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Collaborative Integration between IT Industry and Logistics Industry in Taiwan: A Case Study on T Company's E-Logistics Plan

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Abstract

The IT industry is Taiwan's most thoroughly globalized industry. In the IT industry, suppliers and customers are spread all over the world, so making logistics management more efficient is very important. With government's sponsorship, Taiwan's IT industry has introduced e-Procurement (*Plans A and B*) to make the whole procurement process among enterprises an electronic one. Thus e-Procurement became the fundamentals of e-SCM. In order to extend the benefits of e-procurement, Taiwan government continuously promote the IT industry to introduce e-Logistics (*Plan D*).

The objectives of this paper are to study the collaborative integration between IT industry and logistics industry in Taiwan, and to investigate the progress of introducing e-Logistics into the IT industry. A PC manufacturer, *T Company* was selected for use in the case study. It was found that the logistics visibility elevation through "Track and Trace" and the achievement of VMI (Vendor Managed Inventory) are the objectives of e-Logistics implementation. IT manufacturers worked out common business models. Then each supply chain can follow the common specification and implement their e-Logistics individually. This study found that not only the IT manufacturers gain the competitive advantages, but LSPs (Logistics service providers) also learn from collaborative commerce and provide better service for customers with the implementation of e-Logistics. Then eight guidelines were induced as the reference for other industries to implement e-Logistics afterward. Besides, some suggestions were proposed to IT industry, logistics industry, and government.

1. Introduction

Business nowadays is moving toward globalization due to the specialization and convenience of traffic channels. Recently, the booming of the Internet and other modern communication devices further serve to speed up globalization. Enterprises in Taiwan inevitably move toward global arrangements due to the limited territory and few natural resources of the country. In particular, Taiwan's companies, which are famous worldwide for manufacturing and focus on ODM and OEM, are forced to use resource from other regions to develop their products. The IT industry is now faced with not only volatile customer demands, but also a series of challenges, such as intense global competition, shortened product life cycle

and delivery, and difficult global coordination between sources of raw materials and manufacturing, this situation takes the supply network a great deal of time to integrate. Due to the time pressures caused by the vast supply network, enterprises must develop an integrated process management system to efficiently respond to fast changes within the commercial cycle.

With government's sponsorship, Taiwan's IT industry has introduced e-Procurement (*Plan A and Plan B of IT applications promotion project*), to make the whole procurement process between enterprises an electronic one. In order to extend the benefits of e-Procurement, Taiwan government continuously promotes the IT industry to introduce e-Logistics (*Plan D*). Helping more than 15 industry systems to introduce e-Logistics is the target of *Plan D*. Logistics costs account for 10% an enterprise's total cost[1]. The more globalized industry, the more logistics costs. So the e-Logistics plan aims to apply information technology to logistics management. In addition to extend and expand benefits of e-Procurement, it is also the critical field that companies can save costs, especially for the manufacturing industry. Enterprises can build efficient response systems to reduce inventories with information. Furthermore, they can enforce the ability of global operations and logistics with e-Logistics.

2. Related Works

One of the objectives of supply chain management is to make information flow among participating companies in the supply chain efficient and accurate. The information technologies such as EDI (Electronic Data Interchange) and barcode system can improve the efficiency of supply chain. These technologies can secure and distribute related trading information for buyers and sellers. It makes the trading information transfer smooth. Therefore, the efficiency of business activities among manufacturers, customers, banks, and suppliers can be improved. Nowadays, EDI has been replaced with XML-based B2B application integration. The expected benefits are greater than the EDI.

2.1 Quick Response

"Quick Response" is a main strategy to redesign the supply chain and make the whole process a best practice. The target is to create a quick response system based on customers' requirement. It makes the suppliers and manufacturers cooperate to satisfy customers and reduce

cost. Utilizing a paperless system from the stage of production to payment, continuously input precise data to the system, and reduce data error and data miss that can realize QR.

A study in the food industry supply chain concludes that using EDI can lead the potential cost reduction annually up to US\$27 billion [2]. Further, the study foresees inventory reductions of more than 40% with the application of innovative logistics concepts. In addition, *Loebbecke and Powell* [3] had investigated that through an integrated transport tracking system can gain competitive advantages. They use central information data center, communications networks, and EDI to implement the system. Every party in the logistics can easily access the logistics information. The system provides savings of more than US\$24.5 million in five years. It does not account for competitive advantage through better customer service, not for additional monetary advantages, either. Actually, every transaction can save at least US\$2.5.

