Collaborative Business Process Engineering "CPBE" Across Multiple Organisations in a Cluster

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ABSTRACT

This paper introduces the concept of Collaborative Business Process Engineering (CBPE) within the context of multiple organisations in a cluster. Collaborations are facilitated by the technologies of Web Services (WS) and Mobile Technology (MT). This paper demonstrates how the interoperability of WS results in electronic collaboration of businesses. Furthermore, this paper uniquely describes how cluster-based processes of multiple organisations can be engineered so that they are integrated even when the organisations are not necessarily known to each other. The subsequent effects of this interoperability on their business processes of the collaborating group of organizations including the business structures and the mechanisms to reengineer those business processes are discussed.

Keywords: Collaborative Business Process Engineering, Web Services, Mobile Technologies, Collaboration.

INTRODUCTION

This paper introduces the concept of Collaborative Business Process Engineering (CBPE) as distinct from the traditional Business Process Reengineering (BPR). Engineering of collaborative business processes does not appear to have been addressed previously in the formal literature. Furthermore, the impact of Web Services and Mobile Technologies on engineering collaborative business processes is also studied. Finally, an approach to transitioning to collaborative business processes is mentioned.

The approach to this research encompasses creation and validation of the model for CBPE. This initial paper outlines the model and approach to its validation. Selected methodologies for this study are the combination of *Interpretivist* and *Constructive* approach. Interpretivist approach is a combination of descriptive and interpretive research. It will focus on group of objects under investigation. The interpretivist approach confronts the difficulties presented by the nature of the research domain, and in particular the intangibility of many of the factors and relationships of the researcher within the research domain.

Action research is also considered to be one of the suitable methodologies for this study. By observation and recording the daily activities of the organisations the research can evaluate the existing business processes to identify what kind of business processes will be affected after the engineering process. Furthermore, action research aids this study to evaluate how to get these organizations to collaborate with each other and how people, process, technology and the infrastructure of the organizations will be affected.

Constructivist approach is the fundamental tenet of constructivist philosophy indicating that interpretivism is about contextualised meaning, and that reality is socially constructed. The constructivist paradigm, therefore, provides the assumptions, the rules, the direction, and the criteria by which research is conducted. The solution recommended by this study will use constructive methodology to present the new designed model of collaboration by multiple organizations.

This study will investigate the impact of the collaboration on social system (people *"trust"*, reward *"why collaborate"* and authority structure *"who is in charge of the collaboration"*) as well as technical system (processes *"before and after*

engineering", tasks *"security, convenience and availability of the channels"* and technology *"web services" and "Mobile Technology"*).

RESEARCH AIM

The aim of the research is to identify how Web Services could facilitate interoperability amongst multiple organizations that result in collaboration of business processes.

Arising from the research aim there are several research questions that need to be studied. They are as follows:

- What is the interoperation nature in existing practice (model) of collaboration?
- What is the impact of interoperability emanating from Web Services on organizations that collaborate electronically? (Here we study the dynamic aspect of collaborations wherein organizations can enter and exit the collaboration at will)
- What are the characteristics and the mechanisms to model collaborative business processes that transcend organizational boundaries as against business processes within a single organization?
- What are the factors influencing collaborative business processes? (such as trust, security, confidence level and availability of channels)
- Is the constructed model efficient and profitable for these organizations?
- Are there viable alternatives?

BUSINESS PROCESS RE-ENGINEERING

A business process is a continuous stream of business activities. Every process has some linkage to other processes. An isolated process that has no relevance to any other process in delivering a product or a service to a customer may have little business value to the organisation (Australian Computer Society).

Hammer and Champy (2001) describe the term "Reengineering" as a fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in a critical, contemporary measure of performance such as cost, quality, services and speed. Reengineering a company's business processes ultimately changes practically all aspects of the company including people, jobs, managers and values that are linked together. These impacts on businesses seem to have been studied under reengineering thus far.

