

A Supply Chain Management for SMEs : Malaysian Batik Industry

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ABSTRACT

The current practices in small and medium scale enterprises (SMEs) indicate absence of prompt and effective information sharing among business partners in the supply chain. The existing supply chain of Malaysian batik industry that consists of supplier of raw materials, batik makers, wholesalers and retailers indicate weak integration in terms of information sharing and managing flow of materials along the value chain. This has led to the problems of inventory management and thus resulted in *stock overflow* where supply exceeds demand or *stock out* when demand exceeds supply. To batik industry, this lack of information sharing of supply and demand results in loss of sales or high cost of inventory stocks. This paper aims to propose an integrated framework of cooperation among business partners within an appropriate framework of supply chain that has the characteristics of open standard to ensure interoperability within the framework. Existing Business to Business (B2B) e-business framework has been reviewed and ebXML was found to be a suitable solution for SMEs due to its characteristics; open standard, non proprietary and less expensive. This paper starts by discussing several issues in batik industry businesses, their problems and the limitation of applying IS in their SCM. It follows by presenting a framework of cooperation using ebXML in the batik industry supply chain.

KEYWORDS

Supply Chain Management, Small Medium Enterprises, information sharing, ebXML

1.0 INTRODUCTION

According to Malaysia Small and Medium Industries Development Corporation (SMIDEC), small and medium enterprises (manufacturing) are enterprises in the manufacturing, manufacturing related services and agro-based industries with full-time employees not exceeding 150 or with annual sales turnover not exceeding RM25 million [25]. With the above definition, the batik industry is categorized as Malaysian SMEs (manufacturing). Statistic shows that 2.6% of batik makers are in the medium sized category with more than 50 employees, 23.3% are small businesses with employees between 11 to 49 and 73.7% are family-owned batik producers with employees less than 11 [11].

The batik textile is one of the most decorated textiles from South East Asia, unique in its design and colors. The Malaysian batik is common attire in Malaysia and is worn by both men and women. Today the popularity of the batik textiles is not only confined to the Malays but is equally favored by the Chinese and Indians. Batik is a technique used to decorate a woven cloth with designs using wax to resist the dye from penetrating into waxed area of the cloth during the dyeing process. This technique provides an unlimited range in design possibilities and artistic freedom because the source of patterns is obtained from actual drawings. In Malaysia today, most of the batik producers are situated in the states of Kelantan and Terengganu along the Peninsula East Coast. There are, however many smaller batik producers scattered around the country including the East of Malaysia. The types of materials used for batik making are mainly cotton for block print batik and silk for hand drawn batik.

There are many issues faced by the batik industry; slow manual procedures in making batik technique, poor quality control, competition from textile manufacturers, poor branding strategy and promotions and absence of supply chain management system are examples that hinder the industry from being efficient and global business players.

The current batik industry supply chains indicate weak integration in terms of information sharing and managing flow of materials along the value chain. Which has led to the problems of inventory management and thus resulted in *stock overflow* where supply exceeds demand or *stock out* when demand exceeds supply. To batik industry, this lack of information sharing of supply and demand results in loss of sales or high cost of inventory stocks. This paper aims to propose an integrated framework of cooperation among business partners within an appropriate framework of supply chain that has the characteristics of open standard to ensure interoperability within the framework.

2.0 LITERATURE REVIEWS

2.1 Supply Chain

Traditionally, most organizations have viewed themselves as entities that exist independently from other organizations and definitely to compete with them in order to survive. However, this situation cannot continue in today's businesses because of the highly competitive, global business environment, and the extraordinary explosion in technology. In today's environment, the ultimate success of a single business will depend on management's ability to integrate the company's complex network of business relations [12], which leads to the motivation of continuous evolution of the supply chain.

A supply chain is generally comprised of three forward backward flows: material, information and financial. These flows move through a network consisting of suppliers, manufacturer, distributor and customers. Figure 1 shows the flows of a typical supply chain.

