BARRIERS TO E-COMMERCE TECHNOLOGIES ADOPTION IN THIRD PARTY LOGISTICS COMPANIES

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ABSTRACT

This paper focuses on the barriers to e-commerce technologies adoption in third party logistics companies in Malaysia. Despite multiple benefits, such as improved accuracy of information dissemination, improved product movement visibility and better customer service levels, the level of e-commerce technologies adoption among the third party logistics companies in Malaysia are not high because of several barriers such as data communication too slow and the customers not ready for e-commerce.

Keywords: E-commerce barriers; e-commerce technologies; third party logistics; logistics; supply chain management

INTRODUCTION

The purpose of this paper is to gain knowledge on the barriers to e-commerce adoption among the third party logistics companies in Malaysia. The adoption of information technologies and e-commerce technologies specifically, has been argued across literature to bring multiple benefits to the companies such as improved accuracy in information dissemination, better visibility of product moving along the supply chain and improved customer service levels. However, this study found that the level of e-commerce technologies adoption among third party logistics companies in Malaysia is not as high as could be expected. Several barriers still hinder the adoption process and this paper intends to discuss these barriers.

LITERATURE REVIEW

This section deals with literature review and analysis to provide general overview of the main topic studied in this research. Definitions as well as past studies are reviewed and analysed to provide the foundation to this topic. Specifically, the discussion includes a literature review and analysis of logistics and third party logistics service providers, E-commerce technologies and barriers to e-commerce technologies adoption.

Logistics and third party logistics companies

Logistics is defined as the process of managing (plan, implement, and control) the flow of material, services, and information effectively and efficiently from the point of origin to the point of consumption (Rushton et al., 2000; Javalgi and Reisenwitz, 2001; Lummus et al., 2001; Arlbjorn and Halldorson, 2002; Harrison and Hoek, 2002; The Council of Logistics Management, 2003; Coyle et al., 2003; Karkkainen et al., 2004; Aghazadeh, 2004). Logistics is a broad subject covering a wide range of activities such as production scheduling, order processing, transportation, demand management, warehousing, packaging, information technology, supply chain management, customer services, inventory control, import and export processing, documentation and insurance, payments, customs processing, inspection, returns processing, and implementation of related government regulations such as product and labeling standards, health and environmental protection (Robson, 1993; Plotkin, 1993; Stock et al., 1999; UNCTAD e-commerce and development report, 2001; Ee, 2001; Sohail et al., 2004).

The study of third party logistics companies is important because of several factors. Increase in outsourcing of the logistics function to third party logistics companies means greater customer demand for high quality logistics services. ICT and the Internet can play a substantial role in implementing enterprises' major strategies for high quality logistics services and growth, for example increasing strategic marketing/promotional efforts, customer relations or the quality of the products or services (UNCTAD, 2004). Such a study would help the third party logistics service provider ascertain what the critical success factors are (with regards to e-commerce technologies) and how they should position themselves in the wake of the increasingly competitive digital global marketplace (Malaysian Business, 2002; Chapman et al., 2003).

Internet commerce does not eliminate the need of the physical logistics systems; in fact, it even increases their importance. Despite its advantages, the Internet can be used as a distribution channel only for a limited range of goods which can be stored, processed and transmitted in a digital format such as e-music, e-books, e-journals etc. Even in the case of the virtual companies, the specific logistic operations are sub-contracted by the firm and then coordinated at the managerial level (Gurau et al., 2001).

E-commerce Technologies

The application of information technology (IT) to the logistics process is gradually spreading. The utilization of various information technologies and types of information systems in the logistics process include (Gutierrez and Duran, 1997; Milligan, 2000; Gurau et al., 2001; Tarn et al., 2003; Sauvage, 2003):

- EDI;
- Optical barcodes;
- Demand forecasting systems;
- Automated order processing and shipment systems;
- Service control by customer type, product or geographical area;
- Transportation planning and scheduling systems (fleet management); and
- Warehousing management systems.

As discussed earlier, it could be argued that e-commerce gives rise to new features in logistics and transport services that are more demanding than those imposed in traditional commerce. These new features include the need to transact with a large number of disparate customers, the emergence of new business models and practices, an increased demand for higher service levels and a growing demand for collaboration between users and service providers along the supply chain.

