The roles of electronic marketplace for buyer-supplier relationship: collaborative system architecture

Han Seong Yoon[a]

[a] *Department of Management Information System, Gyeongsang National University*
900, Gazwa-Dong, Geongnam, 660-701, Korea
Tel: +82-55-751-6095, Fax: +82-55-751-1225, E-mail:hsyun@gsnu.ac.kr

Abstract

As the most widely used media of BtoB e-business, the e-Marketplace (EM) can play an important role in the age of c-commerce (collaborative commerce). In supply chain management (SCM) area, the relationship-based collaboration among partners has shown great efficiency. Although the collaboration is important in both areas of EM and SCM, there has been a critical difference in the selection of trade partners between them. In this paper, the EM's collaborative stages for integration with its customer system are reviewed and a system architecture is proposed for EM's electronic functional role within the perspective of collaborative commerce and buyer-supplier relationship. The relationship-based BtoB commerce through EM is reviewed to explain that it can be more beneficial than the commerce based on the price competitive selection of trade partners. With the proposed system architecture, an EM can be the functional medium for the collaborative IOIS system architecture.

Keywords:

e-marketplace, supply chain management, collaborative commerce, relationship

1. Introduction

Electronic marketplace (EM) is considered an approach that business-to-business (B2B) trade and collaboration among trading partners is carried out more efficiently than traditional ways (Lim and Lee, 2003; Sharma, 2002; Skjøtt-Larsen et al., 2003). A typical EM can take one of three different types; buyer (or purchaser) oriented EM, supplier (or seller) oriented EM, and intermediary-oriented EM (Lim and Lee, 2003). Supply chain management (SCM) focuses the entire set of business processes from production to delivery of goods and services to the ultimate customers (Chen et al., 2000; Simchi-Levi et al., 2003). SCM, therefore, includes numerous functional areas such as product flow, order fulfillment, manufacturing flow management, purchasing & replenishment, customer relationship management, reverse logistics, and so on (Klapper et al., 1999; Simchi-Levi et al., 2003).

In the field of purchasing and procurement, information technology such as Internet has been incorporated into e-procurement and EM for various B2B trades. Based on the recent applications of information technology in EM and SCM, it becomes clear that there is a critical difference in partner selection strategies between SCM and EM (Skjøtt-Larsen et al., 2003). In SCM, one of the purchasing strategies is to reduce the number of suppliers and to maintain a close relationship with strategic partners (Arnold, 2000; Dani, Burns and Backhouse, 2005; Seo and Shin, 2002; Welty and Irma, 2001), while EM promotes competition among potential participants.

The relationship-based B2B approaches in SCM such as QR and VMI have been considered innovative even in the field of information system (Chen et al., 2000). As an alternative to B2B electronic business, the intermediary role of EM has been explored by many strategists utilizing EM's potential as a SCM strategy. For the intermediary-oriented EM, which is neutral to a specific buyer or supplier, it is necessary to operate integrative EM and company information systems (Jung et al., 2001). Since the integrative operation of information systems between a buyer and a supplier for relationship-based trades is required, the integrative information system architecture between an EM and a supplier and between an EM and a buyer is also necessary to support the relationship-based trade among the players (buyer, EM and supplier). With the system-integrative operation, the necessary processes for B2B trades can be carried out collaboratively between the EM and the internal functions within a company.

This study attempts to outline an approach to support the relationship-based B2B trade with the intermediary-oriented EM, an architecture neutral to buyers and suppliers. In addition, this paper also attempts to review the trade process for the price in the existing EM and the relationship-based trade in SCM. If an EM is integrated collaboratively with multiple buyers' systems or suppliers' systems, the integrated system becomes a common infrastructure not dependent on a specific buyer or supplier.

The purpose and scope of this paper are outlined in

Figure 1. Relationship between EM and the information systems of a company can vary according to the internal system's level of integration and automation with groupware systems and ERPs (Lea et al., 2005; Liu and Shen, 2004), types and characteristics of EMs, features of internal processes of a buyer or a supplier and so on. This paper addresses possible integration between the EM and the internal IT functions of a company. Functions in this study refer to roles that each unit within an organization plays, such as purchasing, accounting, and production, etc. A process can be implemented for a specific business purpose throughout several functional units. For example, the review of a purchasing request and the selection of a supplier are the typical activities of the purchasing department and they are parts of the entire purchasing process (Hu and Grefen, 2003). Even for the electronic infrastructure of collaboration in SCM, the appropriate technological connection and functional integration architecture are necessary.