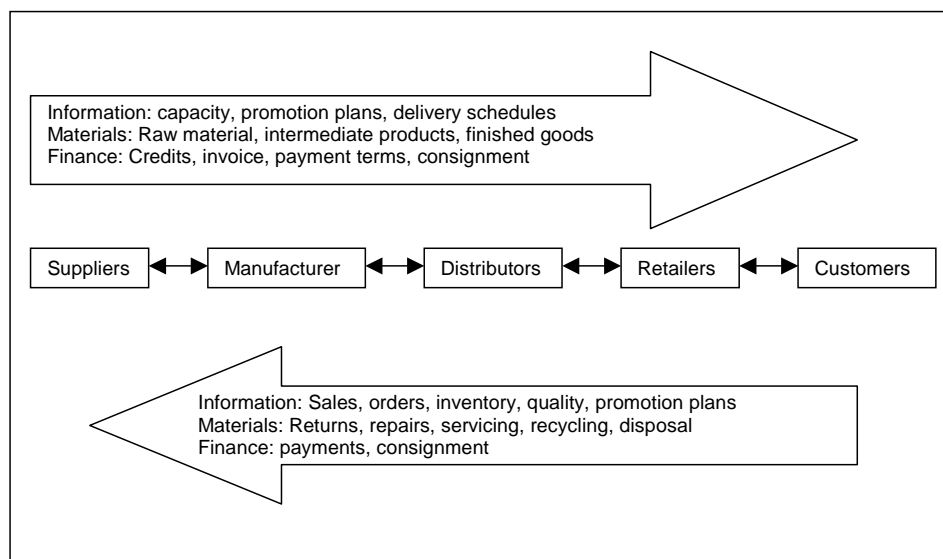


Figure 1. Supply Chain Flows (adapted from [13])

2.2 Information Sharing in Supply Chain

Information sharing is therefore a vital aspect of coordination among members of a supply chain and has received considerable attention from academicians and practitioners. Many studies have found that information sharing has great impacts on supply chain performance, especially in reducing the bullwhip effect [14, 27]. Information sharing enables companies to make better decisions in their operation, which leads to better resource utilization and lower supply chain costs. Information sharing also facilitates supply chain coordination among the chain members, provides mutual competitive advantages in taking out cost from the supply chain. Several examples from industrial

practices show the positive impact of information sharing on supply chain performance. Dell, a computer firm, utilizes online information sharing that provides visibility of customer orders to computer parts suppliers. The suppliers are able to see what parts Dell needs. As a result, the suppliers can reduce inventory on-hand as well as delivery lead-times [24].

Information sharing, which is a form of information integration, is a key element to achieve tight integration among the supply chain members. There are many types of shared information in the supply chain including sales data, inventory status, order status, production capacity, production schedules, production cost and other related cost data [15]. The shared information may vary from one environment to the others depending on types of organizations and their relationship linkages.

2.3 What is the right supply chain for batik?

According to Fisher (1997) [7], problems of supply chain are associated with mismatches between the type of supply chain and the type of product. The two types of products are, *innovative* and *functional*. *Functional* products have stable, predictable demands, long lead times, and price sensitive and low margins, for example groceries products. This type of products need supply chains that are efficient logistically. While *innovative* products are unpredictable (volatile) demand, short life cycle and high profit margins, for example fashion goods, apparel, high-tech product and toys that have the characteristic of rapid obsolescence, volatile markets and utilize significant production time.

As an innovative product, batik supply chain should adopt strategies that reduce uncertainty, cut cycle time, and improved flexibility. Enterprises need to react quickly during the new product's short lifecycle [7]. Information sharing is crucial within the chain. Critical decisions have to be made about inventory and available production capacity not just to minimize cost but also to position inventory and available production capacity. Batik industry supply chain requires tight integration among its suppliers, batik makers, wholesalers and retailers to effectively manage the flow of material, information, and finance within and across the members.

2.4 E-business frameworks

Based on previous literature reviews, the use of electronic business through information sharing and other kinds of inter-firm coordination, like e-supply chain, can lead to major benefits including, improved in information exchanges [18]. This results in reduced inventory levels and improved service levels [1, 2, 14], and improved buyer-seller relationships [16]. The usage of information and communication technology (ICT) plays a key role in supply chain management. The main goal is to provide information along the supply chain in the most inexpensive and fastest way possible [10].