Technologically, these developments imply that traditional methods of handling information such as e-mails, faxes, and telephones are insufficient to meet the additional demand of e-commerce. Therefore it is imperative that companies focus on software systems applications that can automate transactions and also allow data and information exchange between different system applications. Against this context, the development of software applications capable of supporting a variety of logistics services has seen an upward trend. These software purport to offer many benefits such as reduced volume of paperwork, improved overall productivity of logistics services and considerable opportunities for firms to optimize functions over the supply chain (UNCTAD e-commerce and development report, 2001). Possibly the most comprehensive listing and description of e-commerce technologies specific to logistics is the one provided by UNCTAD in their E-commerce development report (2001) presented in Table 1.

Table 1: Software applications for e-commerce logistics

Software applications	Description
Online order management	Order management applications enable users to perform online order entry, and provide real-time information on all customers and on products ordered in order to enable the seller to set priorities for order fulfilment. Some applications allow customers to specify their needs and requirements in order to allow for the delivery of customised products. The system interactively offers product that match the customer's requirement, and allows him or her to choose on a self service basis. Some applications automate the allocation to buyers of products that are in short supply according to set criteria. Others make it possible for customers and suppliers to obtain visibility into the status of orders. This enables sellers to commit delivery dates and customers to know when to expect deliveries. Some applications are designed to enable order fulfilment in B2B, many-to-many transactions. They enable order capture from many sources and execute multiple orders.
Shipment tracking	Users can track individual shipments or parcels while they are in transit, and the status of shipments is monitored as it changes at different points along the transport chain. Some applications monitor shipments and can alert the shipper if the shipment is moving behind schedule. Tracking capability requires the seller or shipper to link its website to the carrier's application systems. It enables all parties in the supply chain to share information and to better plan inventory, sales or production. Shipment tracking applications can also be used by a shipper to re-route shipments.
Equipment and vessels tracking	The movement and locations of transport equipment such as containers and vessels, trucks and cargo-carrying aircraft can be tracked and fed into shipment tracking. It also enables terminal, port and other facility operators plan their operations based on real time information about the location of the vessels, equipment, and so forth.
Transportation management and planning	Users can carry out transportation transactions on the Internet, such as freight rate management, freight bill payment and carrier selection. Carriers can optimize route determination and adjust transportation schedules on the basis of incoming orders. Some provide automatic assignment of manifests as shipments are being processed. Manifests are automatically printed on paper and users can transmit them automatically to carriers billing systems. Others enable shippers to select carriers automatically on the basis of freight cost, transit times and other best-carrier criteria that are specified by the shipper. On the basis of the attributes of a shipment, some applications compute total freight cost, including discounts, additions and surcharges, assign a bill of lading number and remember to assign the same bill of lading number to shipments to be consolidated for delivery to the same consignee.
Landed cost calculations applications	These applications are mainly designed for international e-commerce transactions. They permit automatic calculation of the landed cost of a product when received by the consignee. The calculation takes into account information on trade regulations, custom tariffs, government taxes, insurance and transportation costs. To support calculations, some applications also incorporate large databases on such information as most-favoured-nations (MFN) tariffs and tariffs negotiated under bilateral or multilateral trade agreements and preferential agreements such as the Generalised System of Preferences (GSP). Some applications allow shippers to describe their products in plain language, and the software automatically matches the description to Harmonised System Tariff Schedule (HS) codes. Others enable exporters and importers to compare different landed prices automatically for different Incoterms, for example costs, insurance and freight (CIF) and Free on board (FOB).