2.2 Vendor Managed Inventory

VMI (Vendor Managed Inventory) is a program of inventory management. It is a solution to forecast the requirements and replenish by mastering the sales data and the quantity of inventories. Suppliers can more effectively response to the changes of market and requirements of customers. Thus VMI can reduce the inventories, increase inventory turnover rate, and then maintain the appropriate quantity of inventory. Because manufacturers share important information with suppliers, both of them can improve requirement forecast plan, replenishment plan, transportation and shipment plan, and so on. VMI is changed from traditional replenishment according to purchase orders to replenishment according to actual consumption and forecast. Therefore, VMI model is well suited the dynamic business environment today.

There were many real practices in American, such as Wal-Mart, Campbell Soup, Johnson and Johnson, and Procter and Gamble [4]. They have reduced the inventory with mastering accurate consumption information.

3. Case Study

T Company is an IT manufacturer. It focuses on personal computer manufacturing. In addition, it is an OEM/ODM company serving major brand-name customers. Confronting both international and domestic intensive competition and challenges, *T Company* has deployed manufacturing factories, assembling factories, and research and service centers worldwide. In addition to headquarter in Taiwan, *T Company* has established factories in Thailand, Mexico, the U.S., Netherlands, the U.K., and Mainland China. And it established JIT (Just in Time) warehouse in El Paso near the boundary between the U.S. and Mexico. All of the arrangements construct the foundation of global operations and logistics.

In the past, *T Company* had developed the MRP

system and MRP II system to elevate the manufacturing ability. After focusing on the development of 3C business and the global operations, it introduced *J. D. Edwards'* ERP system successively in the U.S., Mexico, and Netherlands, to meet the major brand-name customers' information requirement and integrate all the business functions. The MRP system and the *J. D. Edwards'* ERP system are the backbone of the global operations network now. In the past two years, *T Company* had implemented e-Procurement, the fundamentals of e-SCM, under the sponsorship of the *Ministry of Economic Affairs of Taiwan*.

Recently, *T Company* is aware that focusing on manufacturing may meet some limitation in gaining competitive synergy. Therefore, it plans to provide major brand-name customers with integrated product services (IPS) that cover advanced research, product development, fast-prototyping, manufacturing, and global logistics throughout North America, Europe and Asia. Therefore, *T Company* applied for the sponsorship of *Plan D* and began to implement e-Logistics.

3.1 The Foundation of Taiwan IT Industry e-Alliance

Early in October 2001, the IT companies applying for government's *Plan D* sponsorship started establishing a users group. The shippers (IT manufacturers), LSPs (logistics service providers) and logistics information ASPs (applications service providers) were invited to join the users group. The target of *Plan D* users group was to hold conferences to strike out common business models and information technology infrastructure as early as possible. Members of *Plan D* users group have to follow the outcomes that the *Plan D* users group decided in deploying the business models and IT infrastructure on their corporations to enable them to do business with other companies via the common manner. After several months, *Taiwan IT Industry e-Alliance* was set up based on the *Plan D* users group.

The mission of *Taiwan IT Industry e-Alliance* is to develop the common specifications and the acceptance criteria for validating implementation results, and to promote the developed specifications and criteria. Members of *Taiwan IT Industry e-Alliance* used the scenario proposed by RosettaNet for e-Logistics as reference model and discussed how to modify it to fit all the members' need. They may add some PIPs into the scenario and take off some PIPs from the scenario. Once the modified scenario is decided, members can follow the common scenario to determine the specifications of PIPs. The last stage is to figure out IT architecture to fulfill these business processes.

3.2 Implement e-Logistics

T Company has confronted the following requirements in logistics management.

- VISIBILITY (make the material flow visible)
- OPTIMIZATION (make the material flow routes

optimal)

- MANAGEMENT (make the logistics efficient)
Therefore, *T Company* proposes to implement its e-Logistics system with following core information technology.

- ASP

ASPs (Application Service Providers) are third-party entities that manage and distribute software-based services and solutions to customers across a wide area network from a central data center.