Companies need to exchange data with their business partners to conduct business. To exchange data, business partners must have a shared understanding of their ways of doing business; i.e. business partners must understand what information they should share. Once business partners' information systems are capable of sharing information, business interactions can be automated. Exchanging data electronically has many advantages over manual transmission, like fax or phone. Some other advantages are traceability, reliability, scalability and security. However exchanging data electronically requires standards so that the applications at both ends can understand each other.

E-business frameworks are *standards* for information sharing within and between companies. The term *e-business framework* used by Kotinurmi et al. [9] is also referred as *standards B2B e-commerce framework* by Shim et al. [23] and *B2B interaction standards* by Medjahed et al. [17] in their papers. The e-business framework facilitates the interoperability of business processes, business documents and messaging [9]. Interoperability is the ability of content or systems to work together through the use of agreed standards and specifications. It covers many areas including technical, semantic, political/human, inter-community and international interoperability. The detail of each areas of interoperability listed above can be found in [26]. In this paper we are only concerned on technical

interoperability, where in general involves, the *description* of the message formats exchanged (e.g. purchased order), *binding* to transport protocol (e.g. HTTP), the sequencing, the process, the security and many more properties.

In this section we focus on the e-business frameworks that commonly used in the information exchange among business partners.

2.4.1 Electronic Data Interchange (EDI)

Electronic Data Interchange (EDI) is an example of such standards mentioned in the previous section. It is one of the early attempts to do business electronically. EDI specifies no universal data format, each EDI implementation has its own customized data format [28]. It is rather inflexible, therefore it is difficult to switch business partner, e.g. to change supplier who may offer goods at a lower price. This is a major drawback for flexibility especially for B2B e-business. EDI is often criticized for being expensive, particularly for the small and medium enterprises (SMEs) [21].

During the last decade, two major developments opened up new paths for e-business: (1) the adoption of the Internet as communication medium, and (2) the widespread acceptance of XML as the data exchange format.

2.4.2 XML-based e-Business Frameworks

With the introduction of XML (E_{xtensible} M_{arkup} L_{anguage}), the infrastructure mechanism of e-Business technology has been totally changed. XML has established itself as the standard for representing data on the Web since 1998. It has become the main standard of self-describing data exchange on the Internet. Its power lies in its extensibility and ubiquity. XML documents are human readable, anyone can invent new tags for particular subject areas and define what they mean in the document type definitions (DTD) or schemas. Compare to EDI, XML is very flexible and interoperable [3]. Many XML-based e-business frameworks existed in the last few years such as RosettaNet, ebXML (Electronic Business XML), xCBL (XML Common Business Library), CIDX (Chemical Industry Data eXchange) and commerce XML (cXML) [9, 20]. However ebXML claims to be suitable for SMEs,

*"We especially recognize the opportunities that XML offers to **small and medium sized companies**, to developing countries, and to economies in transition. It enables them to enter easily into the world of electronic business and, as a consequence, could bring very significant additional growth to world trade."*
[6]

2.4.3 ebXML

Electronic Business XML (ebXML), is an ongoing effort jointly initiated and driven by the Organization for the Advancement of Structured Information Standards (OASIS) and United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT). ebXML provides an infrastructure that allows enterprises to find each other's services, products, business processes, and documents in a standard way and thus helps to facilitate conducting electronic business. The initiative leverages from the success of EDI in large businesses, and intends reaching business of all sizes including SMEs. It provides open standards and the specification are free of charge to anyone, with no royalties or fees associated with the use of specifications. ebXML vision is to create a single set of internationally agreed upon technical specification that consists of common XML semantics and related document structures to facilitate global trade [5].

So, why open standard is a big issue? Open standards allow interoperability. If commercial products, or open source applications are based on open standards, then interoperability among different applications is more likely to happen. Open source projects will support open standards to allow interoperability between different implementations.