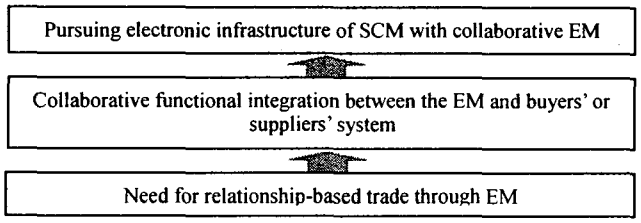

Figure 1 - Purpose and scope of research

2. Relationship-based trade and collaborative architecture of EM

In the existing EM model, the trade is carried out based on participants' bargaining power and price competition (Skjøtt-Larsen et al., 2002). In addition, the relationship among trading partners also can play a significant role in determining the volume or duration of trade.

2.1 Price and relationship in B2B trades

A buyer or a supplier can classify his or her trading results according to the price of supplied product and the value of relationship effect as shown in Figure 2. The point B represents an optimum point where the buyers are willing to pay with price P' and relationship value R'. Region <a> in Figure 2(a) is preferred over region <b> as the increased sum ($\Delta P + \Delta R$) of varied relationship effect and price discount at point B' is attractive comparing with the benefit of usual trade point B. In Figure 2(b), region <a'> is preferred over the region <b'> as the sellers enjoy the increased benefit ($\Delta P + \Delta R$) got from the point B'. In the region <a> or <b>, the possible loss due to price variation can be compensated with the larger benefit of relationship effect. From two preferred regions in Figure 2, a common preferred region emerges where both of suppliers and buyers can get benefit as shown in Figure 3. If it is assumed that a supplier and a buyer share the same amount of relationship effect in a trade, the characteristics of trade can be described according to four divided regions.

Examining the change of returns (e.g. profit) based on the trade position with the additional competition or negotiation, the regions of R and S indicate that additional profit gain for one side (e.g. buyer) leads to the loss of equal amount to the other side (e.g. supplier). In R, the relationship effect cannot compensate the amount of price increase for the buyer, and a usual method of partner selection in the EM is auction where the supplier has the bargaining power. In S, the relationship effect is less than the price decrease, and a typical strategy in partner selection in the EM is either bidding or reverse auction under buyer's bargaining power. The lines, x and y, can represent the auction and the reverse auction respectively, which decide the trade partner based on price competition with an almost fixed relationship effect.

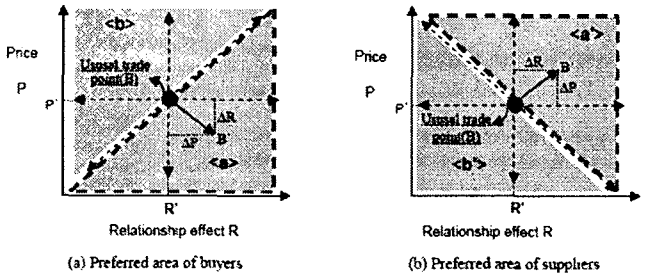

Figure 2 - Preferred trading areas of buyers and suppliers

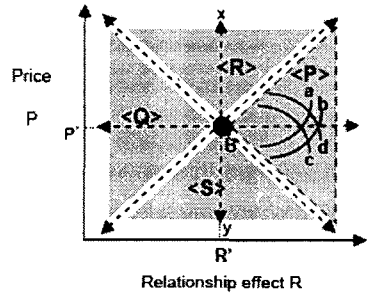

Figure 3 - Common preferred area, P

Table 1 – Trade Characteristics considering price and relationship

Zone	Bargaining factor	Bargaining position	Partner selection	Outcomes	Duration
P	Relationship effect • price	Equal	Negotiation for relationship and price	All winners	Relatively long-term
Q		Equal	Mutual concession	All losers	Intermittent
R	Relationship effect • Price	Supplier	Auction	Depending on bargaining strength	Short-term
S		Buyer	Bidding, Reverse auction		

In Q, both buyer and supplier trade with loss, which may be a situation to dispose excess inventory or emergency procurement problem. In this case, since price variation cannot compensate the loss of relationship effect, the trade is possible with the mutual concession between a buyer and supplier. In P, the trade of mutual profit is possible. Curves a, b, c and d in Figure 3 are indifference curves for a buyer and a supplier. Two scenarios are possible:

(1) A buyer proposes indifference curve 'a' and a supplier counters with curve 'c' and trade is negotiated at the intersection between 'a' and 'c'. Or the buyer proposes an intersection of new curve 'b' and 'c' in an effort to increase its profit.
(2) The supplier may choose a similar strategy proposing an intersection of 'b' and new indifference curve 'd'.