- RosettaNet

For the issues of supply chain process standard, some large information enterprises established RosettaNet organization, a nonprofit organization that strove to define the standard in IT industry supply chain management. The first target of RosettaNet is to make the standard in business processes, and the second one is to make the standard in message syntax. The RosettaNet standard is composed of PIPs, RNIF, and dictionaries. PIPs (Partner Interface Processes)[5] are specialized system-to-system XML-based dialogs that define business processes between trading partners. The RNIF (RosettaNet Implementation Framework) Core Specification provides exchange protocols for quick and efficient implementation of RosettaNet standards. Dictionaries reduce confusion in the procurement process due to each company's uniquely defined terminology.

The architecture of *T Company's* e-Logistics System is shown in figure 1. ASP provides a public information exchange center. *T Company* constructs its virtual private logistics information center under the public information exchange center. The private hub can provide logistics information for every site of *T Company*, including factories in Thailand, Mexico and distribution center in El Paso via the Internet. In addition, *T Company's* suppliers and LSPs can access information in the hub with browser or through gateway. The brand-name customers and international LSPs use the international logistics information ASP for information exchange. *T Company's* private hub connects with the international logistics information ASP directly or through Taiwan public logistics information hub. This makes information share among all the partners of supply chain network.

Furthermore, data gathered in the hub can be used in planning. Managers can reconcile supply with demand, and make production planning according to the status of each node in the global logistics pipeline. Thus FPS (Factory Planning Simulation) system can generate simulation reports in accordance with logistics information in the e-Logistics hub and data generated from ERP in each factory.

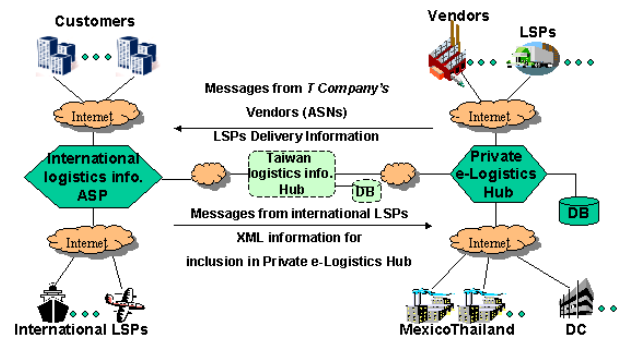


Figure 1: Architecture of *T Company's* e-Logistics System [6]

T Company provides three different interconnection manners for their partners as shown in figure 2. Thus its trading partners can select one way and implement their systems based on their requirements and IT ability.

- System Integration with Open Standard (Class A integration):

Companies with higher IT capability can implement RosettaNet compliant system to integrate the processes among buyers and sellers. Both messages and processes follow the common standard.

- Electronic Data Interchange through Turnkey System (Class B Integration):

Companies use this kind of integration to streamline two companies' backend ERP with document exchanging. It is similar to traditional EDI. Companies use turnkey solution that ASPs provided to achieve standard message exchange.

- Web Access (Class C Integration):

Users connect to the website that central manufacturers provided with browser. This kind of connection doesn't have system connection, and only exchange with common XML standard.

Suppliers or LSPs

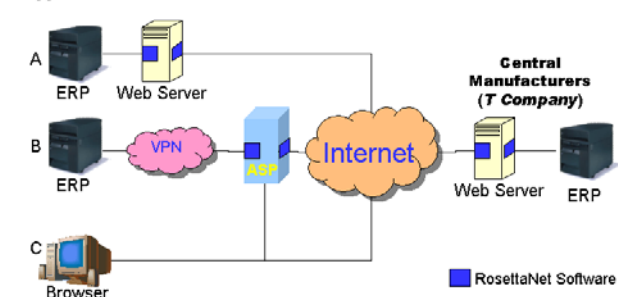


Figure 2: The Frameworks of Introducing RosettaNet Standard [7]

3.3 Business Process and Expected Benefits

In the logistics management, *T Company* still use fax, telephone, or e-mail as the media of information exchange. It is hard to master actual logistics situation, such as the quality and efficiency of logistics. The maximum synergy of e-SCM can't be achieved. *T Company* consequently introduces e-Logistics so as to seamless streamline the processes of all the partners in supply chain network.

The scenario illustrated below not only represents the situation that *T Company* meets; but also represents the situation that many other companies may meet. It is

time consuming and inefficiency.

