

ELECTRONIC COMMERCE ADOPTION AND IMPLEMENTATION IN LOGISTIC INDUSTRY: PENANG PORT AREA PERSPECTIVE

Mohd. Adan Omar, Azham Hussain, and Mohd. Nizam Saad

Faculty of Information Technology, UUM, 06010, Sintok, Kedah.

e-mail: adan@uum.edu.my

Abstract

The Internet-based Electronic Commerce (E-Commerce) is rapidly emerging as an entirely new method to conduct business and to interact with customers, suppliers, competitors, and the government. An understanding of the current Electronic Data Interchange (EDI) status is essential for the successful of any E-Commerce initiatives in Malaysia. Thus, this study seeks to provide such an empirical base. The purpose of this study is to measure the use of electronic information exchange in the Malaysian logistic industry as part of the initiatives of E-Commerce. This study will specifically emphasize the Internet-based EDI system usage in shipping industry. The results indicated that the level of awareness among respondent's companies (which is considered as small and medium companies) to the potential benefits of E-Commerce implementation in logistic industry has increased. Despite the EDI usage at Penang Port were high in terms of volume; however the usage in terms of diversity, breadth and depth were still very low and limited. The extent to which EDI applications are implemented in different business transactions of shipping and forwarding agencies were found to be limited where only a few business partners and certain transactions involved. Investigation on the feasibility factors reveals that the availability of EDI applications, management support, and initial investment are the three most influenced factors cited by the responding companies.

1. Introduction

Electronic commerce or E-Commerce can be summarized as “the buying and selling activities of information, products and services via computer networks” [3]. It refers to business transactions conducted via computer networks, both public and private. This technology is about electronic interactions among businesses, governments, and consumers for the purpose of information retrieval, trading, procurement, purchasing, and delivering of digitalized goods and services. At industry level, the development of Electronic Data Interchange (EDI) has become central to the concept of E-Commerce [1].

EDI is about doing business and carrying out transactions with trading partner electronically. More formally, EDI can be described as the interchange of business documents in a standard format. The standard format enables further automatic processing. EDI is a paperless trading method and therefore an important foundation block for the implementation of E-Commerce.

In order to utilize the EDI capability, Penang Port has facilitated with the national EDI through Dagang Net in 2003 under the government's trade facilitation program. The national EDI was implemented in 1993, known as the Port Klang Community System. This pioneer project is the gateway to companies in Malaysia to utilize the E-Commerce. In order to ensure the successful of the government initiatives, Dagang Net was granted exclusively an electronic connection to the Royal Malaysian Customs and Excise Department. As far as the government agencies in Malaysia are concerned, efforts are undergoing to prepare information and communication technology (ICT) personnel in the public sector for the adoption and implementation of various ICT software and applications in their daily operational functions. *Sistem Maklumat Kastam* (SMK) is an example of such application as the government moves towards the e-government. The growth in international trade activities makes it crucial for the Malaysian Customs to re-tool and upgrade their operational process therefore they can engage and deploy the latest state-of-the-art technology across the entire functional operations. The Malaysian government hopes that EDI applications will bring greater efficiency and productivity hence enabling to respond to the needs of changing the trade requirements if a port is to become one of the major ports in shipping lines in the country.

2. Critical Issue

An understanding of the current EDI status is essential for the success of any E-Commerce initiatives in Malaysia. Thus, this study seeks to provide such an empirical base. The study attempted to measure the use of electronic information exchange in the Malaysian logistic industry as part of the initiatives of E-Commerce. This study will specifically emphasize the Internet-based EDI system usage in shipping industry in Penang area where the electronic cargo clearing system for customs trade facilitation has been introduced in July, 2003.

3. Aims of the Research

The purpose of this study is to empirically ascertain the extent of EDI applications among the users in the Penang Port area in terms of four key dimensions of EDI usage. The four dimensions are EDI volume, diversity, depth, and breadth. Specifically it aimed to determine the extent of EDI usage in the Malaysian logistic industry and to identify the feasibility factors of EDI implementation.

4. Methodology

The research methodology for this exploratory study was a cross-sectional field study. The required data were collected on September 2004 through questionnaires. In order to evaluate and analyze the extent usage of EDI participation in logistic companies, we adopt four key dimensions of EDI usage. EDI usage can be evaluated in terms of;

- volume of business handled;
- diversity, i.e. the different transactions supported;
- breadth, i.e. number of participating partners; and
- depth, which refers to the level of integration with internal systems.

