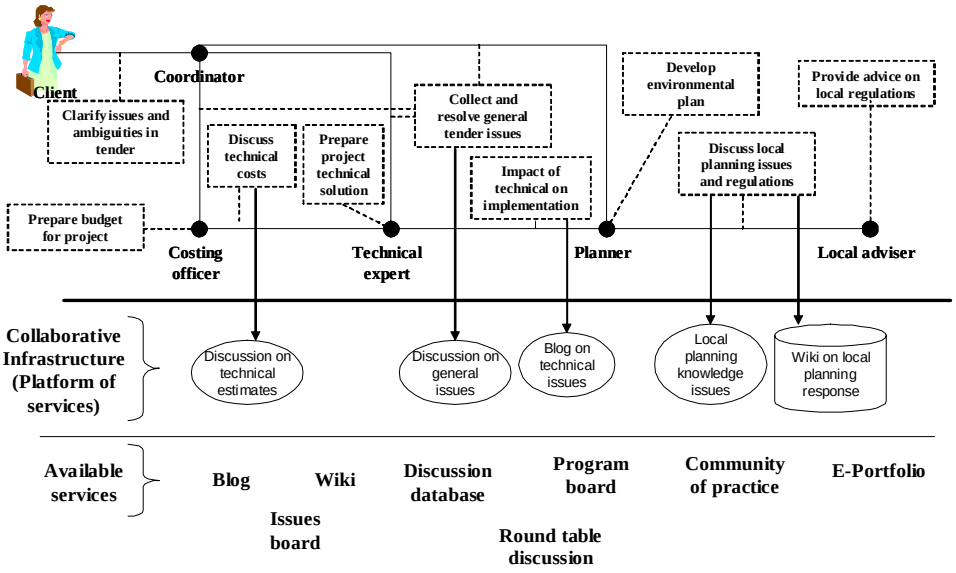


Figure 7 – Enterprise Social Network

.Thus for example technical issues may be raised on a discussion board whereas the impact of technical issues on implementation is raised on a blog. Other examples here include:

- A wiki is setup to construct the local environmental plan, with experts and internal staff contributing to it,
- A general issues discussion that involves most of the task leaders.

The next challenge is the presentation to users. The goal here is to present the system to users in ways that integrates all perspectives. The two options described here are groupware platforms or graphical visualizations.

### 3.2 Groupware Platforms

They should include the concepts defined for the collaborative model while providing commands to easily create and change the structures of workspaces. Our experimental system, LiveNet, demonstrates the kind of support needed by workspace systems.

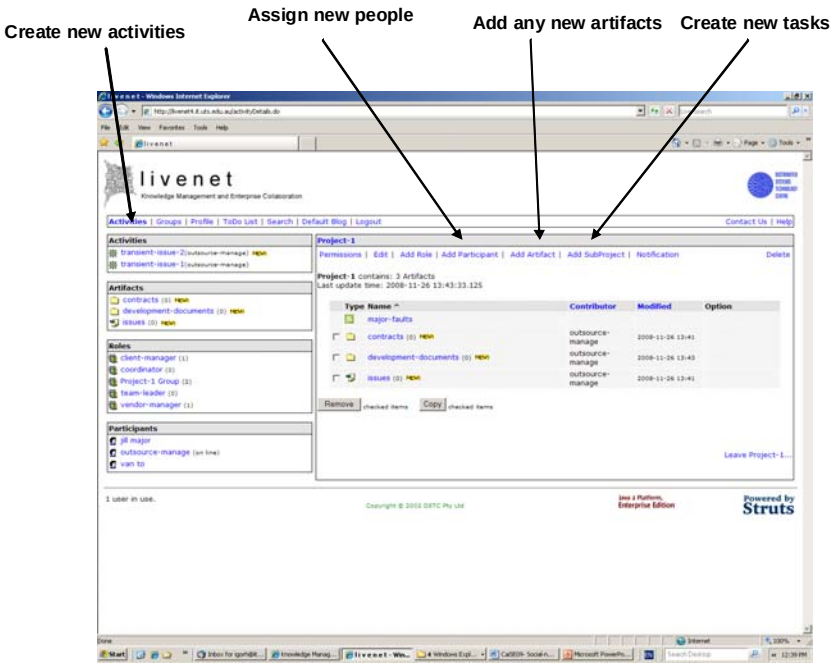


Figure 9 – A Demonstration Workspace

Figure 9 shows the LiveNet interface and its typical commands. It provides a menu that can be used to create new collaborative objects, including activities, roles, and artefacts. It also enables people to be assigned to the roles. Apart from these elementary operations the system includes ways to implement governance features as for example allowing roles limited abilities to documents.

Commercial systems in this area focus on middleware software that provides the commands that allows users to use the middleware functionality to create workspaces. Furthermore, it should allow users to change the workspaces as work practices change. Many manufacturers are now providing ways to integrate the kind of software with enterprise applications. A typical example here is Websphere provided by IBM.

## 4 Summary

This paper identified a need to support business working with collaborative technologies in ways that enable knowledge sharing across the whole network. It proposed a design approach that starts with identifying the business activities and the collaborative architecture needed to support collaboration in these activities. It then selected the technologies needed to support the collaboration.

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