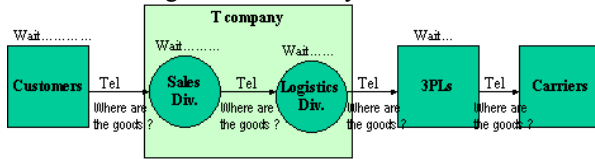


Figure 3: Original Track and Trace Process

Taiwan IT Industry e-Business Alliance had decided to use RosettaNet logistics related PIPs (Partner Interface Processes) as the common standard. Members of alliance must follow the common business processes and implement the infrastructure to exchange messages. The concluded business models including two main functions, “track & trace” and VMI (Vendor Managed Inventory). Track & trace can be further divided into two parts, shipping order management and shipment status.

Table 1: Functions and Related RosettaNet PIPs

Function		RosettaNet Partner Interface Process
Track & Trace	Shipping Order Management	PIP 3B12 Request Shipping Order
		PIP 3B18 Notify of Shipment Documentation
		PIP 3B13 Notify of Shipment Confirmation
	Shipping Status	PIP 3B3 Distribute Shipment Status
VMI (Vendor Managed Inventory)	Managed	PIP 4A2 Notify of Embedded Release Forecast
		PIP 4A3 Notify of Threshold Release Forecast
		PIP 4A5 Notify of Forecast Reply
		PIP 3B2 Notify of Advance Shipment
		PIP 4C1 Distribute Inventory Report
		PIP 4B2 Notify of Shipment Receipt

Source: Taiwan IT Industry e-Business Alliance, sorted by this study

● Track and trace

The scenario of tracking and tracing is shown in Figure 4. The supplier create shipping order request (specifies which products to ship, how to ship them, the origin and destination locations, and other related information). Then the message (PIP3B12) is sent to LSPs. The LSPs create order confirmation to reply. Suppliers create shipping notification with the shipment. Suppliers need to request LSPs to ship the components to customers whenever a sales order is received. It is required to provide delivery documentation. The LSPs inform the supplier when the shipment has been sent with PIP3B13.

Shipping status information has to be sent to the supplier or the consignee according the agreement.

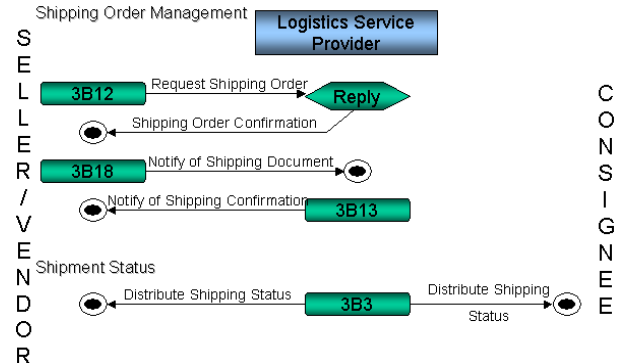


Figure 4: Trace & Track Using RosettaNet PIPs [5]

● Vendor Managed Inventory

The scenario of tracking and tracing is shown in Figure 5. The customer create a release forecast with product demand information (PIP4A2) or create threshold release forecast (PIP4A3) with product demand information, current product inventory levels, and target product inventory levels and send the message. The distribution center creates an inventory report to both the seller and the customer. The supplier notifies the receiver that a shipment has been assigned and created the detail Advance Shipment Notification. Then the physical distribution is conducted. When the goods enter into the distribution center, the distribution center creates a shipment receipt with receipt information. When the customer needs materials, the customer sends pull signal to the distribution center. Furthermore, the distribution center can replenish. The customer sends consumption reporting to the seller with PIP4B2.

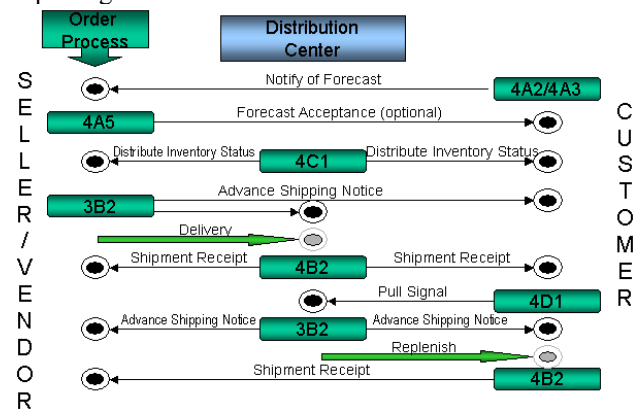


Figure 5: VMI Scenario Using RosettaNet PIPs [5]

Therefore, T Company can elevate the visibility of logistics with business automation and the operation of e-Logistics hub. And the VMI model can be achieved by automating processes.

