Technical and Logical Issues Arising from Collaboration Across Multiple Organisations

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ABSTRACT

This paper discusses the technical and corresponding logical modelling issues arising out of Collaborative Business Process Engineering (CBPE). These modelling issues are based on the technologies of Service Oriented Architecture (SOA) and Web Services (WS). Business Process Modelling Notation (BPMN) is applied in this paper in order to present the proposed model of collaboration across multiple organisations. The uniqueness of this research, and the ensuing discussion, is that the collaboration between multiple organizations is envisaged through a 'yellow pages' and not through the known business-to-business (B2B) interaction. As a result, the collaboration discussed in this paper requires applications to publish, locate and communicate with each other across disparate technical platforms.

Keywords: Web Services, Service Oriented Architecture, UDDI Directory, Business Processes, Trust

INTRODUCTION

This paper describes how business processes of multiple organizations can successfully collaborate with each other. The ideas presented in this paper extend the now well-known concepts of B2B (Business-to-Business) collaborations, and apply them to multiple organizations that may not be known to each other and yet may want to get together electronically to satisfy a particular business demand.

B2B integration (or Business Integration) is a secured coordination amongst two or more known businesses and their information systems. It has dramatically transformed the way business is conducted between specific business partners, suppliers, customers and buyers. According to Microsoft, business process integration enables businesses to link their multiple business processes. Such integration of business processes results in what Gates (1999) has called a 'Digital Nervous System' or DNS. Building business-to-business (B2B) e-commerce systems presents many challenges to the system architect. Each company involved, stores its data and documents in formats that are likely to be different from the formats used by the other participating companies. There is, obviously, a need for companies to integrate what tend to be vastly different systems http://www.microsoft.com/technet/prodtechnol/biztalk/biztalk2000/evaluate/biztalka.mspx.

However, with the advent of Web Services (WS) and Service Oriented Architecture (SOA), it is now possible for businesses to offer as well as locate and consume services irrespective of the physical location of awareness of these businesses with each other. According to Hao (2003) SOA is an architectural style whose goal is to achieve loose coupling among interacting software agents. The SOA achieve loose coupling among interacting by employing a small set of simple and ubiquitous interfaces to all participating software agents. The interfaces should be universally available for all providers and consumers. Also descriptive messages constrain by an extensible schema delivered through the interfaces. A schema limits the vocabulary and structure of messages. An extensible schema allows new versions of services to be introduced without breaking existing services http://webservices.xml.com/lpt/a/1292.

This technical ability of businesses to collaborate with each other has lead to some interesting challenges in terms of both the technologies and the resulting logical interactions between businesses. These challenges emanate from the fact that in CBPE, we are attempting to model services that can be offered and consumed by organizations that may be unknown to each other electronically. This ability to offer services by publishing them on the Internet, and then locating and consuming them, results from the ability of web services to 'transcend' technological boundaries and environments, as discussed later in this paper.

As a part of the development of model for successful collaborative business process engineering, many important issues and challenges were identified and studied. Based on the three-dimensional process framework developed by Unhelkar (2005), these issues and challenges could be broadly categorised into technical, methodological and social challenges. Technically, the challenge is to study the simplicity of implementation of Web Services and their corresponding security and performance issues. These technical issues, revolving around Service Oriented Architecture (SOA) further expand into identifying the availability and management of the various channels of transaction capabilities between the collaborating organizations. Methodologically, the challenge is to identify, model, evaluate and investigate the impact of collaborative business processes on the structure and dynamics of the collaborating organisations. Socially, collaborations lead to challenges in terms of privacy, trust, legal as well as cross-cultural issues between the organizations.

The paper is presented as follows: Starting with a literature review in the area of business collaboration, the discussion deals with the web services technologies and models and the integrated collaborative business processes using a standardised business process management notation (BPMN). Finally, the impact of collaborative web based system on trust is discussed, and concluded with the potential for a successful CBPE model resulting in business integration across multiple unknown businesses.