Online customer service management	Customer service (or customer relationship management) systems provide capabilities for communication and interaction between sellers, service providers and customers. Customers can access interactively customer service specialists directly and request help online. Responses can be given at virtual help desks. Sellers can contact customers to ask them if they need help. Vendors and service providers can post answers to frequently asked questions (FAQs) and thus provide a form of self service to customers. Online discussion groups or chat rooms provide useful information to sellers and buyers. Some applications maintain the history of sold items by tracking the serial number of the items, contracts and warranty details, and records the after sales services and agreements.
Collaborative logistics management	These allow supply chain participants to collaborate in various ways, for example to plan jointly their transport requirements and plans, and to share information on transport capacity availability and thus optimize their vessel scheduling. Participants can also tender for transport and other services. They can also offer customers, producers and suppliers complete visibility into demand data and fulfilment schedules. If exceptions occur that cannot be executed, the trading partners are notified automatically to allow them to quickly resolve the situation.
Customs clearance	Custom clearance and compliance applications permit online preparation of import/export documents and provide direct connection or customs services. They also generate automatically custom documents and distribute them to suppliers, buyers, shippers, carriers, freight forwarders and custom brokers. In addition, import data can be filed electronically in advance of arrival of shipments, thus saving money by reducing the time that goods are held in Customs. Some applications can verify automatically whether imports and exports comply with different countries' trade laws, regulations and procedures, including embargo, boycotts and restricted products.
Returns management	A consumer wanting to return a product visits the customer service section of the retailer from whom the purchase was made. The customer selects options for returned products. The programme guides the customer through series of prompts and questions such as the reasons for wanting to return the product. The programme may offer some troubleshooting tips if the product is being returned because it is defective. If the customer's decision to return the product is final, he or she is prompted to print a mailing label to affect the return.
Integrated all-in-one supply chain management	As opposed to stand alone solutions designed for single functions, integrated applications attempt to handle multiple supply chain functions starting from the moment an order are placed until delivery to the final customer. A number of logistics companies, in partnership with technology companies, have attempted to develop such applications, although it would appear that integrated systems are not widespread.

Source: UNCTAD (2001)

Theoretically, the adoption of e-commerce and its related technologies should result in more effective performance. E-commerce's main endeavour, as pointed out by Kalakota and Whinston (1997), Hoek (2001), and Bowersox et al., (2007), is to improve business transaction execution by enabling firms to use technology to efficiently execute information-laden transactions between various parties in the supply chain.

In a case study of four logistics service providers companies in Hong Kong, Koh and Tan (2005) have shown that e-commerce application has brought multiple benefits to the logistics companies. Specifically, those benefits were:

- Cost reduction by saving communication costs (by replacing traditional communication modes such as telephone and fax with e-mails).

- Increased efficiency in the supply chain by reducing operation time and costs via the use of computerized and automated technologies.
- Order and payment can be transacted and completed over the web and these need only one-time input, thereby reducing human error.
- Increased quality of service to customers
- Improved efficiency of many managerial tasks.
- Increased predictability and visibility in the supply chain.
- Reducing customers' logistics costs
- Enhancing reliability
- Supplying a good tool support for decision making on transportation.

Koh and Tan concluded that, at least for the firms that were studied, the use of e-commerce technologies, especially those of advanced technologies such as track and trace system, have a significant impact on the performance and competitive advantage of 3PL firms. The more competitive firms are always trying to make greater use of e-commerce functions (intranet, internet, track and trace systems etc.) to supply better and more reliable service to their customers. Kumar and Petersen (2006) have further argued that e-commerce improves customer relationship thereby improving customer service.

There is sufficient literature to suggest that e-commerce application improves a firm's performance. However, the e-commerce logistics technologies adoption in third party logistics companies is still not as high as expected despite its multiple benefits.

Barriers to e-commerce technologies adoption

There are several factors that hinder the development and use of e-commerce. In the case study of four 3PL providers in China, Koh and Tan (2005) found that the factors are:

- Insufficient customer demands
- Insufficient understanding of e-commerce
- Lack of experience (on the part of the Chinese customers) in managing the interface with the 3PL providers
- Governmental regulations
- Chinese electronic infrastructure
- Insufficient expertise or quality of software provided by suppliers

Rae-Smith and Ellinger (2002), in their (case) study of a company's experiences during the roll out and implementation of its online logistics service system, illustrates the complexity of such an endeavour. There can be various problems such as delivery issues (software modules not delivered within the time schedule specified in the initial contract); response time slow for all users; lack of system acceptance on the part of customers and internal users (customers did not change the way they did things and internal users are not particularly enthusiastic about learning what the system could do for them). Hoek (2001) further added that the companies' heritage systems could also hinder major changes to the business model and processes.

Arguably the most comprehensive treatment of barriers to e-commerce is one by United Nations Conference on Trade and Development (UNCTAD) in their E-commerce and Development Report (2001). The barriers, incorporated in The Nordic Business Survey, have been suggested to be a good starting point. This model survey has been tested across the countries of the Nordic region and subsequently improved based on experience and inputs from statistical offices in a wide range of

countries. The barriers to the use of Internet, and Information and Communications Technology (ICT) in general, were divided into three topics: Barriers to Internet sales; Barriers to the use of Internet; and Barriers to the use of ICT in general. The specific measurements for all three topics are presented in Table 2.