4. Findings and Exemplary Effects Investigation

4.1 Findings

During the execution process of this plan, this study discovers that large gap exists between the scale of the logistics companies as well as their capabilities on utilizing information technology. How to lead all the

logistics companies into electronic operations would be a tough issue. It is a good way to classify the on-line connections of a system into three levels. The advantages of this classification include: 1. Provide different connection models in accordance with the different demand levels of IT ability for different users. 2. Every logistics companies can join the entirety of the e-Logistics.

Moreover, *T Company* also plans to help several LSPs to adopt B2BI. *T Company* has experience in adoption B2BI (e-procurement), and it also could impart their own experience in adopting them and sufficient orders to drive them to accept new technology, thus, the time of adoption and the possibility of failure would be reduced. For the LSPs, in addition of the orders from *T Company*, the introduction of new IT technology could not only enforce the IT capability but also reduce the cost and the necessary time responding the demand of the customer through this new operation.

4.2 The Issues and Corresponding Measures

During the introduction of Plan B, the late launching of users group caused the progress of introduction highly delayed. Besides, they had spent a lot of cost long before the common range and standard identifying. As so, the *Plan D* learned the lessons. In the initiation of the plan, the enterprises form a user group. Under the discussion, they determine the specification of message exchanging, and standard. IT manufacturers and LSPs can implement e-Logistics early.

From the result of the investigation of the current industry application by *Electronic Commerce Resources Center of Institute for Information Industry* designated by *Taiwan IT Industry e-Business Alliance*; the RosettaNet has developed several scenarios. Therefore, the domestic enterprises could choose scenarios those are fitting them. It not only saves plenty time and cost but also could connect with the international enterprises directly.

From the past experience of the introduction cases and the researches that focus on KSFs (Key Success Factors) of introducing enterprise information systems[8], it can be found that the high-level managers play a very important role, especially for large-sized plans, they even could be crucial for the success or the failure.

Most of the central manufacturers that participate in the e-Logistics plan are the multi-national enterprises. Hence, the choice for designation of the domestic logistic operations which means from domestic suppliers to the domestic assemble factories or manufactories of the domestic central manufacturers is only among the domestic logistics companies, and the choice for designation of international or cross-national logistic operations is among the large-scaled international logistics companies or the international third party logistics service providers. On the opposite, the information processing and the delivery status recall still not get involved deep enough or even not established yet for our domestic logistic corporations. Probably their customers, such as the domestic IT enterprises or the

component suppliers, could check the delivery status by phone calls, but still is short of a spontaneous recall service. Few of the international logistic corporations, for example, UPS, they generally already digitalization in depth, have high cooperation attitude toward this plan and showing their determined support for the introduction of international standard – RosettaNet. Besides, they also have enough IT ability for this introduction. A large part of the logistics service providers or freight forwarders have already sensed the importance of tracking and tracing. In the past, they solved it by outsourcing the establishment of the web site for providing the requiring service but still lack of the abilities in maintenance for the continuing service. So the e-Logistics plan is very welcomed by them as long as the plan gets the support from the central manufacturers.

In general, the enterprises that participate in the plan would designate the logistic assignments to the international third party logistics service providers and they, again, outsource the practical delivery assignments to other companies, including the domestic land carriers, the international land carriers, ocean carriers, and air carriers. Those land carriers usually have not built up the tracking and tracing mechanism yet. Thus, the delivery tracking and tracing is obviously difficult and the information of the responsible department is always behind the latest one. This issue relies on the international third party LSPs to be solved.

Another issue is that the logistics industry has the controversy of the RosettaNet standard proposed by the IT industry. They thought that the standard is particularly set up based on the conditions of IT, EC and semiconductor without considering other industries. Especially, this standard does not include all required processes for the logistics industry. The practical solution is that building up a common standard inside the industry so that the only assignment for logistics corporations would be mapping when integrating the IT process. Actually, this solution should be derived from the logistics industry itself.