LITERATURE REVIEW

The advent of the Internet and computer mediated communication has intensified the nature of collaboration between businesses. This is so because of the ever increasing ability of the Internet to enable business applications to interact with each other quickly. The resultant electronic collaborations (e-collaborations) are also broadly defined as collaboration among individuals engaged in a common task using electronic technologies http://cits.tamiu.edu/kock/pubs/journals/2005JournalIEEETPC/KockNosek2005.pdf.

The existing literature does not explain in sufficient detail how to extend the aforementioned electronic collaboration across many organisations that would enable them to share their products and services. We believe that such an extension is possible through the application of Web Services technologies. This belief also appears to be supported by Goethals and Vandenbulcke (2006), who mention that Web Services could be used for integrating system for collaboration even amongst unknown parties.

Fong (2006) describes the main challenge of the collaboration when the involved organisations have to make the investment necessary for replacing redundant or older system as well as building a dynamic platform that incorporates multiple standards. The challenge is further increased when, in unstructured e-collaboration (without prior contract), creating or exchanging of non-standard documents takes place.

Web Services are a suit of technologies that enable web applications to 'talk' with each other independent of their technical environments. Web Services are based on XML (), WSDL () and UDDI (). Web Services is a newly emerging distributed computing model for the web. S'duk and Unhelkar (2005) define Web Services as an attractive service model able to incorporate standards and open protocols for calling services and transmitting data. Web services 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 website, WAP service, or other application. According to Unhelkar & Deshpande (2004), Web Services based technologies enable applications to "talk" with one another even across organisational firewalls, resulting in an opportunity for a cluster or group of organisations to simultaneously transition to Web-based entities.

Tilley, et al, (2002) describes the WS as a novel approach to engineer and deploy software solutions such as cooperative information systems. Snell and Tidwell (2002) define WS as a network accessible interface to application functionality, built using standard Internet technologies. Another definition by Cerami (2002) state that any services that are available over the Internet, uses a standardised XML messaging system, and are not tied to any one operating system. Thus we see that WS tend to offer opportunities that are way beyond the business integration that is commonly discussed and that merely talks about document exchanges. For example, it is very important from this research point to note the view of Kirda, et al, (2001), who declares that Web Services hold the promise of considerable gains for many organisations by giving them the opportunity to develop techniques to effectively integrate disparate applications by leveraging computer technology. Not only do integrated systems can provide better business value by sharing data, communicating results and improving overall functionality, but the mere ability to integrate systems opens up doors to synergise between systems of disparate organizations.

The ability to promote as well as locate services, however, is provided through Universal Data Dictionary Interface (UDDI). UDDI is a platform-independent, XML-based registry for businesses worldwide to list themselves on the Internet. Enterprise UDDI Services is a key element of Web Services infrastructure that provides a standards-based solution for discovery, sharing, and reuse of Web services, helping to maximize the productivity of developers and IT professionals. The purpose of UDDI is to allow users to discover available web services and interact with them dynamically. The process can be divided into three phases: Searching (discovery), Binding, and Executing.

Roy and Ramanujan (2001) states that UDDI specifications provide a mechanism to register and locate WS. It defines an electronic business registry where businesses can describe their business and register their WS as well as discover and integrate with other businesses that offer Web Services.

Considering, Goethals and Vandenbulcke (2006) emphasis that the UDDI is currently not the best means for realising Web Services discovery since they are accessible to anyone resulting the pollution of the registries. Hence, UDDI will allow companies to publish information about the Web Services they offer in a Universal Business Registry (UBR) that will be accessible by anyone. The solution would be to use the private UDDI or WSIL (Web Services Inspection Language).

The study of the existing literature brings us to the following questions as mentioned in the report by microsft.com. As the number of companies that offer Web-based services increases exponentially into the millions, how do buyers looking for a specific service find all of the potential sellers who can meet their needs?