However, the main focus of this study is to investigate into the collaboration of business processes that transcend beyond the processes of a single organisation. Bergenti et al (2002) defines collaboration as an activity of a group of people, which is a virtual team that exchanges information among members. This collaboration between multiple organisations is not taking place in a formal manner in the existing technical and business environment that requires "engineering" of new processes that are integrated across multiple business organisations.

Most re-engineering discussions until now concentrated on the business processes internal and belonging to a single organisation. All investigations related to a process within the boundary of the business that extended to another "known" business, resulted in what is described Business to Business (B2B). An alternative collaboration in regards to multiple organisations is possible when a gateway is

Figure 1. Existing environment of collaboration

Example of Existing Model of Collaboration
(Interoperation of Multiple Organizations)
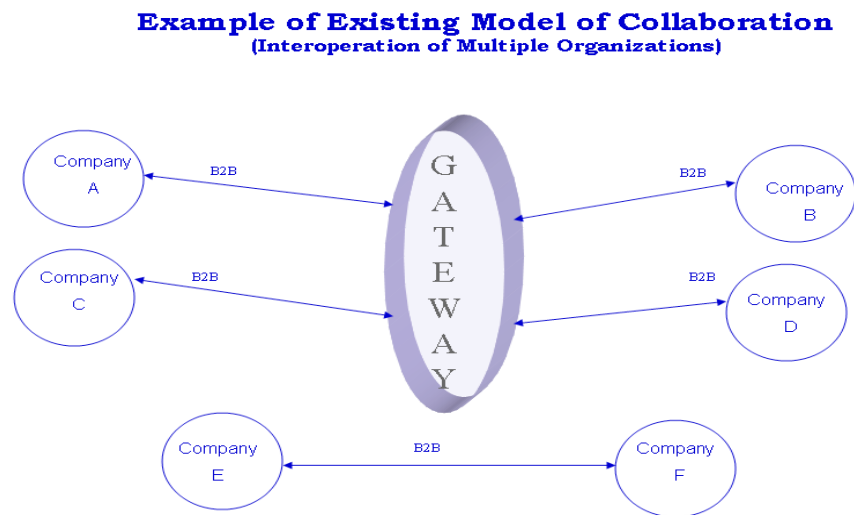
sitting in facilitating the interactions amongst the organisations as illustrated in Figure 1.

This demonstrated gateway in figure 1 is the only existing channel of collaboration between the two organisations (ordinary B2B model). The model presented in figure 1 clearly demonstrates the shortcoming of collaboration since the organisations are not in direct contact with each other. The Gateway (an individual organisation) can collaborate with many other organisations. For example, your bank (Gateway) can pay different bills to different service providers (electricity, water, phone service) through their BPay addresses. Figure 1 is an illustration of the existing environment of collaboration based on the authors' observations.

Conversely, this study focuseses on cross-organisational processes. The new engineered processes must be able to collaborate and negotiate with the organisations that are not necessarily known to each other and that may have different technical environments. Processes running through multiple organisations are the main concentration of this research. Goethals and Vandenbulcke (2006) explain that Web Services may be used for integrating systems for unknown parties. In this type of situation the infrastructure used should be built in such a way that it can easily be adapted to new requirements.

Curbera et al (2003) state that Web Services provide generic coordination mechanisms that can be extended for specific coordination protocols. Such coordination includes the execution of short-running transactions within an organisation (similar to traditional distributed transactions) and long-running transactions across organizations.

Furthermore, Fong (2005) arguess that the limited empirical evidence of successful e-collaboration is attributed not only to the short history of e-collaboration and software, but also to the challenges associated with this revolutionary way of operating and sharing information.

The challenges of e-collaboration are mainly classified where individual organisations use varying technologies and data standards that give rise to islands of networks that now need to be integrated and coordinated. Web Services can solve this problem since the WS is a new kind of web application. WS are the independent application components that take the web to new stage of development in which the other software applications can transmit and receive the required data disregard to their existing platform under operation.