Negotiations will continue until such a point where both parties are satisfied. Regardless where the optimum point is located, both parties will be winners in Zone P compared with Zone Q. EM's intermediating role for relationship among companies become important.

2.2 Relationship among companies and collaborative architecture of EM

Based on the degree of relationship from the simple information sharing to the supplier's consignment, the relationship types between a buyer and a supplier can be grouped into a sequence of 'QR (Quick Response) ⇨ CR (Continuous Replenishment) ⇨ ACR (Advanced Continuous Replenishment) ⇨ VMI (Vendor Managed Inventory)' (Simchi-Levi et al., 2003). The characteristics of each type is explained in Table 2. From the perspective of information system, the collaborative architecture between an EM and the functionalities of a buyer and a supplier may take the following two choices:

(1) Web-based system architecture,
(2) Collaborative and functionally integrative architecture with corporate systems.

Web-based system architecture is the one in which an EM provides electronic trade service to a buyer or a supplier through its web server. With web-based system architecture, it is basically difficult to integrate the EM and the corporate system collaboratively. If the provider of EM service is a major buyer or supplier, the EM is operated integrative with internal system of the service provider. However, for users' perspective of the EM, the EM service is independent from users' internal functional systems. So, it is not functionally integrated system between service providers and users. Thus, information exchange and decision making for the relationship-based trade between the buyer and the supplier are not feasible with the web-based EM.

Table 2 Types of relationship-based transactions

favtors	QR	CR	ACR	VMI
Demand Forecasting	A supplier demands forecasting & supply planning data	QR + (A supplier provides optimum quantity to keep determined inventory level)	Similar to CR except keeping service level and not inventory level	A supplier decides the inventory service level & inventory operation rules.
Order Decision	A buyer makes order decision.	A buyer or a supplier makes order decision according to contract.		A supplier makes order decision.
Inventory Ownership	A buyer has the ownership of inventory.	A buyer or a supplier has the ownership of the inventory according to contract.		

For more collaborative and functionally integrative EM with corporate systems, the EM needs to collaborate or intermediate some functions with the internal systems of the buyer or the supplier by processing the necessary information (purchasing request, inventory data, sales data, reorder point, etc) according to pre-determined sets of rules. Accordingly, the information system architecture should consist of EM's functional integration with a buyer and a supplier as if the related systems of the buyer and the supplier collaborate mutually to handle the necessary processes under relationship with the EM.

3. Functionally collaborative integration between corporate systems and EM

In this section, a functionally collaborative integration is explored among corporate systems and the EM's roles and functions in supply chain management.

3.1 Conventional process of buying and supplying with EM

A buyer's process in a conventional purchasing usually consists of 'purchase request from departments' ⇨ 'check the inventory level and determine the level of purchasing' ⇨ 'selection of a supplier' ⇨ 'delivery and storing'. If a buyer utilizes the external EM, the process will become similar to one in Figure 4. The 'delivery and storing' is controlled indirectly by EM. As the trade frequency increases, the conventional process (either internal or external to a company) may need to be modified as follow:

(1) Internally, the department that originates a purchase request selects a product or a supplier from the internal electronic purchasing catalog.
(2) Externally, the purchasing function utilizes EM to select an appropriate supplier.

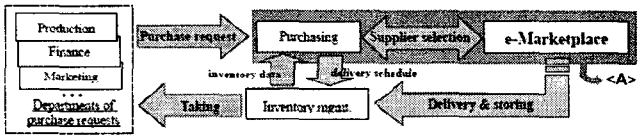

Figure 4 - Buyer's buying process with EM

The use of an internal electronic purchasing catalog in the entire purchasing process is similar to the process that the purchasing department uses the external EM's electronic catalog to select the required goods (Joh and Lee, 2002). A main difference is caused because the purchasing process is integrated into external system based on EM's electronic catalog. If the required internal functions such as workflow system, purchasing strategy, budgeting, and inventory management can be collaboratively integrated into the external EM in the scope of A in Figure 4, the role of EM will become more critical to the users.