Table 2: The barriers to the use of Internet and Information and Communications Technology (ICT) in general

Barrier Topic	Measurements
Barriers to Internet sales	• The products of the enterprise not applicable for Internet sales • Customers not ready to use Internet commerce • Security problems concerning payments • Uncertainty concerning contracts, terms of delivery and guarantees • Cost of developing and maintaining an e-commerce system • Logistical problems • Considerations for existing channels of sales
Barriers to the use of Internet	• Security concerns (e.g. hacking, viruses) • Technology too complicated • Expenses of development and maintenance of websites too high • Lost working time due to irrelevant surfing • Data communication expenses too high • Data communication is too slow or unstable • Lack of perceived benefits
Barriers to the use of ICT in general	• ICT expenditure too high • New versions of existing software introduced too often • Supply of ICT-technology not matching the ICT needs of the enterprise • The level of ICT skills is too low among the employed personnel • Difficult to recruit qualified ICT personnel • Existing personnel reluctant to use ICT • Lack of updated ICT strategy • Lack of perceived benefits

Source: Nordic Model Questionnaire; UNCTAD E-commerce and Development Report (2001)

The model survey described above however, would have to be modified in order to study specifically the third party logistics industry. Barriers to e-commerce and ICT in general, however, have not been well documented even in developed countries and even less is known in developing countries. It has an implication for the companies. For examples, to the companies, not knowing what hinders the e-commerce development could result in making mistakes that could be avoided thus resulting to a certain extent in higher implementation costs and a strain to their bottom line – profits.

RESEARCH METHODOLOGY

Secondary data was first collected through literature review. These secondary data sources include journals and reports of committees. The key journals used were International Journal of Physical Distribution and Logistics Management, and Logistics Information Management. Key reports used were the UNCTAD E-Commerce Development Report 2001 and 2004, and the European E-Business Report 2006/07. The research questions were refined and measurement items for the questionnaire were developed using these secondary data. The secondary data collection method was employed because it "can provide a useful source from which to answer, or to begin to answer," the research question

(Saunders et al., 2003). The main product emerging from the secondary data collection was the pilot questionnaire, which was then subjected to test on a selected research group.

Sampling Design

The research population for this study was the maritime-based logistics service provider companies in Malaysia. Maritime-based logistics service provider companies are those companies that provide services inherent to the logistics function such as transportation, warehousing, freight forwarding, and includes integrators (port authorities), hauliers, shipping agents, shipping liners (ship owners) etc. As the name suggests, maritime-based LSPs are those that uses the sea as their main mode of transportation, including those that deal with companies that use (mainly) the sea transportation mode. For example, although the haulers would use land as their main transportation mode, they usually provide services to the OEMs that use sea transportation as the main transportation mode to send goods to their clients. It is usual that the hauliers would send the OEM's containers to the port to be loaded onto a vessel of choice and transported through the sea to its preferred destination. Therefore, companies like the hauliers, or the freight forwarders for that matter, would qualify as maritime-based logistics companies.

There is an inherent difficulty in obtaining a suitable sampling frame for the population under study. To the knowledge of the researcher, there is no complete listing of all logistics service providers operating in Malaysia that can be publicly and cheaply accessed. Therefore, an Internet search of logistics service providers in Malaysia was done (see www.superpages.com.my/business services) that yielded a result of approximately 500 LSP companies. This listing was further reinforced by the list provided by the researcher's contact in Malaysia (the contact's identity will not be disclosed due to assured confidentiality. The researcher's said contact however, is one of the top management level employees of one of the biggest integrator companies in Malaysia, with a considerable amount of LSPs in its client base).