As per Ghanbary and Arunataileka (2006) the technology has increased the connectivity all around the globe. Organization are globalizing faster than ever before. The global technology advancement has raised the expectations of people in their work conditions and living standards. The customer is better informed with the availability of information at their finger tips over the Internet. The Internet also has offered a window of opportunity for users to purchase products and receive services on a global scale.On the other hand the WS gives the opportunity to web applications to be discovered by other software components to conduct their business transaction.

Table 1 distinguishes between existing collaboration and the recommended way of collaborating by this study.

Table 1. Recommended investigations of the study (based on Ghanbary, 2006-Innovation Conference UWS)

Existing Model of Collaboration	CBPE (Research)
Web Services *(Dedicated)*	Web Services *(Open for research)*
No interoperation amongst organisations	Identify the issues involved in *interoperation*
Organisation must know each other to collaborate (B2B)	Organisations collaborate without knowing each other
	Their business processes will be "Engineered" in a way to collaborate
Pre-Qualification is necessary for collaboration	Identify the channels of collaboration (No qualification is required)
	Investigates trust issues between multiple organisations
	Create security for the *Engineered* channels
	Investigate the availability of the channels

Table 1 identifies that in the existing model of collaboration the full potential of the WS is not extracted, while the study will develop a model in order to exploit the full potential of WS for CBPE. Goethals and Vandenbulcke (2006) address the shortcomings of WS by arguing that many WS standards have been developed, but most of these are still immature and do not fully answer the expected challenges.

FACILITATION BY TECHNOLOGY

Emerging technologies, such as information and communication technologies (including future versions of the Internet), microelectromechanical systems, nanotechnologies, genomics, robotics, artificial intelligence, and sensors, provide enormous opportunities for enhancing health and quality of life (Eng, 2005).

The communication technologies are providing the basis for most business processes reengineering. On the other hand, mobile technologies and web services are the technologies that can be considered as the emerging technologies of today. They are creating dramatic transformation in all aspects of business and personal lives around the globe. The specific issues to be considered in the context of this study are, of course, the manner in which these technologies are influencing the business world. However, since the business world itself is a part of the overall socio-cultural fabric of the society, it is also worth considering the impact of these emerging technologies on the society in general.

As correctly pointed out by Unhelkar (2005) mobility has had a significant impact on the quality of life of individuals and the society in which they live. While the location-aware mobile connectivity has dramatically increased the ability of individuals to communicate, it has also produced challenges in terms of privacy and new social protocols. The effect of globalization now needs to be further considered in the context of a global-mobile society. Stacey and Unhelkar (2004) describe WS as a promise to expand and enrich the existing distributed computing arena with their ability to connect disparate systems and allow communication between them from anywhere and on any platform. Web Services promise to revolutionise the way in which companies interact with each other and also how they come together or discover each other to form business alliances.

The need arises to consider multiple aspects of the technological transformation, as mentioned above, due to the fact that the current transformation could be considered as one of the most thorough and significant changes to people and society since, perhaps, the industrial revolution of the 18th century. These major socio-cultural changes will also definitely affect the next and upcoming generations of businesses in various ways that may not be obvious at this stage. For example, business processes transgressing organisational boundaries would require unique business arrangements and agreements in order to carry them through.

The phenomenal growth of mobile technology has created a new culture in the business world. The use of mobile and Web Services (WS) has passed their boundaries to a business revolution. The new technology has capabilities of text, voice and videoconferencing using wireless devices as well as the ability to connect to the World Wide Web. Pashtan (2005) indicates that Web Services can replace less-flexible methods for information exchange. He also states that with Web Services multiple WSDL interfaces can be defined for accessing a service and multiple clients can make use of the provided access methods.

The application of the WS will give this study the opportunity to implement the cross-internal organisational boundaries, beyond the simple exchange of information considering that Web Service's main purposes are basic request and response functionality. Linthicum (2004) states that WS deliver additional value to application integration, including a standard application for publishing and subscribing to software services, local and remote. XML provides a common data-exchange format, encapsulating both data and metadata. This allows the various applications and databases to exchange information without having to understand anything about one other.