Considering Pollock (2002) opinion that most problems contributing to the high failure rates of integration projects are not technical in nature, but logical, the following will recommend a technical/logical model to resolve already identified problems.

THE WEB SERVICE TECHNOLOGIES

The research is facing many challenges as it investigates the issues involved within the collaboration across multiple organisations. For example, there are the issues of how to create the proper channels of collaboration, what is the confidence level of these created channels and how these organisations could trust and collaborate when they do not even know each other?

As mentioned previously, it was realised some of the challenges such as the channels and their availability are technical issues. The issue of trust can be classified as a logical issue dealing with human factor. This study needs to investigate and identify a way for technology to solve the human related factor of trust. The study further revealed the need to put in place a mechanism in for organisations to define/publish and locate/consume each other's applications specifically when they are not even aware of each other's physical existence.

Figure 1 (Unhelkar, 2003), explains how Web Services are able to define and publish at the same time locate and consume services and applications. While the XML application is defined by WSDL and published by UDDI the same application is located by UDDI and can be consumed by WSDL. Therefore the application can talk even when the organisations are using disparate platforms.

The circle on the left hand side present that the Web Services, specifically WSDL define the XML application and the UDDI publishes the application. And, on the right hand side circle, the UDDI locate the original XML application that was submitted by left hand circle and the WSDL of the right hand side circle consume the application.

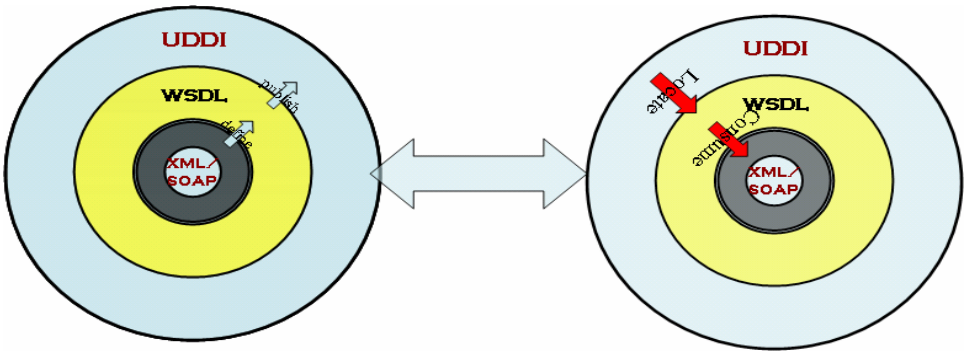
The literature review on the concept of the WS triggered the study by applying the existing technology of Web Services to propose a new model of Collaborative Web Based System (CWBS). The applications of the multiple organisations could be defined/published and located/consumed.

The literature review clearly explained how the WS specifically the UDDI could be applied to create entirely new channels of the collaboration that will not pollute the UDDI directory.

The study proposes two levels of the UDDI directories to register the organisation's information. The first level registers the industries while the second level registers organisation information such as name, address, products and services offered.

The channels of collaborations are illustrated in Figure 2, by identifying that UDDI directories can also publish and locate applications, the demonstrated model was automatically validated hence the different level of the UDDI's directories could also communicate with each other.

Figure 1. The Web services model (Extracted from Unhelkar (2003))



The level 2 directories would not be able to communicate with each other directly. The submitted applications can only published/located through level one directory for the better management of the CWBS.

Figure 2 will present the unique model of the collaboration amongst the multiple organisations that necessarily are not known to each other. These organisations might never have business agreement prior collaborations.

The red dotted line in the picture present a request entering the Collaborative Web Based System (CWBS), based on the request, the CWBS send the request to the first level to identify the industries involved. Then, the system will send it to level 2 in order to find the organisation capable of handling the request and submit the application. The proposed model will have the capability the send the application (request) to multiple organisations either in same or different industry until the process is competed and submitted back, informing the client of final result.