However, this listing did not provide information on whether the LSPs are maritime-based. The next step in efforts to find suitable maritime-based sampling frame was to divide the population into segments and extract the companies located near the three biggest ports in Malaysia. This was done based on the assumption that most maritime based LSPs would be based in/near the ports for business or operational efficiency. There are three major ports in Malaysia: Penang Port (situated in the state of Pulau Pinang), Port Klang (situated in the state of Selangor) and Tanjung Pelepas Port (situated in the state of Johor). Therefore, the LSPs situated in Pulau Pinang, Selangor (including Kuala Lumpur), and Johor were selected. This yielded a total population of approximately 400 LSP companies. However, further telephone checks on the list revealed that the LSPs included in those states also included 40 air cargo services companies. As such, those companies were excluded from the sampling frame. The final sampling frame, after the air cargo LSP companies' exclusion, was three hundred and sixty companies. A 50% sample was chosen from the final sampling frame, yielding 180 randomly selected companies to whom the survey questionnaire was mailed.

Data collection method

Research Instrument

The main research instrument used in this study was a questionnaire. The questionnaire was designed to fulfil the research objectives' focus on barriers to e-commerce technologies adoption. Therefore, the questionnaire consists of sections dealing with e-commerce barriers. The questionnaire went through pilot testing and was subsequently modified. The modified post pilot questionnaire was then used to collect data in the main data collection phase.

The barriers to e-commerce component in the questionnaire was compressed to include only those barriers considered to be the most important and relevant to the third party logistics industry in Malaysia following feedback from the pilot LSP group. The items were also reworded, compressed and reduced to improve layout and avoid respondent fatigue phenomena. Only thirteen items were included instead of the previous twenty-one in the pilot questionnaire. Barriers included in the post-pilot questionnaire were: products/service of the company not applicable for Internet sales; customers not ready for e-commerce; security problems; new versions of existing software introduced too often; supply of technologies not matching the needs of the company; level of e-commerce technology skill is too low among the employed personnel; difficult to recruit qualified e-commerce technologies personnel; existing personnel reluctant to use e-commerce technologies; lack of perceived benefits; expenses of development and maintenance of information system infrastructure too high; lost working time because of irrelevant surfing; data communication expenses too high; and data communication is too slow or unstable. Respondents still answer on a five point scale ranging from "1=no importance" to "5=very important".

The questionnaire was self-administered via postal method. Following suggestions by Saunders et al., (2003), detailed protocol for postal administration was:

1. Carefully designed and planned covering letter and questionnaires were printed and the envelopes addressed.
2. Recipients were contacted by e-mail to advise them to expect a questionnaire where possible.
3. The survey was posted with a covering letter and stamped addressed return envelope. It was ensured that the questionnaire arrive when the respondents were likely to be receptive, avoiding Fridays and days surrounding major public holidays as suggested by Saunders et al., (2003).
4. The first follow-up was posted one week after posting out the survey to all recipients. These were in the form of a letter designed to thank early respondents and to remind non-respondents.
5. The second follow-up was posted to respondents who had not responded after three weeks. It contained another copy of the questionnaire, a new return envelope and a new covering letter. The covering letter was reworded to emphasize further the importance of completing the questionnaire. The second follow-up was possible in this research because every questionnaire contains a unique reference number that refers to the specific logistics service provider company recorded in the researcher's list of recipients.
6. The third follow-up was by telephone calls to non-respondents to increase the response rate and also to ascertain reasons for non-response.

Data analysis method

Standard statistical techniques were used in this study for the purpose of data analysis. The SPSS software, the most widely used computer software for data analysis, was used to analyse and manage quantitative data for this study (Coakes and Steed, 2001). The data was subjected to univariate analysis (descriptive analysis). However, before the data were subjected to the analysis stated earlier, analyses were done to measure the reliability and validity of the survey data.

The aim of this research was to establish the barriers to e-commerce technologies adoption amongst third party logistics service provider companies (3PLs). Therefore, as a start, descriptive analyses were employed with the (descriptive) focus of painting a summary picture of the sample (3PLs) in terms of the variables of interest (Diamantopoulos and Schlegelmilch, 1997). The description of data is a typical first step in any data analysis project. In addition to being an important, independent activity when a descriptive focus characterises the aim of the research and its analysis objectives, descriptive data provides a very useful examination of the data (Diamantopoulos and Schlegelmilch, 1997).

FINDINGS AND DISCUSSION

The third party logistics service providers as defined for the purpose of this study cover companies that offers logistics services as their core business. The population of maritime-based 3PL companies in Malaysia was 360 companies of which 180 companies were randomly selected and sent the questionnaire. 69 companies responded yielding a 39% response rate. Background information results indicated a good spread of companies based on size (determined from the number of employees), geographical spread of operations, position of respondents in the company, and logistics-related role played by the companies surveyed.