4.3 Effects

BPR teams should be conducted simultaneously once the Plan D started in order to re-engineer the organizational structure and all business processes.

A comprehensive education and training program for this plan is essential. From real experience, it is found that many employees have defensive attitude toward the plan without fully understanding. However, this system could reduce their job load and let them put more efforts in a more meaningful duty with more additional value. For example, the traditional tracking and tracing process cost a lot of manpower. From the beginning, the customer needs the delivery status. Then, they make the phone calls to the internal purchase department; the purchase department inquires the logistics department; then, the logistics department contact with LSP; then, LSPs contact with Carrier, and so on. Under the Plan, those level-by-level inquiring could be solved at once by web site directly from the customers. The duty for the

purchase department, logistics department, etc could shift to higher value-added jobs, such as analysis.

A good communication is also necessary. This plan needs wide involvement, and the participants may contact with various departments or countries. For practical experience, unpleasant cooperation has occurred because some departments were not informed in advance. The precedent communications among all involved departments are dispensable.

4.4 Exemplary Effects Investigation

The IT industry is chosen as the pilot of the B2B integration introduction by the government and thus, gains the assistance. The purpose of this pilot project is to spray the experience to other industries that would like to join the plan afterward. No matter it is success or fail, the most important function of this plan is to keep the conclusion and provide to other industries in order to avoid similar mistakes and unnecessary time-consumption in implementation. That is what we called the spirit of demonstrative "Information Technology Applications Promotion Project". Here are some findings and suggestions that may be applicable for other industries interested in introducing the similar plan in the future.

1. Organize users group as early as possible

The foremost condition for a successful plan is the foundation of User Group that could provide a mutual communication mechanism together with the establishment of the relevant standard. To reach the common sense of the participants is the purpose of the users group so as to corresponding the coming of an era of group competition.

2. The manufacturers drive the participation of the upstream suppliers of the supply chain and the logistics service providers

From the experience of *Plans A and B*, the success is owed to a key point caught by the *Department of Industrial Technology of The Ministry of Economic Affairs*— start from those center manufacturers of a supply chain. It just likes to hold a bunch of sweet corn. To hold the knot means to hold the whole bunches. Consequently, the *Plan D* follows the same model, except some of the large-scale LSPs join users group spontaneously; the center manufacturers are in charge of the drive the participation of the cooperated LSPs for the discussion and establishment of the business process and the specification of the information technology.

3. Build up a common partner interface process and message standard

Standardization is still the spirit of *Plan D*. The implementation of the interactive dialogue of e-business and the operations process of the enterprises are possible only after standardization. The common standard that followed by all participants is on the list of the primaries in integration introductions. There are two ways to set up the standard: the first choice should be the current international standard; if not, then set up a new one according to their own by the way of imitating the current successful model such as RosettaNet, for example: its

RNIF, PIPs, Dictionaries and the methodology of the process integration is suit to be the reference for other industry. Besides, XML could be a good basic tool when set up the standard for the integration of business-to-business on the angles of its excellent self-description.

4. Participate in the discussion of the international industry standard

If we analyze the past rules showing in the IT industry, we could easily found that the standard has become a weapon of these international major enterprises and caused a clear boundary between different systems. The competition start far from choosing the standard if a group of major IT corporations decide to follow some certain standard. All the relevant product is deem to follow the decision of theirs. In short, the future is a war of the standard. As far as the Taiwan domestic corporation on the position of suppliers to be concerned, lost the opportunities to participate establishment of the standard, it means to risk the possibility of the replacement. For example, the current standard, RosettaNet and Oasis etc, are dominated by foreign enterprises. Thus, they may not put our consideration on the list. The IT industry hopes that the assistance in regularizing standard and striving against the dominance from the government could be more active. At that time, we, the suppliers, could own more negotiation power than the customers and the strength for a long-term prospect of the IT industry.

5. Establish common business model and process

The principle for establishing common business model should be focus on coordinating a proper one for everybody based on the original one owned by each one. The business model could modify the process situation set up by IT industry that could reduce the necessary effort of introduction.

6. Draw up the relevant IT support

For the necessary IT supporting this standard business model and process, the participants should looking for the IT corporations that fit for the process of the corporations. However, the framework proposed by the IT industry is possible a good choice, the participants afterwards might follow as well.