The system is also capable of performing another transaction by submitting the application back to the first level to find the related industry for further processing in the level 2. This classification places the industries as well as the organisations in the allocated place to make it very easy for their publication and location without polluting the directories.

The Figure 2 also illustrate how the organisations and the users not adapting the Web Services will remain outside of the model, unable to use or register in the system (Red organisations). However, if an organisation or a client using the systems facilities, but not registered, are allowed to use the system as long as they are using the Web Services. (Green organisations)

The application will return back to the client after completion, informing the finalisation of the request by supplying all the related booking and transactions numbers. The red dotted line shows existing channels of collaborations across the organisation and clearly shows how the participants could collaborate.

PROPOSED BUSINESS PROCESS MANAGEMENT NOTATION

In this section of the paper, the authors present the Business Process Management Notation (BPMN) designed for the software implementation of the proposed model in Figure 2. Business Process Modelling Notation (BPMN) will provide businesses with the capability of understanding their internal business procedures in a graphical notation and will give organizations the ability to communicate these procedures in a standard manner. Furthermore, the graphical notation will facilitate the understanding of the performance collaborations and business transactions between the organizations (http://www.bpmn.org/Documents/NWG-2001-09-01R4%20Charter.pdf).

Figure 3 depicts the process where a prospective member is ready to register in the system. It is very important to note that different prospective members such as user, person (`Doctor`, `Patient`) and organisations could connect to the Collaborative Web Based System (CWBS) to register. The CBWS does not classify them as a member until the registration is completed.

Prospective Member connects to the CWBS and requests to register in the system. The CWBS prompts the appropriate member registration form to the prospective member to enter the relevant details. If the information is insufficient or incorrect prospective member is asked to input correct details.

Then, CWBS prompts that the registrations form to be submitted and the prospective member submits the registration form. At the end, CWBS registers prospective member sending a unique registration number. The system recognises the prospective member as a member and allows the client to log out of the CWBS.

As depicted in Figure 3, the developed system is ready to accept registration of all prospective members. A prospective member could be any one of the following persons (user of the `system`, `doctor`, `Patient`) or an organisation such as police, insurance company, pharmacist, hospital, Health care system or any other organisations.

In Figure 4, the CWBS places the registration in the allocated directory in order to avoid the pollution of the directories. The CWBS identifies the relevant member industry from the registration form. The CWBS identify the industry's registration by informing the administrator for further direction if the industry does not exist. The directory level 1 will receive an identification number from that specific member and the CWBS register the member details of the member in directory level 2. Finally, the system stores the member details in the database. This is an automated process and only instance of human actor involvement will occur when the specified industry is not available in CWBS.

The Figure 4 illustrates how an automated process places the member details in the right place for the uncomplicated publish/locate process. The difference between the process shown in Figure 4, and a non-collaborative business process would be that the non-collaborative business process would *not* have the directories.

Figure 5 further illustrates the nature of CWBS. In Figure 5, channels of identifying a desired organisation are based on directories where the product and services they offer are stored. The process is triggered when a client submits a request (an inquiry) to the CWBS. It is very important that the user is using the Web Services. CWBS accept the request and identify the member's relative industry/industries based on the submitted request.

The CWBS prompts an optional form requesting details of registration if the Client is not a member. The CWBS prompts a message denying the request when there is no prior registry of the organization capable of handling the request.

The CWBS finalize the appropriate checks and submits the application to the directory level 1. The directory level 1 identifies the industry and submits the application to suitable level 2 directory to identify the organisation capable of