The sample consists of small (less than 50 employees), medium (50 – 199 employees) and large (more than 200 employees) – sized companies. The breakdown of companies who responded according to their size is as follows: small-size - 48%, medium-size - 30%, and large-size – 22%. There seems to be good representativeness for this study as there were responses from all company sizes (small, medium, and large). The survey results seem to indicate that third party logistics companies in Malaysia consist mainly of small and medium size companies.

In terms of company's geographic operations, the survey results showed a good spread with a majority of the companies surveyed (58%) having worldwide operations spanning Asia, Western Europe, Central and Eastern Europe, North America, Latin America, Africa, and Middle East countries.

More than half of the respondents who answered the survey on behalf of the logistics service provider companies are executives (52%) followed closely by general managers/managers (42%). This indicates that the survey has been successful in its respondent target and that the information gleaned from it will have good reliability as it is usual for general managers and executive to have strategic and tactical information of e-commerce development and impacts that concern both their companies specifically and their industry in general. Results on the logistics-related role indicated that 41% of the companies surveyed are a combination of transportation, warehousing and freight forwarder companies. This means that almost half of the companies surveyed are multi-functional (playing more than one logistics role/providing more than one type of logistics service). This would seem to indicate a pattern in the evolution of the role played by the 3PL companies from being just a transportation company, for example, to taking a wider logistics solutions provider role offering a wider span of services.

The survey also asked the companies to indicate important reasons why they did not practice e-commerce and/or implement its related technologies. Several reasons were suggested. For the Malaysian 3PLs, important reasons for not using e-commerce are that data communication is too slow, customers are not ready, and that expenses are too high. The results are presented in Table 3.

Table 3: Barriers to E-commerce Technologies Adoption

Barriers to E-commerce Technologies	Mean
Data communication too slow	3.17*
Customers not ready	3.03*
Expenses too high	3.00*
Data communication expenses too high	2.93*
Security problems	2.62*
Lack of perceived benefits	2.17*
Product/service not applicable	2.13*

**Note: Ranking: 1=No Importance to 5=Very Important*

It would appear that speed, readiness, and costs are the important barriers to e-commerce use. Similar barriers were reported by Ndubisi and Kahraman (2005) in their Malaysian women entrepreneur ICT usage behaviour study where dearth of resources to deploy technology was seen the main barrier. It is

interesting to see that when compared to other European companies (based on the 2006/07 European E-business Report), the reasons for not using e-commerce somewhat differ in terms of importance ranking. For the European companies, technology cost was the most important reason but in the case of Malaysian 3PLs, speed and readiness take a more important position than costs.

Reasons that were considered moderately important are security problems, lack of perceived benefits, and product or service of the company are not applicable to be traded on the Internet. Other possible reasons were perceived as less important.

The barriers to the uptake of e-commerce are recognized to be different in many ways but they exhibit similar within-group characteristics. In most developing countries, Malaysia included, majority of businesses, in this context – the freight forwarders – are small to medium businesses. They therefore lack financial, technological and human skills resources. Small and medium businesses in many countries face the same problem; they do not fully utilize the use of technology (Emerald Group Publishing, 2008) and this limits the size of online market in this sector.

Compared to other developing countries, Malaysia, to a large extent, is facing more superficial barriers than deep-seated ones. Salman (2004) has reported very severe barriers – most of them deep-seated - in Bangladesh where micro level barriers such as sense of complacency, resistance to change, unsound financial conditions, and macro-level barriers e.g. human plight (i.e. income of less than a dollar a day), hazardous environment, and conflicting political barriers are hampering to a large extent e-commerce development there. These barriers are more difficult to address and imposes challenges far worse than the ones facing Malaysia.

CONCLUSION

The most cited barrier to the uptake of e-commerce is that data communication is too slow followed by that customers are not ready for e-commerce. Similar to Rae-Smith and Ellinger's study (2002), these findings illustrate the complexity in the e-commerce endeavour in that there are various issues such as lack of acceptance on the part of the customers. This does not mean a firm should never seek to implement e-commerce software, but think through ways to eliminate or minimize these barriers since literature has been able to show that e-commerce software implementation does improve the firm's performance (i.e. in better customer service levels, for example).

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