



The Impact of Electronic Data Interchange (EDI) on Purchasing: a Case of Midgal Product Ltd

¹Oba Abimbola Aina – David, ²Oduombaku Aliu Ajani & ³Olatunde T. Sanusi

^{1&3}Department of Business Administration and Management

Moshood Abiola Polytechnic, Abeokuta.

²Department of Marketing, Moshood Abiola Polytechnic, Abeokuta.

Abstract

Electronic data interchange (EDI) is possibly the most promising application of information technology witnessed in recent years. It is revolutionizing supply-chain management and has enormous potential for this paper. We have attempted to define EDI and examine major EDI elements that link organizational systems. The application of EDI in manufacturing, retailing and service operations is examined, and a framework for describing EDI components and their role in different areas of an organization is proposed. This research focuses on electronic data interchange (EDI), an important class of IT used for inter organizational information transfers in the supply chain. Data from a survey of the roofing sheet manufacturing industry issued to examine the use of EDI with respect to interfirm coordination activities involving suppliers and customers. The influence of demographic characteristics on EDI use is also investigated. The results suggest that firms view EDI as a tool for improving effectiveness, efficiencies and also as a tool for facilitating supply chain integration. There is also a surprising difference in firms' use of EDI with suppliers. Firms tend to be much more accommodating of the desires of their customers than of their suppliers. Finally, we summarize our finds and conclusions.

Keywords: *Electronic Data Interchange, Trading Partner, Value-added Networks, Purchasing*

Corresponding Author: Oba Abimbola Aina – David

Background to the Study

Electronic data interchange (EDI) is an electronic communication method that provides standard for exchanging data via any electronic means. By adhering to the same standard, two different company or organization, even in two different countries can electronically exchange document (such as purchase orders, invoices, shipping notices and many others). EDI has existed for more than 30 years and there are many EDI standards (including X12, EDIFACT, ODETTE etc), some of which address the need of specific industries or regions. It also refers specifically to a family of standards.

According to the National Institute of Standards and Technology, an organization that issued the standard for Electronic Data Interchange in 1996, EDI is –the computer-to-computer interchange of strictly formatted messages that represent documents other than monetary instruments. EDI implies sequences of messages between two parties, either of whom may serve as originator or recipient. The formatted data representing the documents may be transmitted from originator to recipient via telecommunications or physically transported on electronic storage media. (Federal Information Processing Standards Publication 16-2). According to the Council Directive 2001/115/EC and Commission Recommendation 94/820/EC, EDI is essentially defined as an electronic transfer of data from computer to computer, using an agreed format, and processed automatically and unambiguously. There should be an agreement providing for procedures guaranteeing origin and authenticity of data. (European Commission, 2011). According to Levy and Gantz (1987), EDI comprises three basic components: the application software, translation software and communication network. The application software enables the operations such as purchasing, order processing, account payable and accounts receivable. The translation software provides the conversion of data into standard format, whether the communication network ensures the delivery of information between partners.

Swatman, and Fowler (1994) identified two separate tasks of EDI related to the ability of the application to link input and output information flow allowing a seamless connection to functions such as purchasing, order entry, shipping, inventory management, accounts payable and receivable. The first one, is the in-house application, which translates the outgoing information from unstructured, company-specific formats into the structured EDI formats and vice versa. The other one is the network communication software, which transmits the new structured message to its recipient.

Banerjee and Golhar (2002) defined EDI as a system that automates routine transactions by integrating tasks and functions across a predetermined set of organizational boundaries. EDI comprises three basic functions: first, data transfer between partners, i.e. the actual transmission; second, data transformation or translation between proprietary format, i.e. the data format used by sender or recipient, and the standard format that is required to meet transmission protocol; third, directing data to and gathering it from different computer applications. This scheme demonstrates how the data flows between a sender and recipient, i.e. represents the basic functions of EDI (Powers, 1989). The high level of EDI integration into the internal information systems refers to the operational

relationship. It was suggested that trust is a critical factor affecting willingness of the partners to integrate their systems, and expand the percentage of transactions. (Lee and Lim, 2005).

Diversity relates to the degree of how widely and comprehensively an organization uses EDI. The diversification of document formats enables a seamless communication between trading partners and organizations diverse functions. The partner attributes had no significant effect on the diversity of EDI implementation, possibly due to the utilization of value-added networks (VANs). VAN supports the conversion and transmission of documents with the prominent communication speed. In addition, VAN enables the EDI transactions, providing the partners with message standards, communication protocols and operation procedures. Therefore, the diversity of document formats by organizations itself has less effect on the EDI performance. (Lee and Lim, 2005).