There are five key components of ebXML initiative's reference architecture [5]:

- *Business Process (BP)*, defines business processes and the associated messages and content.
- *Collaboration Protocol Profile and Agreement (CPP/CPA)*, detail business partner profile & agreements

- *Core Components (CC)*, provides a way to define company profiles.
- *Registry and Repository (RR)*, provides a means of registering and discovering business process sequences to allow information sharing and
- *Messaging*, XML message system to exchange information. Enables a uniform message transport layer.

Figure 2 shows a high level overview of the interaction of two companies conducting e-business using ebXML.

Let's assume two companies (A and B) are searching for a business partner, to trade goods or services. Company A has not trade using ebXML before, Company B however did. In this case, company A becomes aware of an ebXML Registry that is accessible on the Internet (Figure 2, step 1). An ebXML Registry contains Business Scenarios and Business Profiles (business processes, CPPs, CPAs, and other documents) that are defined in the XML standards.

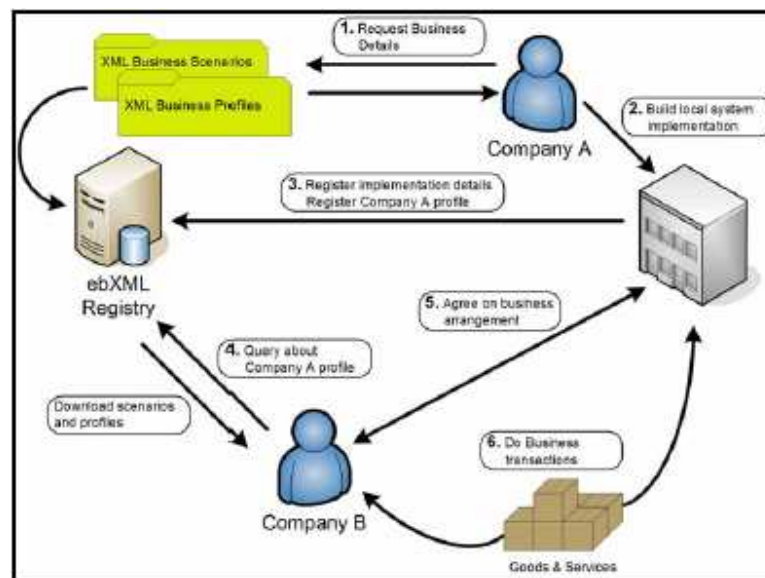


Figure 2. E-Business transactions using ebXML [19]

In order to interact with other companies using ebXML, Company A needs to build and deploy its own ebXML compliant application (Figure 2, step 2). Then Company A creates and submits its own Business Profile (CPP) information to the ebXML Registry (Figure 2, step 3). The business profile submitted to the ebXML Registry describes the company's ebXML capabilities and constraints, as well as its supported Business Scenarios. These Business Scenarios are XML versions of the business processes and associated information in which the company is able to engage. After receiving verification that the format and usage of a business scenario is correct, an acknowledgment is sent to Company A (Figure 2, step 3). Company B discovers the Business Scenarios supported by Company A in the ebXML Registry (Figure 2, step 4). Company B sends a request to Company A stating that they would like to engage in a Business Scenario using ebXML (Figure 2, step 5). Before engaging in the scenario Company B submits a proposed Business Arrangement (CPA) directly to Company A's ebXML compliant software interface. The proposed CPA outlines the mutually agreed upon business scenarios and specific agreements. The CPA also contains information pertaining to the messaging requirements for transactions to take place, contingency plans, and security-related requirements (Figure 2, step 5). Upon agreement of the CPA, both companies are ready for electronic business. To do this, both companies, exchange business documents through *messaging* according to the *business process* (BP) defined in the CPA (Figure 2, step 6) [19].

Just like other standards, ebXML is not a product but a set of guidelines that allow application and application integration technologies to support it. Users can determine at which level they want to participate. For example, the

messaging specification, released in May 2001, was designed to work with or without the other components. This provides significant flexibility and enables users to get involved with ebXML one step at a time.