Figure 2. Proposed model of collaboration across multiple organisations

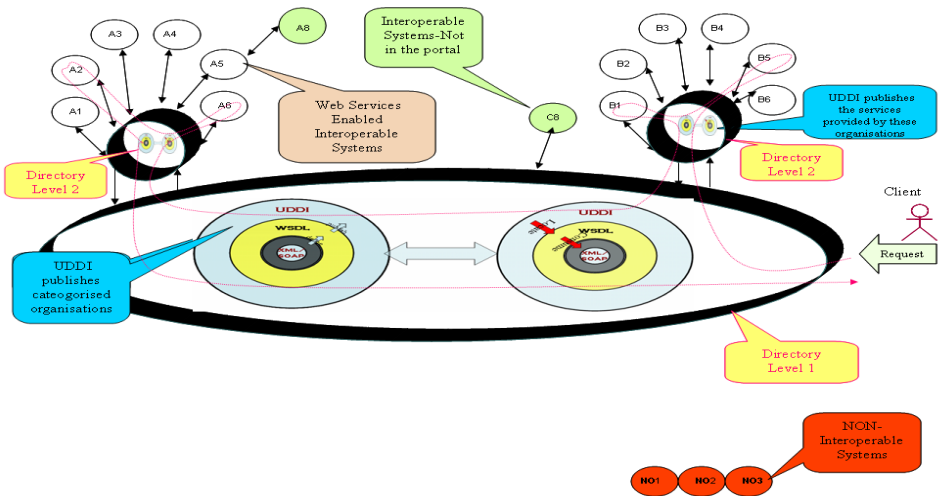


Figure 3. Registration of prospective members

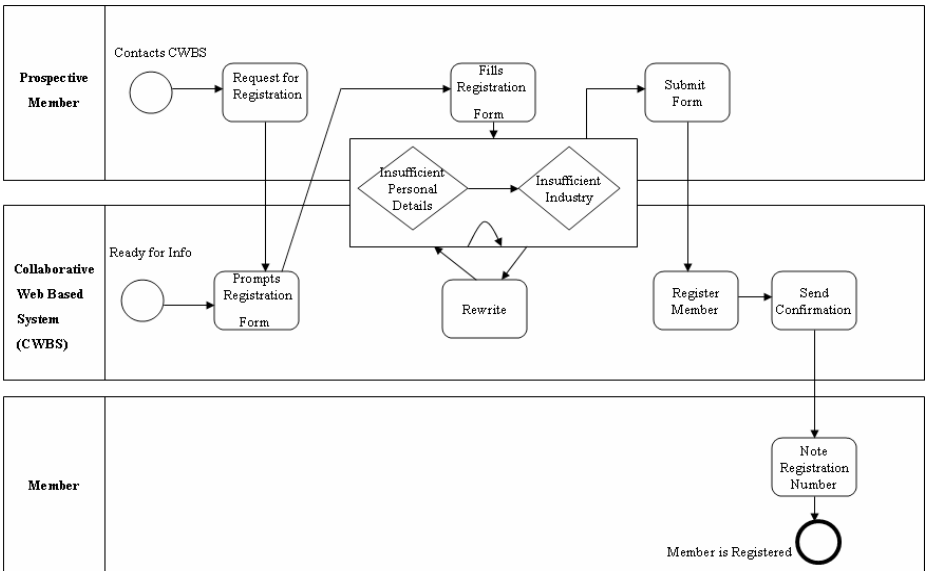
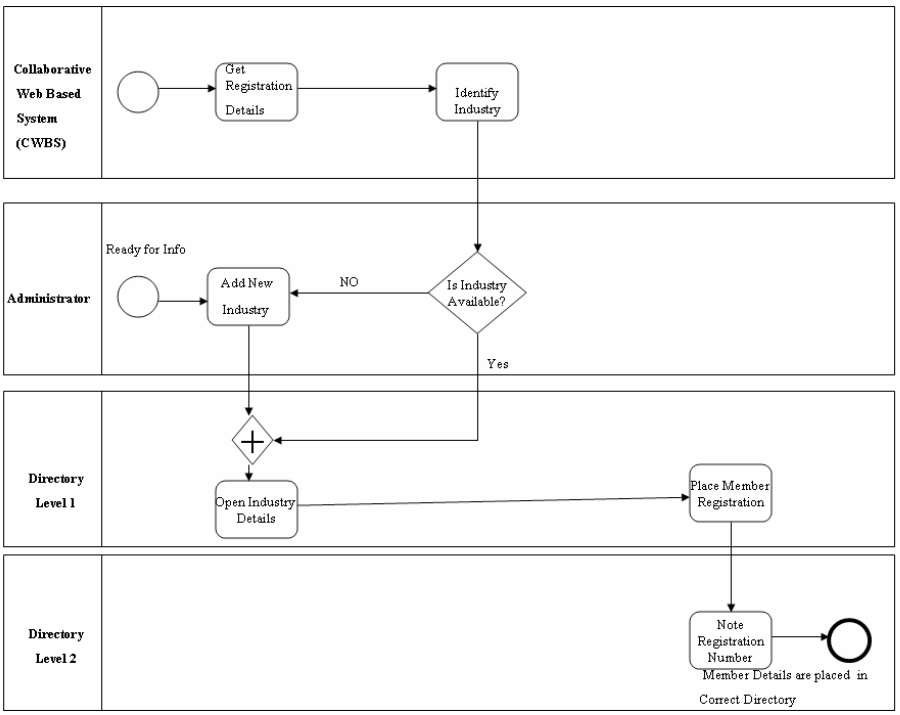