The expansion of Mobile Technologies will also provide a robust basis for the organisation's desire to reach a wider customer and corporate base. This study will concentrate on the assessment of a business in the context of WS and MT and discusses the approach of transitioning to a new collaborative mobile organisation with the aid of emerging technologies. Figure 2 represents the explained model in more detail.

With the aid of mobile and web services technologies (Mobile Web Services), the proposed application, demonstrated in Figure 2, will give the opportunity to multiple organisations to communicate with each other in one transaction if desired. Considering Davies et al (2004) stated that the Web Services initiative effectively adds computational objects to the static information of yesterday's Web, and therefore offers distributed services capability over a network. Web Services have the potential to create new paradigms for both the delivery of software capabilities and the models by which networked enterprises will trade.

As shown in Figure 2, an individual business process could cross different organisations until one request is complete. In order to purchase airline tickets and book for hotel rooms or other related queries, Collaboration and communication will take place within these organisations until the initial request is completed. These collaborating organisations that have m-enabled WS make it possible for sale/service providers to benefit all people involved in the process.

KEY RESEARCH INVESTIGATION

As it could be seen in Figure 2, the businesses are collaborating across each other even on different platforms/frameworks with the aid of XML, WSDL and UDDI. With the aid of mobility (Location Based Services) the communication could take place without the consideration of geographical and time boundaries. (Anywhere at anytime).

Figure 2. Key research iInvestigation – Business processes across a cluster of organisations (In this example, Travel Agency of a Cluster)
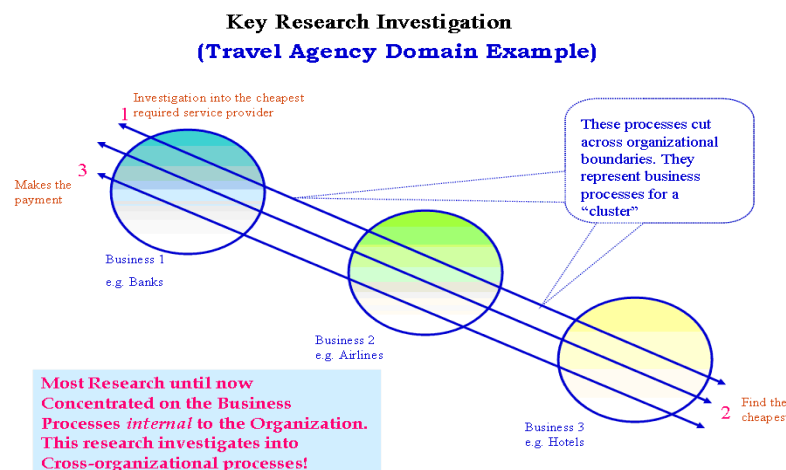
Firstly, in order to purchase the numbers of airline tickets and hotel bookings, the transaction could take place with a request that could even happen with the aid of mobile devices.

Secondly, the request can go to the airline portals and make sure that the tickets for the destination are purchased. The purchase does not have to be from one specific airline and could be purchased from many airlines that are not even known to each other. Prior to this collaboration between their business processes they probably did not even know about one another's existence. With the recommended system their business processes can collaborate with the aid of WS or Mobile Web Services (MWS).

Thirdly, the same processes could take place in order to book the hotels in the destination city.

Fourthly, the bank has the capability to pay them and integrate with their processes without any prior agreements.

IDENTIFIED CHALLENGES INCORPORATING CBPE

To incorporate this proposed new world of collaboration there are many identified issues and difficulties. These issues include:

- Technical – Methodological – Social issues of *interoperability*
- What are the *requirements of the "manager"* of the Directory Services
- The basis for *trust* amongst participant businesses and between the businesses and the manager
- The basis for a *successful business model* for the manager of the collaboration.
- The *benefits* for the participated organisations.
- The *concerns* of the participating organisation.
- The best technical *model for CBPE*.
- The *security*, *convenience* and the *availability* of the channels.
- To *convince the organisations to adapt* Web Service considering the limitation of WS. (Eg: slow speed of XML)
- Identify the *dynamic aspect of collaborations* wherein organisations can enter and exit the collaboration at will
- Identification of the *factors influencing collaborative business processes* such as issues involving the trust.
- The limitation of business or *technological issues* to create the best environment of collaboration.