3.0 FINDINGS

The current literature does not focus on Malaysian Batik Industry business processes. Due to that, several interviews were conducted to give a better picture of the current state of the industry. From those early interviews, players in the industry were identified and how they played their roles. Based on the interviews, players in Malaysian batik industry supply chain consist of *suppliers* of raw materials (supplier), *batik makers* (manufacturers), *wholesalers*, and *retailers*. The network pattern is not a hub-spoke; rather with many customers and many suppliers.

3.1 Batik Industry in Malaysia

Here we will briefly describe the roles of the players in the batik industry supply chain. The *suppliers* of batik industry are in the medium sized enterprise category, to name a few, the *suppliers* are Batik Malaysia Berhad (BMB), Samasa Batik, Persatuan Koperasi Pembatik Kelantan, Nordin Batik and Razali Batik. Since most of the raw materials used in the process of making batik like the white cloth of silk (crepe de chine, jacquard, habotai and satin/charmeuse), rayon and cotton, dyes, wax and sodium silicate are imported goods and controlled by the government, suppliers need to obtain Approved Permits (AP) from the Ministry of International Trade and Industry (M.I.T.I.). With certain conditions imposed on import requirement and financial strength of the importer, thus suppliers are normally established and financially strong companies. Next is the *batik maker*, batik maker buys raw materials from the suppliers. They may consist of small and medium sized enterprises with most batik makers are family-owned batik producers having employees less than 11. The end products of the factory may consist of silk hand-drawn batik (4 meters and 2 ½ meters), batik sarong, caftan, pareo, men's shirt, and many more. These end products will be sold to the retailers or wholesalers. *Wholesaler* buys batik products directly from several batik makers and sells them to retailers all over Malaysia, Singapore and Brunei. *Retailers* will buy batik products from the wholesalers, who will visit them from time to time. But retailers cannot rely only on the wholesaler. To have variety of designs, the retailers may have to purchase batik products by visiting several factories and make the selections themselves. Once they are satisfied with the quality and design produced by the particular factory, retailer will make future orders through phone calls and will receive the order the next day through public transportation system.

3.2 Batik Industry Supply Chain

The supply chain of the batik industry can be divided into the following categories:

1. The first category consists of the players of different entities; batik maker buys raw materials from the supplier, the wholesaler buys batik products from the batik maker and sells the products to the retailer and finally consumer buys batik from the retailer.

Supplier → batik maker → wholesaler → retailer → consumer

2. In the second category, the supplier is also the producer of batik and has shop(s) to sell their batik products to the consumer

[Supplier + batik maker + retailer] → consumer

3. In the third category, the batik maker is also a wholesaler that sells his products to the retailer.

Supplier → [batik maker + wholesaler] → retailer → consumer

4. In the fourth category, the supplier supplies the raw materials to the batik makers to produce batik for him and the supplier/wholesaler sells the batik to the retailers.

Batik maker \Leftrightarrow wholesaler/supplier \rightarrow retailer \rightarrow consumer

There may be more categories of batik supply chain available in Malaysia and the above categories are what we have encountered through our interviews. It is noted that the fourth category is the most appropriate supply chain model that represents some forms of collaboration between batik maker and supplier/wholesaler. This vendor type relationship assumes that the role of marketing the end products to the market lies with big anchor company, the materials supplier. In this case, batik maker only provides necessary expertise and labor in producing batiks determined by supplier/wholesaler. We expected the model would result in low operating cost of production, better inventory management, fast response to market demands and competitive prices of end products.

The demand for batik products are unpredictable with short life cycle and the process of producing batik is slow and laborious. As the demand is uncertain and the batik producer consumes time to produce and deliver, retailers must determine how much inventory to build (safety stock). A large inventory enables the retailer to fulfill demand most of the time. However, the batik producer has nominal capacity that enables him to produce only a certain quantity each period. Medium size enterprise like Razali Batik and Songket employs 150 workers, can produce about 100 jacquard or crepe batik pieces and 100 exclusively hand drawn pieces per day [22]. Small enterprise, batik producer, like Li Sutera Batik, Cendering Terengganu, can only produce 50 to 100 pieces per week, approximately 10 to 20 pieces a day [8].