Statement of the Problem

The research problem that the study tends to focus on includes:

- i. The link between Electronic Data interchange and purchasing.
- ii. The difficulties in identifying the importance of Electronic Data Interchange over other purchasing methods.
- iii. The thorny of problem that could arise when using EDI to Purchase goods.

Objectives of the Study

- i. To find out the degree of utilization of time and paper invoices while using EDI in purchasing
- ii. To know the extent at which EDI has help the organization in routine purchase
- iii. To discover the relationship between the supplier and the buyer using EDI standard
- iv. To ascertain the manner at which EDI has aid the effectiveness and efficiency of the company that adopt EDI

Research Questions

In order to achieve the objectives of the study, the following questions shall be answered.

- i. Does Electronic Data Interchange (EDI) hasten the time constraint in the purchase of goods?
- ii. Does EDI strengthen Routine purchase of goods?
- iii. Does EDI aid the selection of the appropriate supplier when the need to purchase goods arises?
- iv. Does EDI aid prices comparison between different supplier's goods before the goods are purchased?
- v. Does purchasing of goods through EDI more secure compare to other ways and methods of purchasing.

Research Hypotheses

In the course of the research work, the following hypotheses will be tested

- i. H_0 : Electronic data interchange has not hasten the time constrain in the purchasing of goods
 H_1 : electronic data interchange has hastened the time constrain in the purchasing of goods.
- ii. H_0 : EDI has not aid price comparison between different suppliers goods before the good are purchase.
 H_1 : EDI has aid price comparison between different supplier's goods before the goods are purchased.
- iii. H_0 : Purchasing of goods through EDI is not more secure compare to other ways and methods of purchasing.
 H_1 : purchasing of goods through EDI is more secure compare to other ways and methods of purchasing.

Electronic Data Interchange

Our research looks specifically at EDI and its relationship to supply chain coordination. EDI is defined as computer-to-computer transmission of standardized business transactions, as found in Walton and Maruchek (1997). In the manufacturing industry, there are standard inter firm EDI transactions which use the industry protocols that are defined in the uniform communication standard II (UCS II).

Our research also explores the frequency and depth of EDI use within the manufacturing industry. Evans et al. (1993) give a history of EDI and develop descriptions of the phases of EDI implementation through which an organization would typically progress. A study on EDI implementation and benefits was published by Williams (1994), who developed a framework for EDI adoption based on characteristics of the industry and its interorganisational relationships. EDI use and its value to the organization were explored by Williams et al. (1998) with specific applications to the freight industry in Murphy et al. (1998). EDI's Impact on customer service and delivery were studied by Lim and Palvia (2001) and Ahmad and Schroeder (2001).

Edi and Supply Chain Management

Supply Chain Management (SCM) places an emphasize on the flow of information and material, synchronized to the customer's requirement, from raw materials to the end consumer (Stevens, 1989). In effect, SCM blurs the traditional boundaries that exist between supply chain entities through interfirm activities such as: sharing of research and development, the placing of employees with other firms, development of cost management systems across firms, collaborative inventory control and inventory placement decisions. SCM has an emphasis that goes well beyond the traditional function of materials management (Cooper and Yoshikawa, 1994; Tzafesta and Kapsiotis, 1994). Information sharing between the buyer and supplier is considered to be a major indicator of the use of SCM. When information flows seamlessly in both directions, the effect is to

create a virtual supply chain. Information transfer is used, in effect, to integrate the entire value chain into one longer chain (Shapiro et al., 1993; Rayport and Sviokla, 1995; Bhattacharya et al., 1995; Towil, 1997). In the context of SCM, the term integration relates to how closely, particularly at their interfaces, supply chain entities operate as a single unit. Higher degrees of integration occur when supply chain members automatically coordinate some aspect of production. EDI is important since it facilitates frequent and automatic transfers of information required for high degrees of integration and coordination within the supply chain. Conversely, the use of EDI, without the integration of supply chain activities, will simply speed up an existing process. This integration requires the reorganization and restructuring of the relationships between firms to achieve the full benefit from use of both EDI and SCM (Konsynki, 1993). Coordination is an integral part of supply chain integration. Clemons and Row (1992) focus their research on the coordination between firms, using it to measure integration. In particular, EDI is an enabling factor and the first step leading to integrated supply chains (Swatman et al., 1994; Curran, 1991). Evans et al. (1993), show that the degree of integration in SCM depends on the degree of EDI use within the firm.