The supplier process takes the following form: 'receive purchase of goods and check inventory' ⇨ 'buyer selection and order processing' ⇨ 'shipping and transportation'. During the process, the external EM indirectly controls the stage of 'shipping and transportation' when the goods are sold in the EM. If the supplier uses the EM for the selection of buyers, the entire process will be like Figure 5. The sales department selects the most profitable buyer with the EM or becomes a supplier by joining the bidding process in the external EM. Similar to the buyer process, the collaborative functional integration between the EM and the supplier internal systems can be outlined with the scope B in Figure

5.

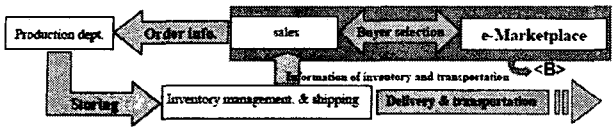

Figure 5 - Supplier process with EM

3.2 EM's functional scope for the collaborative integration

Either a buyer or a supplier can be integrated tightly with its EM if the EM is buyer-oriented or supplier-oriented respectively because the function of its EM can be regarded as extension of its internal functions through Internet. However, in the case of the integration between the EM and its external customer systems, the functional integration needs more consideration from several viewpoints including stages, scope and benefit.

3.2.1 Integrative process with collaboration

An integrative process between buyer and supplier with an EM can be organized as shown in Figure 6. The scenario takes the following process: 'purchase request from departments' ⇨ 'check the inventory level and make decision whether to issue a purchasing order' ⇨ 'check supplier's inventory' ⇨ 'partner selection and order processing' ⇨ 'shipping, transportation and payment'.

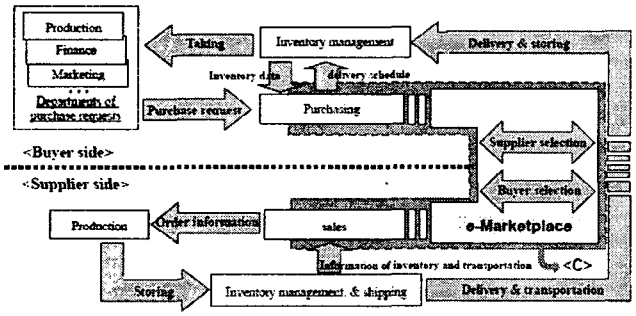

Figure 6 - Collaboration between buyer, supplier and EM

If the feasible scope of collaboration is C in Figure 6 which includes A in Figure 4 and B in Figure 5, it can be the target scope for the collaborative process between the EM and corporate systems to support the relationship-based B2B trade in Table 2. According to the scope of collaboration and the level of EM's functional processing, collaboration between corporate systems and the EM may take one of the following three stages:

Stage-1 (Stage of Brokerage): This is the stage where a buyer or a supplier collaborates with an EM for the scope of ['partner selection and order processing' ⇨ 'shipping & transportation and payment'] within the collaborative 'integrated process' among the buyer, the supplier, and the EM. This stage is the one prior to the relationship-based trade, and can be accomplished through the existing web based system architecture of the EM.

Stage-2 (Stage of Supporting Buying and Selling): The EM's collaboration between he buyer-supplier relationship is possible over the entire scope of the 'integrated process.' However, since the partner for relationship was already selected, the roles of the EM at this stage should be to support the buyer and the supplier to exchange information between them periodically or at the time when it is necessary. At this stage, the seamless exchange of necessary information among an EM, a buyer and a supplier is the EM's main collaborative function. So, the pure web-based system, which is triggered only by user's access, is limited to the necessary collaboration works.

Stage-3 (Stage of the Functional Collaboration for Buying and Selling): As the advanced form of Stage-2, this stage illustrates the EM collaborating with a buyer or a supplier to accomplish a portion of the purchasing or supply function. According to the predefined procedures of buying or supplying and the contract between a buyer and a supplier, the EM checks the inventory level, compares to the requested purchasing quantity and places the order by collaborating with the corporate systems. For these processes of the EM, the functionally integrative architecture between the EM and the corporate systems is required beyond the limited scope of information exchange described in the Stage-2.