The above measurements was developed by [7], based on case study data on seven sites using the strategic business unit as the unit of analysis as cited by [6].

In this study, we attempt to uncover the extent to which EDI applications are implemented in different business transactions of shipping and forwarding agencies. Interviews through phone calls were conducted with the key personal from Dagang Net Technologies Sdn. Bhd. and Dagang Net Commerce Sdn. Bhd. Interviews also took place at a few shipping and forwarding companies in Penang and few numbers of Royal Malaysian Custom and Excise Department in order to understand and determine the transactions involved.

4.1 Population and Sample

The targeted population of the study was all shippers and forwarders dealing at Penang Port. Penang Port as the major port in the northern region of peninsular Malaysia was chosen because they already developed an electronic cargo clearing system for customs called SMK. This system was established in July, 2003. The targeted subjects were likely to have EDI facility.

There was a population of 532 companies dealing with Penang sea-port and air-port at the moment when this research was conducted. Only 100 companies were identified and chosen as the research samples. These companies are located in three different customs official port of entry and exit for goods points;

1. Pelabuhan Selatan, Bagan Dalam, Seberang Perai.
2. Pelabuhan Utara, North Butterworth Container Terminal (NBCT), and
3. Kontena Nasioanl Inland Clearance Depo (KNICD), Perai.

Out of the number of questionnaires sent, a total of 48 questionnaires (48%) were returned back. Table 1 summarized the respondent's profile.

Table 1: Respondents' Profile

	Frequency	%
Company		
Forwarding	33	68.8
Shipping	1	2.1
Both	10	20.8
Others	4	8.3
Size		
< 50 employees	36	75.0
2-5 employees	8	16.7
> 50 employees	4	8.3
Branch		
1 branch	23	47.9
2-5 branches	24	50.0
> 5 branches	1	2.1
Years in business		
< 5 years	5	10.4
6 - 10 years	8	16.7
11 – 15 years	13	27.1
> 15 years	22	45.8
Internet Application		
Internal connectivity		
None	2	4.2
Low	22	45.8
High	24	50.0
External connectivity		
None	2	4.2
Low	28	58.3
High	18	37.5

4.2 Respondents' Profile.

Based on Table 1, it is approximated that 70% of the respondents were forwarding agents, while 20% of them were companies, which operated both forwarding and shipping operations. The table also indicated that 75% of these companies could be classified as small company where the number of employees were less than 50 and have less than 5 branches (50%). About 46% of these companies have been in business for more than 15 years. This indicates that these companies are very competence in handling cargo and freight services. In terms of Internet application, the responding companies did well in this area which was indicated by nearly 100% of these companies have being using Internet application for the sake of their business operations. Furthermore, it was found that internal connectivity is high (50%) relative to external connectivity (37.5%).

5. Findings

The following section presents the finding in this study.

5.1 Extent of EDI Usage

Table 2: EDI Using Companies

EDI application	Frequency	Percent
Yes	48	100
No	0	0

Table 3: EDI User Category

	Frequency	Percent
Self-directed user	32	66.7
Mandated user	16	33.3
Missing	0	0.0

Table 4: EDI Implementation

	Frequency	Percent
XML (Internet)	37	77.1
VAN	8	16.7
Both	3	6.3

As it was indicated in Table 2, all (100%) of the responding companies were EDI users. This finding was consistent with [3] argument that it has been increasing trend for companies to migrate their businesses by using the Internet. Business process reengineering) was applied to transform the business operations into the web in order to facilitate functional operations in Penang Port therefore they could keep in line with the ICT development in Port Klang.

Of these EDI users, Table 3 indicated that about 67% of them classified themselves as self-initiated user. In other words, their EDI usage was initiated by themselves without any mandated by larger or dominant business partners. This finding was inconsistent with [1] empirical study in Port Klang. Most of the companies dealing at Port Klang classified themselves as mandated user, which was influenced by dominant business partner. It was also found that that over 77% of the responding companies were using Internet-based EDI (Table 4). This can be attributed to the responding company's initiative to migrate their business operations into the web which is reflect by 67% of these companies were self-directed user. The trend is changing gradually from relying on the services of third party networks or value-added networks (VAN's) to Internet-based EDI. This finding appear to lend support to [2] prediction that with the advent of I-EDI, EDI data traffic will move from traditional VAN to the Internet due to the anticipated 15% to 20 % reduction in data transport costs.