Due to the above problems, many batik producers keep making batik all year round to create safety-stock [8]. Mohd Sahiman Salleh of D. Collections Batik is one of batik producers based in Kuala Lumpur. According to him, the batik producers would produce the batik all year round to capture the demand. His factory would produce around 50 pieces of exclusive hand drawn batik per week. According to him again, this will not only create safety stock to the product but it will also create jobs to the villages as part-timer workers. But when supply exceeds demand, product has to be marked down and sold at a loss.

3.3 E-business framework for batik industry

One of the objectives of our work is the definition of Standard XML documents/messages based on ebXML specification for B2B information exchange between business partners in the Batik Industry. This interoperability framework expected to provide easy and inexpensive system integration for the players in the supply chain.

3.3.1 Requirements for common interoperability framework

To design an appropriate solution the new architecture should include:

- **User requirements** expressed by the enterprises, regarding the data and processes that should be included in the e-business services, this includes the definition of a set of Standard XML documents e.g. purchase order, invoice etc.
- **Relevant standards**, any widely used specification defined by relevant standardization bodies must be considered during the design phase; Internet communication protocols, the protocols used for message exchanges between enterprises, and language for creating documents and messages (in our case, we have chosen ebXML standards)
- **Interoperability with other solutions** (if there is any). Open sources solutions would be attractive for SMEs because of their limited available resources.

SMEs in most cases did not model their business processes, using a modeling techniques, for example UML - Unified Modeling Language. However based on ebXML, business processes of the targeted industry (in this case Batik Industry) need to be defined in XML according to Business Process Specification Schema [4]. If the business processes are informal, most of the cases in Batik Industry, they have to be formalized and defined in XML, in order to be able to match with other potential business partners. Basically, in this industry everything needs to be defined, design and develop, including the CPP, CPA, business processes, XML Schemas, messages templates and the

registry/repository. Batik Industry or any SMEs in general are the least capable to deal with complex technological frameworks, therefore it is the aim of our research to present guidelines for the design and implementation of XML based framework for communication of players in the industry supply chain.

Figure 3 depicted, the conceptual relationship of Batik Supply Chain and ebXML. The proposed framework defines business messages and the way to exchange them, among different partners of Batik supply chain. The Registry/Repository is used to store and maintain the Standard XML documents (BPs, CPPs, CPAs) used during interchange processes. Instead of a centralized architecture (used by ASP), a peer-to-peer architecture is adopted, allowing every enterprise to communicate directly with its correspondents in the supply chain using simple software modules, and transport interface (BSI). Therefore any structures of batik supply chain (mentioned in section 3.2) will be considered.