EMs can be classified into three different types: the buyer-oriented EM, the supplier-oriented EM and the intermediary-based EM. Each type of EM is explained in Table 3 according to the degree of collaboration and the stages of collaboration between the EM and corporate systems. The buyer-oriented and the supplier-oriented EMs collaborate with a unidirectional fashion with a buyer or a supplier respectively. The intermediary-oriented EM provides the brokerage service to both buyers and suppliers usually with the web. If the intermediary-oriented EM includes the functional collaborative integration with the internal functions of a buyer or a supplier, the EM can support the relationship-based B2B trade, which focuses on the scope of C in Figure 6.

Table 3 - Degree of collaboration between each type of EM and corporate functions

EM	Collaboration with a buyer	Collaboration with a supplier
Buyer-oriented EM	Integrated between the EM and corporate systems (Stage of functional collaboration)	Utilize the EM with the web (Stage of brokerage)
Supplier-oriented EM	Utilize the EM with the web (Stage of brokerage)	Integrated between the EM and corporate systems (Stage of functional collaboration)
Intermediary-oriented EM	Utilize the EM with the web (Stage of brokerage)	Utilize the EM with the web (Stage of brokerage)

3.2.2 Functionally integration for collaboration stages

The collaborative functions between the intermediary-oriented EM and the corporate systems can vary according to the three (3) stages of collaboration. The type of the relationship-based buying and selling can take the specific method between 'QR' to 'VMI' in Table 2. With these two perspectives of collaboration between the EM and the corporate systems and the relationship between the buyer and the supplier, the typical functions to be collaborated are listed in Table 4. For 'CR' and 'ACR' in Table 2, the collaborative functions of the EM can be a mixed form of 'QR' and 'VMI'.

According to the relationship between a buyer and a supplier and the collaboration between an EM and a company (either a buyer or a supplier), the functions of the EM can vary from brokerage of trades to collaborative

accomplishment of purchasing or supplying functions described in Table 4. With the functions dealing with several types of relationship-based buying and collaboration types, the EM can support the collaborative relationship-based purchasing and supplying, which spreads into SCM and can be a dynamic provision for the relationship in SCM. When a buyer and a supplier collaborate with an EM in the basic functions of buying and selling according to the given criteria, the exchanged information between the EM and the buyer or the supplier can be summarized as Table 5.

Table 4 - Collaborative functions of an EM

Collaboration stages	QR	VMI
Stage of brokerage	•Brokering the partner selection: e-Catalog, search and negotiation of price and relationship requirement and so on	
	•Processing the buyer's order	•Processing the supplier's order
Stage of supporting buying and supplying	•Transfers information of demand forecasting and inventory: buyer→EM→supplier	
	•Transfers the order data of a buyer to a supplier •Supports related decision making: ordering, inventory management, demand forecasting of a buyer	•Transfers the supply data of a supplier to a buyer •Supports the related decision making: ordering, inventory management, demand forecasting of a supplier
Stage of functional collaboration	•Receives the buying (supplying) strategy, rules of work flow and digital approval, budgeting rule and so on from a buyer (a supplier) and updates them (according to the transferred standards and rules, the collaboration functions of EM can be carried out for ordering and supplying)	
	•By the purchasing rules, EM decides and orders the supplying quantity. - Purchasing is requested by a buyer and reviewed inventory by EM	•By the supplying rules, EM decides and orders the supplying quantity. - Checks the inventory level of a buyer or a supplier and makes order decision

Table 5 - EM's collaboration of relationship-based buying and selling

EM's function	EM's information exchange	Connected corporate functions
<Collaboration with buyer's system> •Identify the purchasing type and the supplier •Decide the reorder point and order quantity according to the contracts and type of relationship (QR, VMI, etc)	•Receive purchase request, supplier information •Information about ordering criteria, inventory, shipping, distribution, storing, etc.	purchase request department, purchasing function, inventory management
<Collaboration with supplier's system> •Identify supplying type and the buyer •Decide the reorder point and order quantity according to the contracts and type of relationship (QR, VMI, etc)	•Receive supplying condition, purchase information •Information about supplying criteria, inventory, shipping, distribution, storing, etc	supplying function, inventory and shipping functions
<Administration and support> •Payment based on relationship and contract •Manage the record of buying and supplying •Authentication and security	•Payment processing •Elec. Approval processing •Encryption and decryption	budget management, electronic approval