Table 5: Usage of EDI in Respondent's Business Transaction

Transaction	Frequency	Percent
Arrival notice	13	27.1
Bill of lading	15	31.3
Booking confirmation	12	25.0
Booking request	4	8.3
Cargo report/status	14	29.2
Customer shipping notice	6	12.5
Dangerous goods declaration	7	14.6
Dangerous goods response	6	12.5
Delivery order	5	10.4
Departure report	0	0.0
Discharge list	0	0.0
Duty payment	9	18.8
Export manifest or customs declaration	41	85.4
Fund transfer	3	6.3
Import manifest or customs declaration	37	77.1
Invoice	3	6.3
Letter of appointment	3	6.3
Letter of approval	3	6.3
Loading/Packing list	5	10.4
Rates/tariff quotation	2	4.2
Receipt	4	8.3
Shipment delivery address/notice	0	0.0
Shipment scheduling	1	2.1
Shipment tracking/status	4	8.3
Shipping instruction	6	12.5
Trans-shipment manifest	3	6.3
Vessel information	6	12.5

In order to ascertain the extent to which EDI applications are implemented in different business transactions of shipping and forwarding agencies, a twenty seven item scale is used. Each of the 27 items represents an inter-organizational transaction that can be performed using EDI technology [1]. All business transactions that have had EDI in place were illustrated by Table 5.

Table 5 showed that most of the responding companies used the EDI facility to fulfill their communication needs with the Customs Department. They use the EDI to declare their import and export operations (41% and 37% respectively), bill of lading (15%), cargo reports/status (14%), and arrival notice (13%). This indicates that the EDI application is mostly used in relation to custom clearance. In fact, there are certain transactions in the 27-item scale, which is not being operated

through EDI facility. None of these companies had apply the Internet-based EDI (XML) or VAN for departure report, discharge list and shipment delivery address/notice.

These results was consistent with [1] findings that the EDI use at Port Klang may be high in terms of volume of import and export manifest which relates to the transactions with the Customs Department. Even though these companies have been using Internet-based EDI and being a self-initiated user, the use of EDI is still limited in terms of diversity, breadth and depth. It is obvious that the responding companies, did not utilizing the EDI facility and technology in full potential.

5.2 EDI Feasibility Factors

EDI feasibility factors were determined using a sixteen-item scale. Each of the 16 items was measured using a 5-point Likert scale anchor at 1 (none at all) and 5 (very much). The measurement used in this study is similar to the measurement used in Electronic Commerce Diffusion in the Malaysian Shipping Industry written by [1]. Table 6 as shown below summarizes the findings of the study.

Table 6: Feasibility Factors Affecting EDI Adoption

Factor	Mean*	SD**
1. Availability of EDI applications	4.23	0.88
2. Management support	4.08	0.74
3. Initial investment	4.04	0.89
4. Availability of EDI standards	3.96	0.9
5. Internal skills/resources	3.88	0.73
6. Customer, supplier and government requirements	3.85	1.05
7. Availability of maturity in EDI applications	3.83	0.9
8. Software reliability	3.81	0.89
9. Strategic objectives	3.81	0.98
10. Hardware reliability	3.79	0.85
11. Software capability	3.77	0.88
12. Software availability	3.6	1.07
13. Hardware capability	3.58	0.98
14. Hardware availability	3.56	0.99
15. End user acceptance	3.35	1.08
16. Organizational resistance	3.31	1.11

The three most cited feasibility factors are availability of EDI applications, management support and initial investment with score over “moderate”. Meanwhile, the least affecting factors are hardware availability, end user acceptance and organizational resistance.

From Table 6, the availability of EDI applications is stated to be the main reasons of EDI adoption among the responding organizations (more than 50%). This finding also showed that initial investment was ranked in the third place with mean score of 4.04. This was partially consistent with the study made by [1] which indicated that the initial investment was the most affecting factor to the adoption of EDI. In their study, initial investment was cited the most affecting factor with mean score of 4.16. Furthermore, this study also found that management support was an important factor with mean score of 4.08. This can be attributed to the responding organizations, which categorized themselves as self-directed user. This reflects that most of these companies which was categorized in small-scale business are more concerned about the availability of EDI applications in terms of external or internal connectivity and support from top-level management. The finding supports [11] argument that enthusiasm of the top manager/CEO toward E-Commerce would influence the adoption of E-Commerce in small and medium companies.

The responding organization also cited that requirements of trading partners were perceived as moderate factor in EDI adoption as well as internal skills/resources, software/hardware reliability, capability, and availability. Even though an EDI adoption in the Penang Port area was initiated by the responding organizations, it was surprisingly found that end user acceptance and organizational resistance were perceived as less significant when compared to other external and technological factors.