Electronic Data Interchange and the Manufacturing Industry

Effective implementation of EDI has great potential for improving efficiencies within the manufacturing industry's supply chain. There are three industry programs in place that promote the use of EDI for performing the routine transactions between trading partners. ECR, the largest program of this type, focuses on the manufacturers' strategy of developing closer relationships between distributors and suppliers (Kurt Salmon Associates, 1993). An underlying principle of ECR is the need to develop EDI links between the supplier and customer.

The estimated savings through cost reductions that could come from the use of ECR could potentially exceed \$30 billion. In the manufacturing industry, a similar program, called electronic fund transfer (EFT), is being implemented with potential savings in supply chain costs of \$14 billion (Smith, 1996). The third program is the UCS II program that promotes the development of electronic data synchronization through the use of standard transaction sets for transferring information between retail stores and their suppliers (Kearney, 1995). This phenomenon has been estimated to account for 40-50% of distributors' inventories. Clark and Hammond (1997) study the performance benefits that occur from reengineering the process of supplying products to the retailer in the food industry. In this case, EDI is the enabling technology which makes continuous replenishment possible as a result of the reengineering process.

Our research looks at EDI use and the demographics of the manufacturing companies that use EDI. Supply chain coordination and its relationship to EDI use are also explored in this research. This paper is similar to other research in SCM where the focus is centered on relationship between suppliers and buyers (Ellram, 1991; Cavinato, 1992).

Theoretical Framework

This section presents the model designed by Cannon and Perrault, taxonomy of the aspects that will be projected onto the buyer-seller Relationship. In addition, this chapter provides a short overview of the most important of the most important theories, focusing more precisely on transaction cost theory, because of commonality of theory's construct with a model applied in this thesis.

The Inter-organizational relationship, i.e. the business partnership between trading partners was analyzed in various researches. The aspect emphasized by researches differed, as well as, applied theories and models. The key theories used in the research on business relationship are Resource Dependency theory, transaction cost theory and social network theory.

The main contract of the Resource Dependency theory is power of one organization upon another. The Resource Dependency theory proposes that actors (organization) lacking in essential resources, in order to obtain needed resources, are seeking to establish relationships with those who are abundant. The organization acquires external resources. The organization acquires external resources in order to decrease their dependency on other organizations, but it is also applicable to the relationship between the business units within organizations. (York University)

The social network theory proposes social relationships in terms of nodes and ties, and therefore, displays the relationship concepts as a social network diagram, where nodes are the points, and ties are lines. Social networks have been used to examine inter-organizational interaction as well as, associations and connections between individual employees at different companies. These networks provide insights into the ways for gathering information, tackling competition and policy setting. (York University)

Transaction Cost Analysis (TCA) is the dominant theoretical framework employed in other literature to model variation in governance structure. TCA provides efficiency-based guidelines to determine which governance structure would be appropriate for which type of task, and tries to align a governance structure with transactions required for the task. (Bello, Dant and Lohtia, 1997)

Methodology

The research study adopted survey research design so as to obtain information on the impact of Electronic Data Interchange on purchasing. Survey method was used for the study because it was not possible to study the whole population; thus, a small representative sample was selected for study. A population is made of all conceivable elements, subjects, observations relating to a particular phenomenon of interest to a research. Hence, for the purpose of this study, the entire staffs of Midgal Product Ltd were taken as the population of study. Since the entire population of staff and workers in Midgal Product Ltd is large, a sample of 40 respondents was used as the sample size and 36 questionnaires were recovered. The sample size was taken in order to reduce the volume of data to be analyzed to a manageable proportion. The sampling technique used for this study was convenience

sampling method. A structure questionnaire was used to gather information required. It was divided into two sections. Section A consists of questions relating to the personal data of the respondents while section B focuses on the research questions.

Simple Percentage: The responses given by the respondents were classified into different groups as contain in the questionnaire. The data analysis was done using simple percentage method to determine the agreement or otherwise with the research questions by the respondents.

Chi-Square Test: Chi-square statistical tool was used in testing the formulated hypothesis base on the fact that the distribution of the data was not normally distributed.

The Chi-square formula is given by:

$$X^2 = \sum \left\{ \frac{(E-O)^2}{E} \right\}$$

Where O = Observed frequency
 E = Expected frequency
 \sum = Summation Sign
 X^2 = Chi-Square

Decision Rule

Reject H_0 , if chi-square (x^2) calculated is greater than critical value.