3.3 Benefits of collaboration between EM and corporate systems in SCM

Sharing inventory information, demand forecasting and sales data with suppliers, a buyer can increase the trust in the relationship-based SCM (Chen et al., 2000; Simchi-Levi et al., 2003). Comparing with the traditional relationship-based trade, the collaboration among the EM, a buyer and a supplier will create an environment where decrease of bullwhip effect is possible. The selected supply chain in Figure 7, for example, consists of retail customers, $supplier_1$ as a retailer, $supplier_i$s as intermediate distributors or wholesalers and $supplier_k$ as a producer (Chen et al.).

• $Supplier_i$ orders Q_i ($1 \le i \le k-1$), the quantity of difference between the target inventory level and the present inventory, to $Supplier_{i+1}$ per unit period by the periodic review policy.

• The target inventory level of each $Supplier_i$ is '$(1+L_i)\times M_i$', where Q_k and L_k are the production order quantity and the period to finish the order of production respectively, Q_i and L_i are $Suplier_i$'s order (demand) quantity and $Supplier_{(i+1)}$'s fixed lead-time to deliver the order, and M_i and δ_i are moving average and the standard deviation of Q_i's for the recent p periods ($0 \le i \le k$))

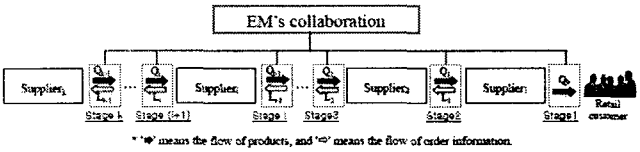

Figure 7 - A supply chain for evaluation

To determine the target inventory level in the above supply chain, each $supplier_i$ can use (1) its own M_i or (2) M_0, which can be delivered under the relationship throughout the supply chain, on behalf of M_i. At this time, the bullwhip effect of each case can be calculated as δ_k^2/δ_0^2 in (a) and (b) as shown below (Chen et al.). BF_a is the bullwhip effect occurred at the trade without information exchange and BF_b is the bullwhip effect when the information on moving average of retail demand is shared throughout the supply chain.

$$BF_a = \delta_k^2/\delta_0^2 \ge \prod_{i=1,k}(1 + 2L_i/p + 2L_i^2/p^2) \quad (a)$$

$$BF_b = \delta_k^2/\delta_0^2 \ge 1 + 2(\sum_{i=1,k} L_i)/p + 2(\sum_{i=1,k} L_i)^2/p^2 \quad (b)$$

When the information of several stages up to a specific supplier is shared, the bullwhip effect can be further reduced under the following situation:

(1) $Supplier_i$ now is aware of the order quantity Q_{i-2} in advance at t_1 as shown in Figure 8 with $Supplier_{i-2}$'s Q_{i-3} through the EM. In addition, $Supplier_i$ knows the status of order Q_{i-2} before ordering Q_{i-1} by $Supplier_{i-1}$.

(2) Knowing in advance that Q_{i-1} will be ordered at t_3 and the amount of inventory will decrease for $Supplier_{i-1}$'s delivery of Q_{i-2}, $Supplier_i$ can prepare the order Q_{i-1} of $Supplier_{i-1}$.

(3) Based on (1) and (2) above, $Supplier_i$'s lead-time after $Supplier_{i-1}$ order at t_3 will reduced from L_{i-1} to $L_{i-1}-(t_3-t_2)$ or $L_{i-1}-(t_3-t_1)$. An optimal postponement of order preparation can be located in the interval $[t_2, t_3]$.

As discussed above, the lead-time will be reduced with information sharing provided by the EM and order preparations. Accordingly, the reduced bullwhip effect can be measured by (c) below;

$$BF_c = \delta_k^2/\delta_0^2 \ge 1 + 2(\sum_{i=1,k} L_i')/p + 2(\sum_{i=1,k} L_i')^2/p^2, \quad (c)$$

Where $L_i' = (1-\beta_i)\cdot L_i$ and, β_i=parameter pf order preparation ($0 \le \beta_i < 1$)

For Equation (a), (b) and (c), $BF_a > BF_b > BF_c$ when $i>1$. According to different levels of information sharing and order preparation, Figure 9 shows that the lowest bullwhip effect occurs when k=3 and k=5 respectively. If the lead-time after receiving an order is reduced by the order preparation, then not only the bullwhip effect over the entire supply chain can be reduced but also the inventory level ($L_i \times M_i$ + safety stock) of reorder point can be decreased more than the ratio of β_i.