7. Seek support from high-level managers

As we mention in the last section, the high-level managers holds crucial element in a large-scale plan.

8. Implement BPR in accordance with the plan

To adopt the needs of the common business models demand great modifications in internal process so we could not neglect the importance of the internal BPR when we introduce B2BI system.

However, what kind of industry is particularly suit for this model in e-Logistics introduction? The nature is more similar to the IT industry, the more possible for the participant to adopt this plan and the less cost in modification it would need during the introduction. From the observations, among of all the industry, the auto industry is the most close to those of the IT industry. For example, the earliest application model is from the one of

the TOYOTA in the respect of JIT. We suggest that the auto manufacturers are the best choice for government for the option of popularizing the demonstrative model. The other option could be mechanical and electrical industry, flight and space mechanic industry, or the medical equipment manufacturer etc., with slide modification of the model to fit the individual needs of the industry.

5. Conclusions and Suggestions

5.1 Conclusions

The crucial point for achieving and holding the No. 1 market share in the current global business market is the speed of information integration – The faster, the better. As the information is getting visible and instant, the competition of each industry is getting serious. The only chance for the corporation to survive is rely on the ability to respond the market demand instantly and put the customer satisfaction on the top of the list.

Another important element for a successful enterprise in this era is choosing the ways of the efficient alliance, instead of standing along. Only the cooperation and pursuing the mutual beneficial of the corporations could create the best benefit for themselves, as the market in the future would be a competition of the whole supplier chain, instead of just the corporations in the past.

Plans A and B has integrated the upstream suppliers, the central manufacturers, and the downstream customers in an entirety of electronic supply chain and *Plan D* also has brought into the logistics industry, a kind of bridge between the enterprises, in this entirety, at the same time, the conjunction of *Plan C* with those two plan could form a complete integration of supply chain with “information flow”, “material flow” and “cash flow”. Then, this integrated chain definitely could increase the overall competition of our IT manufacturer industry and furthermore, drive the whole domestic industry to advance into a new boundary.

5.2 The suggestions for the industry

1. The suggestion for the IT industry — Enforce ERP

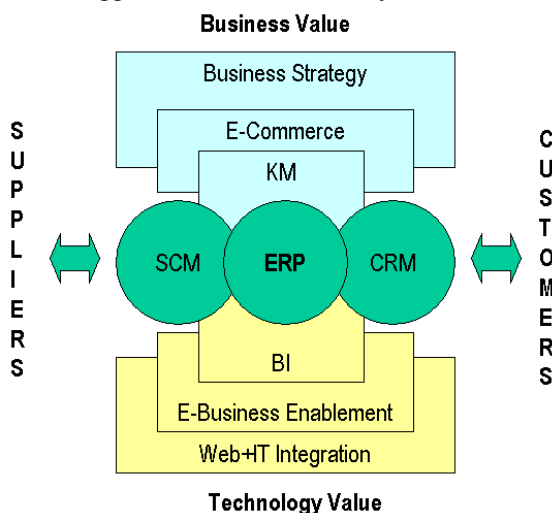


Figure 6: Malecki's view of e-Business [9]

ERP is the core for the operation of the e-Business, the pivot of all applications. From the view of Malecki in the e-Business as shown in figure 6, we know, the most overall effect is from the coordination between the B2BI introduction and the internal IT system. The introduction of ERP develops from “the predomination of the competition”, “the necessity of the competition” to “the foundation of the competition” until now. Before introducing the business-to-business application integration, the enterprises should, first, has a robust ERP system.

2. The suggestion for logistics industry

- The standardization of logistics process in accordance with the IT introduction

The IT industry has already own mature IT in internal facilities and went through the phase of rationalization. As we mentioned before, the issues should be the different depth of information processing in logistics industry. The most effect of B2BI introduction relies on the standardization of logistics industry.

- The integrations of their own IT system

During the process of introducing the *Plan D*, we could observed that the logistics choose passive attitude toward providing the relevant information to the IT manufacturers, that brings more convenience to the latter but more burden to the former. The logistics industry should conduct an internal system integration (Enterprise Application Integration) and enforcement in its own information system so as to connect with B2BI system by the way of automation. An overall automation is an important element for a best overall effect of the business-to-business application integration.