6. Discussion

This study found that it has been an increasing trend for logistic companies to migrate their business operation/process by using the Internet. Business process reengineering is applied to transform the business operations onto the web to facilitate functional operations in Penang Port in order to keep in line with the ICT development in Port Klang (Port Klang Community System). A lot of research has centered the business process reengineering in procurement migration using the Internet. By re-engineering the business process, the migration of the processes from the conventional method to E-Commerce may result in a direct information and material flow. In fact, some or all of the operating functions in logistic operation may also be changed, merged together, or diminished [3].

EDI adoption among logistic companies dealing at Penang Port was initiated by themselves, which is not mandated by larger or dominant business partners. This indicates that these companies are willing to change its business operation process from conventional way to the state-of-the-art technology. Their motivation and initiatives towards E-Commerce were increasingly become a primary focus in order to gain competitive advantage. This finding was inconsistent with [1] empirical study in Port Klang. Most of the companies dealing at Port Klang classified themselves as mandated user, which is influenced by dominant business partner.

In terms of EDI connectivity, most of the responding company's in this study were found to be migrating from traditional conduct of EDI onto the I-EDI. This finding was consistent with [2] and [5]. They argue that the Internet-based E-Commerce is giving a new way to electronic commerce, with different characteristics than the traditional EDI.

The extent to which EDI applications are implemented in different business transactions of shipping and forwarding agencies were found to be limited to only a few business partners and certain transactions. From this study, Customs and Excise Department appeared to be at the center stage of the EDI application in Penang Port. This finding appear to lend support to [1] empirical study in Port Klang. But this doesn't mean that they are not willing to adopt E-Commerce for other transaction and with other partners. This can be explained by the above results, which had proved that over 50 % of the responding companies perceived that the availability of EDI application is an important factor of EDI feasibility. The responding companies have had Internet-based EDI application and infrastructure, but the availability of EDI application at business / trading partners' side is still in its infancy. This factor will deter the adoption, implementation and the extent of usage of EDI in logistic industry.

7. Recommendation

For most companies the most significant items of implementing Internet-based EDI is initial investment. This factor is related to computer hardware and software solution, which appeared to be the biggest portion of total cost involved. However, logistic companies must realize that the benefit of EDI implementation is very huge in terms of profitability and cost saving. In other words, logistic companies must keep up to date with ICT development. This measure must take into account in order to keep in line with other logistic companies around the world. Ultimately, the Internet-based EDI will enable them to compete globally.

Efforts to encourage more logistic companies and business/trading partners to adopt and implement E-Commerce must be continued thoroughly by all parties involved. This measure must take into account in order to increase the use of EDI in terms of breadth, diversity and depth, apart from volume. There is a need for those parties involved to exploit the full potential of EDI technology.

Training and employee development was also identified as being highly important to ensure successful implementation. Shipping and forwarding agencies must prepare their personnel with knowledge that would enable them to use EDI technology. ICT personnel and all levels of management is not only involved in operation but also must be involve in planning, implementation or both of EDI adoption. This is an important factor in order to generate positive attitudes among employees towards EDI adoption. A study by [4] indicated that employee involvement in this area would generate positive attitudes towards the implementation of E-Commerce.

8. Conclusion

As a result of conducting this study, a number of issues of interest have been identified and conclusion reached:

- The level of awareness among respondent companies (which is considered as small and medium companies) to the potential benefits of E-Commerce implementation in logistic industry has increasingly become a primary focus. All companies in the samples did have

Internet-based EDI (XML) application in their day-to-day and business-to-business communication and trading helped to explain this emerging trend.

- The level of awareness and motivation among small and medium companies towards implementation of E-Commerce were found to be encouraging. The results indicate that EDI use at Penang Port was found to be high in terms of volume. However, its use was still very low and limited in terms of diversity, breadth and depth. The extent to which EDI applications are implemented in different business transactions of shipping and forwarding agencies were found to be limited to only a few business partners and certain transactions.
- All of the companies in the sample had Internet-based EDI application. There was a common expectation that the majority of business-to-business communication and trading would take place via this medium in the near future.

The evidence from this study indicates that shipping and forwarding companies dealing at Penang Port that implement EDI for E-Commerce with trading partners can reap substantial benefits. There are, however barriers to adoption and implementation issues that need to be addressed in order to ensure these potential benefits are realized.

9. References

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