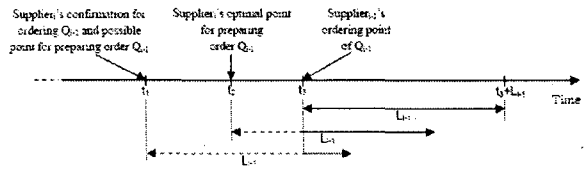

Figure 8 - Information transfer through the EM

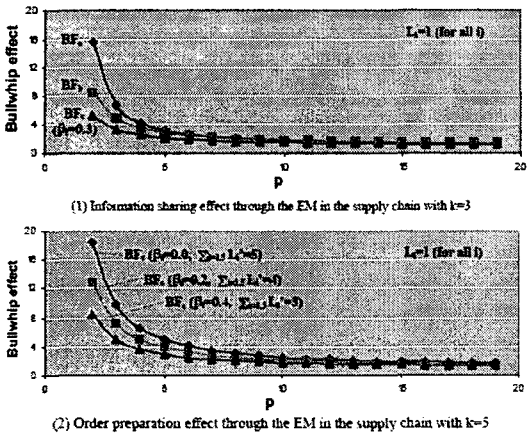

Figure 9 - Bullwhip effects under relationship and information Sharing through the EM

4. Inter-organizational systems and its prototype

It is inevitable to organize the inter-organizational information system (IOIS) for the collaboration between organizations to be successful (Perrin and Godart, 2004). The area of IOIS has grown with several promising information technologies which include the distributed computing in Internet such as CORBA (Common Object Request Broker Architecture), DCOM (Distributed Component Object Model) and the recent Web Service with XML (eXtensible Markup Language) based functional integration among application systems with HTTP (Hyper Text Transfer Protocol) over Intranet and Extranet (Gosian et al., 2003; Park et al., 2004; Korea Sun Microsystems, 2003; VanLengen and Haney, 2004). Especially, .NET environment provides the capability of easy development of Web Service systems such as the automatic generation of electronic XML documents like SOAP (Simple Object Access Protocol) message, WSDL (Web Service Description Language) and so on.

Focusing on the scope of buying and selling, the system architecture for the functional collaboration can be designed not only between 'a buyer ⇔ an EM' but also between 'a supplier ⇔ an EM' similar to Figure 10. In addition to .NET environment, the following requirements are assumed for the system:

(1) The relationship-based trade partner should be decided in advance.
(2) The staff in charge of purchasing should review and decide the purchase request including the product, supplier information, ordering criteria, and so on and transmit the request to the EM using the customized electronic catalog provided by the EM.
(3) The EM carries out ordering, purchasing and supplying functions according to the predetermined criteria and rules.
(4) The electronic approvals should be processed by a buyer system or a supplier system when a buyer system or a supplier system sends the related information to the EM or when the EM carries out ordering or supplying on behalf of a buyer or supplier respectively.

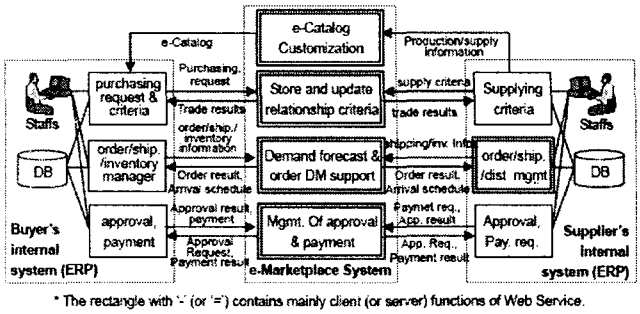

Figure 10 - A collaborative system architecture between 'EM ⇔ companies'

In a collaborative system structure, the collaborative functional integration is feasible with the functional integration summarized in Table 5 and with the collaboration among an EM, a buyer and a supplier shown in Figure 6. The system architecture in Figure 10 consists of the EM's server functions of Web Service, each company's Web Service client functions integrated into its ERP system and the information exchange through the SOAP XML messages. Based on the systematic integration with their EM, a buyer and a supplier can make purchasing requests and their confirmation more speedily as if they belong to the same organization. A case that a buyer's purchase request and a supplier's supply confirmation are carried out through the inter-organizational system using Web Service is shown in Figure 11. After the purchase request and the supply confirmation, each system incorporates the SOAP message with XML and sends it to the partner via EM. Figure 12 shows the bodies of SOAP messages exchanged under the collaborations between the EM's and the users' Web Service systems.