Figure 4. Place the registration in the directory



handling the requests. Then, CWBS eliminates the organisations that are not meeting the environmental boundaries (geographical, budget, member optional preferences).

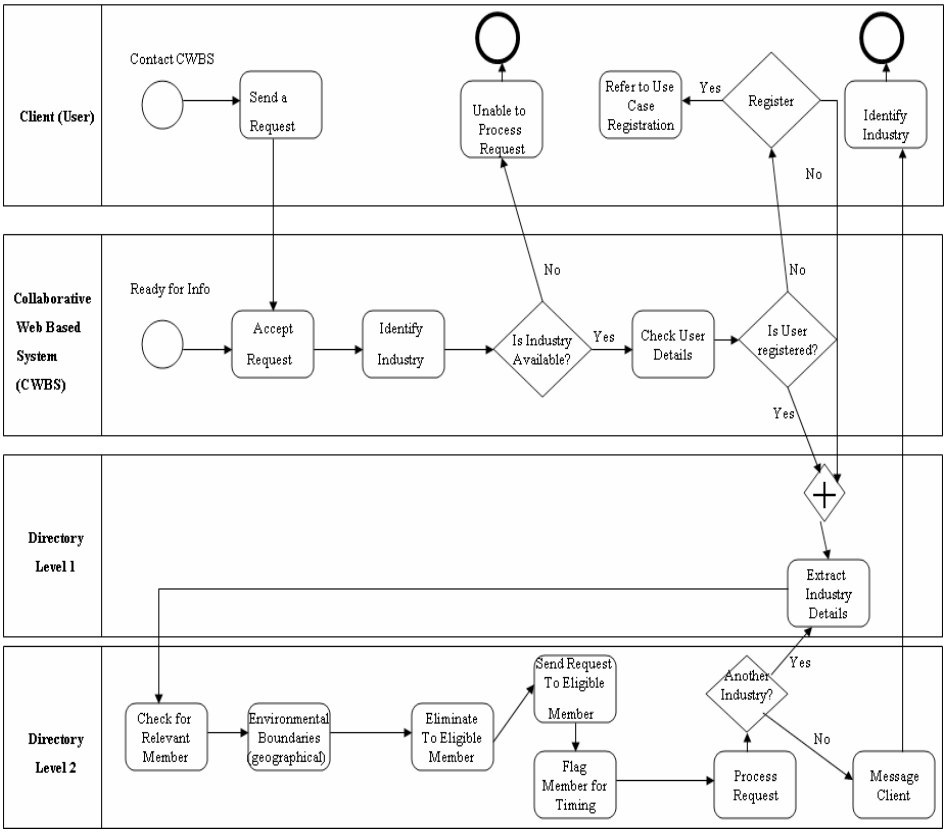
The CWBS follows eliminations of the capable parties who have received the most recent requests. In the next stage, the CWBS processes the client request and collaborates with selected members regarding request.