THE ELEMENTS INVOLVED IN THIS STUDY

Today, mobile devices have surpassed the numbers of personal computers in use. The number of WAP enabled devices has also surpassed the numbers of PC enabled Internet users. As outlined by Pashtan (2005) over 100 million wireless Internet users were recorded as at September 2003. The majority of users are in Japan and Korea, while fast growth rates are being experienced in Europe.

Therefore the MT, which are a convergence of communication, computer and Internet technologies with mobility is a relatively new but fast growing area. The impact of mobility is an important element of the mobile transition process that is felt at both business and personal levels (Ghanbary, 2006).

Jamalipour (2003) explains that current network architectures used in either the wired Internet or the cellular networks would not be appropriate and efficient for any future wireless mobile Internet, even if we assume that the cellular network will provide the major infrastructure for the mobile Internet. He finalises by saying that the access to the mobile Internet is slow, expensive and confusing.

The access and connection to the Internet and the functionality of the WS or MWS have also become very simple and ubiquitous. These facilities have opened up opportunities for organisations to revolutionise their business processes. Undoubtedly, improvement of the communications technology has impacted not only the business domain but also the socio-cultural domain. The reason that the service model is so attractive is its ability to incorporate standards and open protocols for calling services and transmitting data (Unhelkar and S'duk, 2005). WS make software functionality available over the Internet so that programs can request a service running on another server (a web service) and use that program's response in a web site, Wireless Application Protocol (WAP) services, or other applications. The possibilities are endless.

Normal day-to-day activities become more related to the way we communicate with each other. Faster transfer of data, transactions and communications, which are independent of location and time, and with the identified functionality of mobile devices has become the mainstay of all challenged business processes.

The impacts of ICT (such as Internet, mobile and so on) on people's lives has been an evolutionary transformation. For example, at the beginning of the Internet age, with the aid of its communications capabilities, businesses were transformed to e-businesses. Ranjbar (2005) states that many technological products that were first considered by people as luxuries were later consumed as necessary items in daily life. IT products are of no exception. If the computer was an item of luxury in the 1980s, it has since established itself as an essential component of most contemporary homes. Like electricity, water and gas, information seems a necessary commodity for running everyday home life in a modern society. As one may turn on a tap for water and press a switch for light, one can also switch on the computer and obtain information and numerous IT-based services.

The Internet is described as the most powerful tool that brings information to our homes and offices like water and electricity that come by power lines and pipes (Ghanbary, 2003). Now, MT are allowing the information to be accessible anywhere and anytime with the aid of advanced mobile gadgetry.

Thus Mobile Technologies along with WS would form a formidable front in tomorrow's technology. As far as the emerging technologies are concerned the major areas of investigation would be:

- Technological issues such as modeling of the WS applications (extracting the full potential of Web Services)
- The issues and challenges in incorporating Web Services in businesses with the aid of Mobile Technologies.
- The subsequent mentioned issues and challenges of CBPE.
- The software applications that would facilitate business processes to collaborate across multiple organisations.

The methods to transit from already e-transformed businesses into collaborative may be m-enabled collaborative business process engineering is an important part of this study. In order to find the most suitable transformation method, the authors are investigating the suitable organisations to have the capability of demonstrating the smoothest transition.

As per Ghanbary (2006) it is very crucial for all parties involved in the process to know that there are some changes to take place since people must be prepared to adjust themselves. The training is the most suitable method for internal parties of the organizations however it is very important to provide sufficient information to external parties and advise them about the change.

CONCLUSION

The introduction of CBPE was described in this paper, and also the technologies supporting the recommended concept were identified. At the same time other important issues such as challenges faced by organisations participating in such a collaborative environment and studying the environment were also outlined. However, further research is in progress to construct and re-construct the model across multiple organisations to explore this concept to create better collaboration and interoperation amongst multiple organisations. The authors strongly believe that the organisations, as well as their customers, can greatly benefit from CBPE.

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