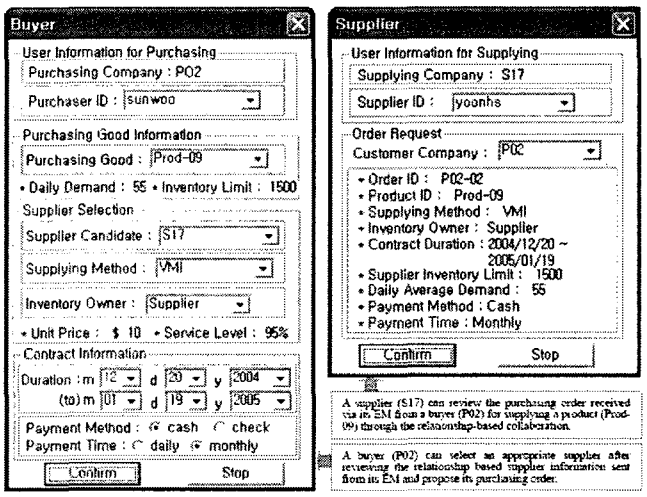

Figure 11 - An example of a buyer's purchase request and a supplier's confirmation

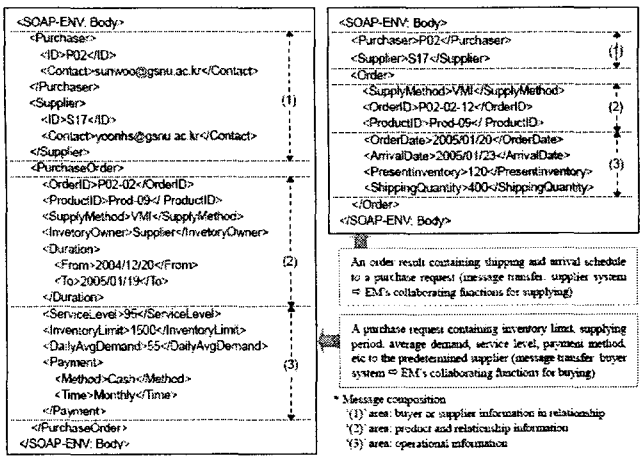

Figure 12 - SOAP message bodies for purchase request and its result

5. Conclusion

The B2B trade over the Internet has been growing from buying and selling goods to the collaborative commerce by integrating the functions inter-organizationally. Such collaboration with the EM can be achieved in diverse ways. In this study, mutual functional integration with the scope of the relationship-based business-to-business trade is examined. As an alternative for improving the existing EMs, which mainly brokers the trade under competition, the EM's relationship-based trade is suggested with its meaning, necessity, effectiveness, and collaborative system architecture in a relatively high-level perspective.

Considering the integration with the EM for small and medium sized companies, the EM can be an electronic infrastructure to provide the ease of the initial investment burden and the efficiency of the relationship-based SCM. In addition, it can be a new business model not only to the intermediary-oriented EM but also to the buyer-oriented and the supplier-oriented EM.

With the advance of information technologies, the integrative operation of IOIS and the utilization of other systems' services in the Internet environment may become easily available with the recent Web Service. As the same context, the system architecture and the case messages of its beginning prototype are illustrated. For the effectiveness of development and maintenance in the real world, the EM can provide the functional system modules and customize them for each company.

The collaboration between the EM and corporate systems needs additional studies with various perspectives besides the relationship-based SCM in this study. For example, the additional study may include the method for relationship-based trade, the relationship management with the existing relationship framework, the brokerage methodology of relationships, and so on. It may worth studying the relationship with EAI (enterprise application integration) and a popular existing method to integrate the internal processes and systems. The actual system design and development for the real application and its related information security are also areas to study further.

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