Right at this stage, the system flags the members involved in the process not to receive the next query. The application will return back to level 1 and if other industries should be involved in the request, the CWBS will go through the process of locating them in order to complete the request.

Finally, the CWBS prompts a message to client informing the outcome of the requested application and allows the user to log out.

Figure 5 above, illustrated the finalising of the processing a request that could be a classified as a very complex type. In this figure, the business process collaboration of multiple organisations is engineered. It is also clearly demonstrated how they collaborate without even knowing each other. The Web Services technology

Figure 5. Process service/product request



creates an opportunity for their application to process and progress regardless of the original platform used for their ordinary process.

IMPACT OF COLLABORATIVE WEB BASED SYSTEM ON TRUST ACROSS ORGANISATIONS

Having considered how the business processes of multiple organisations can be engineered in a way to collaborate, the study can focus on the trust issues amongst them. Jessup and Valacich (2006) outline three different relationships classified in the modern business world as basic, preferred and strategic. A basic relationship can be best described as buy products and services on the basis of price and convenience. Preferred relationship occurs when buyer and seller set preference and price to benefit each other and in strategic relationship both sides share risks and rewards.

The preferred relationship between the ***company*** and ***consumers*** takes place while the most influencing factor of ***trust*** is respected. Those factors are classified as positive customer service experience, length of the relationship with company, company or product reputation, brand familiarity and privacy policies. Therefore, the factors most damaging the trust could be classified as online security fears, telemarketing, company reputation by past incident, general suspicious of company and the disapprove of the company's business practice. http://www.clickz.com/stats/markets/professional/article.php/3312681#table2.

In the proposed environment, the organisations collaborate (work together) rather than compete (work against). The business processes (Applications) of the participated organisation work together to serve a customer request.

The system immediately identifies the industry/organisations involved in the process as soon as the original application is submitted. The application will be submitted to the relevant organisation in the order of priority. For example, if the client is a patient and submitting a request to appoint and see a doctor, the client is unable to purchase the medication online before the doctor submitting the prescription online.

In the given example, the application will be forwarded to the doctor for further process. The system then submits the application to the pharmacy for further processing. However, the doctor and pharmacy might not know each other, hence the system is locating the pharmacy there is really no issue of the trust involved since the client can actually carry the physical prescription to any pharmacy and purchase the medication.

This comparison shows the difference between the two processes – without and with CWBS – especially in the way in which it affects the roles played by people in the organizations and the role of the client. The application will be submitted to an organisation for further process and confidentiality of the involved organisations is indeed respected.

CONCLUSION AND DIRECTION

This research investigated the current collaboration (Business-to-Business) in order to look at possible solutions to enhance the collaboration across business processes of multiple organisations that are not necessarily known to each other. The business processes were studied in order to find the suitable channels of collaboration and evaluate the availability and the level of confidence of the proposed channels.

The paper explained how Web Services can facilitate engineer the collaborative business processes across multiple organisations. The logical challenge was also resolved by proposing a model of collaboration and the illustrated Business Process Management Notation (BPMN) illustrated the availability of the channels systematically and carefully under the guiding principles of the proposed directories.

As per Ghanbary (2006), when an organization undergoes electronic transition (e-transition), there is ample focus on the effect of the rapidly evolving technology on the dynamic environment as well as the structure of the organisation. Undoubtedly, transitions cause organizations to restructure and would introduce a new suite of business processes enabling them to remain in the market as well as grow by dealing with greater number of customers.

In the proposed model, the confidentiality of the participated organisations will be respected while the business processes will be fully collaborative. The research will need more investigation in order to study the actual impact of the collaborative business process on social (trust and legal) issues.

ACKNOWLEDGMENTS

The authors wish to acknowledge the support of the University of Western Sydney, School of Computing and IT.

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