- Enforce the understanding of e-business

For the whole environment of e-business, the key point is the connections between upstream and downstream corporations. It will reduce the individual character of the logistics industry from the angle of pursuing the best effect of the whole supplier chain, instead of individual benefit. In the future, in addition to the demand of a fast order process and transportation, the accuracy in controlling the amount and type of the goods, the integrity of controlling the inspections, and the goal of zero stock amount and shortage are also the criterion of a standard B2B logistics service.

- Participate in relevant projects sponsored by the government

Our government also provides relevant electronic project for domestic logistics industry. The demonstrative “mobilized logistics information system” sponsored by *Department of Commerce* under the *Ministry of Economic Affairs* in 2002 is an example. The aims of this project is to drive the applications of wireless communication technology into logistics industry in accordance with the goal of business automation and e-business by helping them to introducing “mobile information technology” so as to increase the efficiency of the transportation and the utilization of the fleet, increase the service quality and decrease the transportation cost. It is a good opportunity for logistics industry to offer a better service by enforcing

its infrastructure and introducing e-Logistics.

5.3 The suggestions for government

This plan is expected to advance the logistics industry from the respect of IT. However, we still have several suggestions as below for the government:

1. Encourage the establishment of public hub

We suggest that government could encourage the establishment of public hub by the ways of demonstrative applications system or other reward investment program.

The spirit of the public hub is: As long as you connect with the hub, you connect with numerous enterprises that join with the hub. Save the cost and increase the effect are the major advantages of this model.

Nevertheless, the participants of the *Plan D* has many concern and criteria and is suspect with the neutrality of any central manufacturers since the hub is a convergence owned all the details of the participants. It is possible to estimate the operation status of the participants from the information saved in the hub if someone intend to. We suggest the government assist to establish the hub under a third party with a reputation of just. Moreover, the government could offer preferential measures and for those who are willing to adopt the public hub. Besides, the public hub is not only established for IT industry but also could provide for other industries to use.

2. The strategy of international logistics set by the government still has rooms for improvement

The current global strategy of our government still focuses on the manufacturers with less consideration of assistance in logistics industry. For the domestic logistics, the major concern is usually the cost. The government could lead them entering the international logistics under the special project. Besides, IT manufacturers may assistance logistics firms to enter the international logistics.

3. Cross-industry integration needs Cross-industry plan

Plan D is sponsored by the *Department of Industrial Technology of the Ministry of Economic Affairs*; while the *Department of Commerce of the Ministry of Economic Affairs* and the *Ministry of Transportation and Communications* are jointly responsible for servicing and supporting the logistics industry. When the IT industry and the logistics industry make effort in such collaborative integration, all the responsible departments of the government should set up a joint supporting framework to provide strong assistance to the Plan participants.

4. Sponsor the development of Taiwan-based R&D center and global logistics and operations center

Taiwan is a small place. In the recent, we face the pressure of industry moving outward. In the past, the development country, such as U.S.A. or Japan, has been gone through and it turns out an expansion of IT industry, instead of reduction. Besides, that the manufacturing base shift to Mainland China should be regard as a global expansion, instead of a view of industry emigration since the advantage of low-cost has disappeared in domestic environment. The assistance for the corporations in developing the Taiwan as the center of R&D and global

operation could start from the outstanding the features of our industry and product, then, cooperated the proper global operation plan of the central manufacturers of supply chain as the schedule and encourage the coordination of the satellite enterprises for the purpose of a competitive regional supply network.

5.4 Suggestions for Future Research

The advance of IT is at a tremendous pace. During the process of the e-Logistics, we discovered that many technologies in the applications of business are discussed enthusiastically, for example: Web Services, ebXML...etc. The relevant technology may not be mature enough but those ideals are fantastic. The progress of the IT would never stop and it is a good topic for the researcher afterwards to study.

For the logistics operations, the visibility of the material flow is only an initiation. The most important steps should be the application strategy after obtaining the visibility information. Until the research is closed, this part still remains on the paperwork without practical performance or implementation. This is also a good topic for further study.

Once Plan D is finished, whether the benefits could be achieved as expected is another potential topic for further study.

Reviewing from the e-procurement in Taiwan's IT manufacturers to the e-Logistics and e-financing after e-procurement, the trend of the future, the *Plan E* – engineering collaboration and the relevant knowledge management, can be peeped. Likewise, the *Plan E* and the relevant knowledge management are worth of future researches.

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