Research Question 1

Electronic Data Interchange (EDI) has Hastened the time Constraint in Purchasing of Goods

| VARIABLE | FREQUENCY | PERCENTAGE (%) |
|-----------------|-----------|----------------|
| Strongly Agreed | 23 | 63.9% |
| Agreed | 13 | 36.1% |
| TOTAL | 36 | 100% |

Comment: From the table here majority of the respondents 23 (63.9%) strongly agreed while the remaining 13 (36.1%) respondent agreed that EDI has hastened the time constraint in purchasing of goods.

Question 2:**Routine Purchase of Goods is Strengthened by Purchasing these Goods through EDI**

| VARIABLE | FREQUENCY | PERCENTAGE (%) |
|-----------------|-----------|----------------|
| Strongly Agreed | 9 | 25% |
| Agreed | 25 | 69.4% |
| Undecided | 2 | 5.6% |
| TOTAL | 36 | 100% |

Comment: The result from the study depict that majority of the respondent 25 (69.4%) agreed and 9 (25%) strongly agreed while 2 (5.6%) were left undecided that routine purchase of goods has been strengthened by purchasing this goods through EDI.

Question 3:**The Appropriate Supplier is Easily Selected when the Need to Purchase Goods Arises Through EDI**

| VARIABLE | FREQUENCY | PERCENTAGE (%) |
|-----------------|-----------|----------------|
| Strongly Agreed | 19 | 52.8% |
| Agreed | 16 | 44.4% |
| Undecided | 1 | 2.8% |
| TOTAL | 36 | 100% |

Comment: The table shows that 19 (52.8%) strongly agreed while 1 (2.8%) where undecided to the topic that the appropriate supplier is easily selected when the need to purchase goods arises through EDI.

Question 4:**Edi Aid Price Comparison Between Different Suppliers Good Before the Goodds are Purchase**

| VARIABLE | FREQUENCY | PERCENTAGE (%) |
|-----------------|-----------|----------------|
| Strongly Agreed | 11 | 30.6% |
| Agreed | 22 | 61.1% |
| Undecided | 1 | 2.8% |
| TOTAL | 36 | 100% |

Comment: Statistics from the table here shows that 11 (30.6%) of the respondents strongly agreed and 22 (61.1%) also agreed while only one respondent was undecided that EDI aid price comparison between different suppliers goods before the goods are finally purchase.

Question 5:

Purchasing of Goods through Edi is More Secure Compare to other Ways and Methods of Purchasing

| VARIABLE | FREQUENCY | PERCENTAGE (%) |
|-----------------|-----------|----------------|
| Strongly Agreed | 10 | 27.8% |
| Agreed | 20 | 55.6% |
| Undecided | 6 | 16.7% |
| TOTAL | 36 | 100% |

Comment: Table 11 indicate that 10 (27.8%) of respondent strongly agreed, 20 (55.6%) also agreed while 6 (16.7%) were undecided that Purchasing of goods through EDI is more secure compare to other ways and methods of purchasing.

Testing of Hypothesis

In order to arrive at a reasonable conclusion, the research employed the use of Chi-Square test (χ^2) in testing the hypothesis formulated for the study at 0.05 level of significant

Hypothesis I

Using Table 7

H₀: Electronic data interchange has not hasten the time constrain in the purchasing of goods

H₁: Electronic data interchange has hastened the time constrain in the purchasing of goods

Computation

| Variable | Observatio (O) | Expected (E) | O-E | (O-E) ² | (O-E) ² E |
|--------------------|----------------|--------------|------|--------------------|-------------------------|
| Strongly Agreed | 23 | 7.2 | 15.8 | 249.64 | 34.67 |
| Agreed | 13 | 7.2 | 5.8 | 33.64 | .67 |
| Undecided | - | 7.2 | -7.2 | 51.84 | 7.2 |
| Disagreed | - | 7.2 | -7.2 | 51.84 | 7.2 |
| Strongly Disagreed | - | 7.2 | -7.2 | 51.84 | 7.2 |
| TOTAL | 36 | 36 | | | 60.94 |

Expected frequency is obtained thus:

$$\frac{\text{Total number of respondents}}{\text{Total number of responses}} = \frac{36}{4} = 7.2$$

$$\text{Degree of freedom} = (5-1)(2-1) = 4$$

At 0.05 level of significance

X^2 calculated = 60.94

X^2 tab = 9.488

Decision Rule: Reject H_0 if X^2 cal > X^2 tab

Conclusion: since X^2 cal. (61) is greater than X^2 tab (9.4888). we reject H_0 and concluded that electronic data interchange has hastened the time constrain in the purchasing of goods at 5% level of significance.