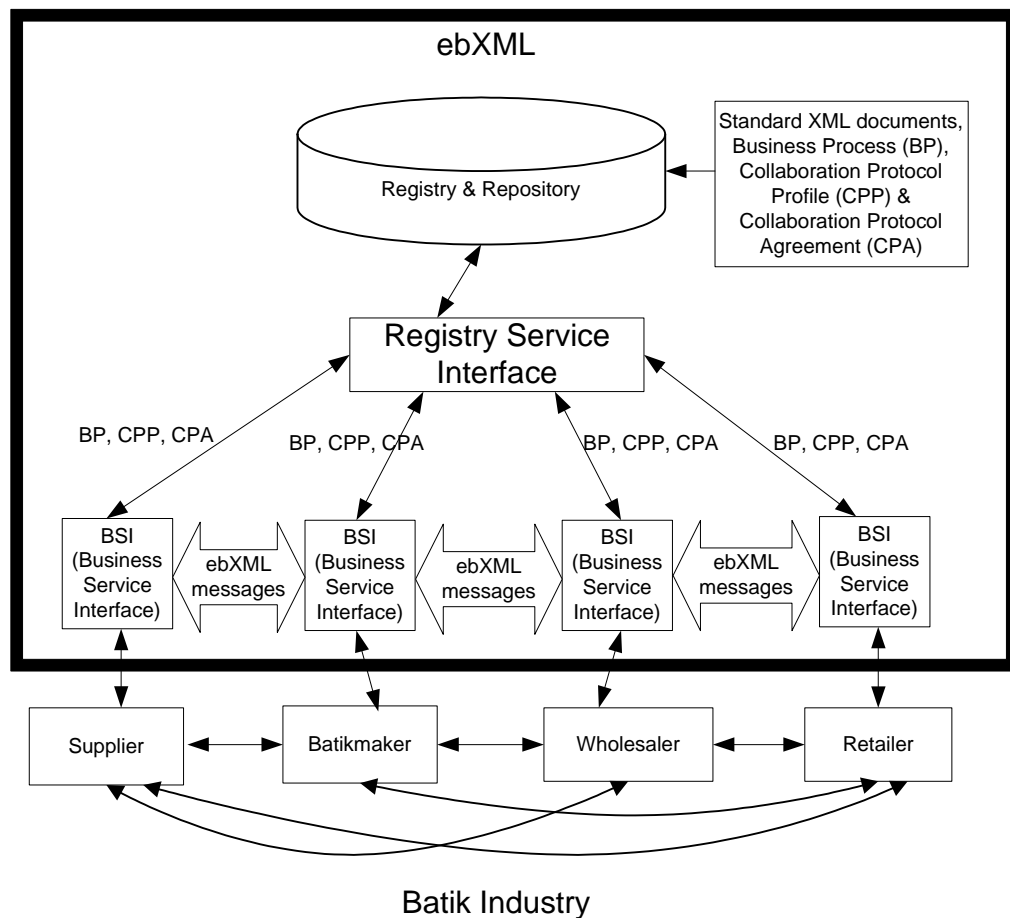


Figure 3. The conceptual relationship of Batik Supply Chain and ebXML

Development of a prototype is necessary to evaluate the framework. The prototype will test transactions of the industry; forward, receive and browse XML documents based on the electronic protocol that is compatible with ebXML messages specifications

However, to implement a complete ebXML solution requires concerted efforts of various industry stakeholders. SMEs who wish to conduct e-business using ebXML framework, need to define and describe their business processes, business documents and core components and register them in an ebXML registry. Proper coordinated works in designing the framework, enabling e-business to work should be a planned ongoing works in the future.

Fortunately, the ebXML framework is modular by design and this allows industry to use the individual framework components regardless of the others, i.e. ebXML compliance can be achieved step-by-step.

4.0 CONCLUSION AND FUTURE RESEARCH

In this paper we stress the importance of information sharing among business partners in Malaysian Batik industry. A framework was proposed using ebXML standards. EbXML is considered less expensive compare to EDI and its standards are key factors to create a common framework for data interchange between business partners in the supply chain. XML technologies will make it possible to involve SMEs with different levels of ICT adoption to integrate among business partners.

For future works, we will identify appropriate supply chain structure for batik industry. Simulation methods such as System Dynamics Simulation using STELLA and Discrete Event Simulation using ARENA have been considered to find the appropriate supply chain structure that would result in low operating cost of production, better inventory management, fast response to market demand and competitive prices of end products. Next, definition of a set of Standard XML documents, suitable for exchange of information through Internet along the supply chain, is then placed in the repository. Follows by, design system architecture to implement the framework by using UML (Unified Modeling Language) as the modeling language. Development of a prototype to forward and receive XML documents based on the electronic protocol that is compatible with ebXML messages specifications will follow after that and then testing the prototype to evaluate the framework.

We hope that one day Malaysia Batik will become as famous as Thai Silk or Irish Linen. Whether or not batik manufacture remains a cottage industry in Malaysia or becomes an integrated industry is only can be determined through the collaboration intensity of batik producing clusters in the country. Through the patronage and active support of the late Yg. Bhg. Datin Seri Endon, wife of Malaysia's Prime Minister, Dato' Seri Abdullah Badawi, in the launch of the Batik Guild, the opportunity for all stakeholders to integrate their products and service offerings is strong.

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