Hypothesis 2

Using table 10

H_0 : EDI has not aid price comparison between different supplier goods before the goods are purchase

H_1 : EDI has aid price comparison between different supplier's goods before the goods are purchase

Computation

| Variable | Observatio (O) | Expected (E) | O-E | (O-E) ² | (O-E) ² E |
|--------------------|----------------|--------------|------|--------------------|-------------------------|
| Strongly Agreed | 11 | 7.2 | 3.8 | 14.44 | 2.01 |
| Agreed | 22 | 7.2 | 14.8 | 219.04 | 30.42 |
| Undecided | 1 | 7.2 | -6.2 | 38.44 | 5.34 |
| Disagreed | 2 | 7.2 | -5.2 | 27.04 | 3.76 |
| Strongly Disagreed | - | 7.2 | -7.2 | 51.84 | 7.2 |
| TOTAL | 36 | 36 | | | 48.73 |

$$\text{Degree of freedom} = (5-1)(2-1) = 4$$

At 0.05 level of significance

X^2 Cal. = 48.73

X^2 Tab = 9.488

Decision Rule: Reject H_0 if X^2 cal. > X^2 tab

Conclusion: Since X^2 calculated (48.73) is greater than X^2 tab. (9.488). We reject H_0 and concluded that EDI has aid price comparison between different supplier's goods before the goods are purchase.

Hypothesis3

Using table 11

H₀: Purchasing of goods through EDI is not more secure compare to other ways and methods of purchasing

H₁: Purchasing of goods through EDI is more secure compare to other ways and methods of purchasing

Computation

| Variable | Observatio (O) | Expected (E) | O-E | (O-E) ² | (O-E) ² E |
|--------------------|----------------|--------------|------|--------------------|-------------------------|
| Strongly Agreed | 10 | 7.2 | 2.8 | 7.84 | 1.09 |
| Agreed | 20 | 7.2 | 12.8 | 163.84 | 22.76 |
| Undecided | 6 | 7.2 | -1.2 | 1.44 | 0.2 |
| Disagreed | - | 7.2 | -7.2 | 51.84 | 7.2 |
| Strongly Disagreed | - | 7.2 | -7.2 | 51.84 | 7.2 |
| TOTAL | 36 | 36 | | | 38.45 |

$$\text{Degree of freedom} = (5-1) (2-1) = 4$$

At 0.05 level of significance

X² Cal. = 38.45

X² Tab = 9.488

Decision Rule: Reject H₀ if X² cal. > X² tab

Conclusion: Since X² calculated (38.45) is greater than X² tab. (9.488). we reject H₀ and concluded that purchasing of goods through EDI is more secure compare to other ways and methods of purchasing.

Summary of Findings

This study was conducted to examine the impact of Electronic Data Interchange on purchasing. The following are the major findings.

- i. Electronic data interchange ahs hastened the time constrain in the purchasing of goods table VII has clearly shows that 63.9% of the respondent strongly agreed while other agreed.
- ii. Electronic Data Interchange has aid price comparison between different supplier's goods before the goods are purchase.
- iii. Purchasing of goods through Electronic Data Interchange is more secure compare to other ways and methods of purchasing.

Conclusions

The study concluded through the testing of hypothesis that Electronic Data Interchange has a significant positive impact on purchasing. This implies that organizations get satisfaction through the use of Electronic Data Interchange and this positively impacts their purchasing at work. All through the testing of hypothesis using table VII, it was concluded that electronic Data Interchange has hastened the time constraint in the purchasing of goods i.e. it reduced the time used in the transferring of information between trading partners when purchasing goods. In addition, Electronic Data Interchange has enhanced purchasing of goods through this channel more securely compared to other ways and methods of purchasing. It is now certain that Electronic Data Interchange has become an indispensable tool in purchasing goods from one organization to another organization.

Recommendations

- i. Electronic Data Interchange should be used frequently to purchase goods from other organizations and it should not be given a second thought as it is an important management tool to increase productivity.
- ii. The organization should use purchasing as a tool for maximizing its profit through minimizing the cost of purchasing, since it helps to accomplish a bridge in the distance between different organizations.
- iii. The organization should compare the prices of goods and securities when purchasing through different organizations that supply those goods and balance their terms and conditions in the Electronic Data Interchange process.

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