Electronic Data Interchange:
A Backbone for Backend ERP System

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Abstract: Electronic Data Interchange is a process of exchange of data present in one format to another among business partners. The data exchange process takes place between computers of different business units which follow a standard format. EDI process is a commitment among business partners, makes the exchange of information more efficient. EDI process makes organization more responsive to consumer needs via easier order cycles. EDI technology reduces cost by reducing paper usage, mail expense and manual errors occurred during data entry. Enterprise Resource Planning is a system which facilitates the exchange of information among all the internal business functionalities of an organizations and manages all the information flow to business partners. The document exchanged among firms are given as input to respective organizations ERP system. EDI Translation Process is the fundamental economical process of a company whose output documents are used as input to the ERP system.

Keywords: Business Partners, EDI Translation Process, Electronic Data Interchange, Enterprise Resource Planning.

I. INTRODUCTION

Electronic Data Interchange (EDI) carryout the exchange of documents and eliminate usage of paper. The business data is converted into electronic format that computers can process which is according to standard form. EDI are used to send purchase order to other organizations. The orders receipts are acknowledged electronically, and invoices are sent based on receipts. EDI reduces transaction time, manual data entry effort and improves responsiveness which improves business. EDI is used in time-sensitive environment with more transactions to improve competitiveness. EDI is an inter-process communication of business data in a standard format. EDI is used when there is a need to send a purchase order, sales order, acknowledgement of received orders, receipts of the orders between two firms. EDI is used in two phases. A customer order is sent by EDI and delivery notification from the supplier is sent back by EDI. The supplier sends acknowledgment voice by EDI and the payment is done by the customer through EDI to supplier. Trading partners establish channels to exchange data electronically. EDI replaces huge usage of paper in scenarios like sales orders, invoices, receipts transmission. EDI efforts to encourage automation of the process and alerts the business process. As a result, transaction costs are reduced, and the efficiency of filling orders are improved. EDI is a layered architecture. The semantic layer explains business applications, standard layer explains the structure and influences the application layer contents, transport layer manages the exchange activity and then the physical infrastructure layer.

A.   Benefits of EDI.
EDI generally solves the problems in electronic communication that are raised by paper-based transaction. The information flow of the firm is reorganized via EDI.
- EDI improves speed of transactions, where the paper-based method used to take more time. Hence promotes good relationship among partners.
- EDI automates the data entry and reduces manual effort and hence the labour cost. EDI reduces time for re-work
- EDI reduces errors that may occur when manual intervention is present or during physical exchange of data. Usage of EDI reduces the chances of missing any orders taken via phone.
- EDI overcomes uncertainty, encourages receipt invoice and acknowledgements.

II. LITERATURE SURVEY

The Electronic Data Interchange is a process which helps business to make transactions easier. The format agreed upon by the firms for the communication may be different. A review on EDI process application is done which impacts business transactions. The documents explain the EDI processes and their interactions with the firms, relationship with the buyer-supplier. The current section describes the work carried out on EDI.

A.   EDI Application in Business.

Kavita Choudhary et al [1] defines EDI as a transaction medium across companies in international trade since it is less cost, less time consuming, less transaction expenditure, good customer service, less prone to corruption. EDI provides customer clearances, on hand purchasing, acts as trade point for a community of customers. Applicability Statement 2 is used to exchange structured data like xml, flat files securely. AS2 is a peer-to-peer protocol. AS2 is not concerned with the content of data. HTTP protocol provides secure medium, S/MIME encryption is done to achieve data security. Security involves verification by digital signatures and receipts. EDIINT AS2 involves data exchange on internet. Validation of acknowledgement of data from both the firms done by sending messages in AS2. Documents sent via AS2 is auditable and is internationally acceptable communication method. Data exchanged are ensured by both firms via receipts sent on receiving the messages.

Theodore H. Clark et al [2] proposed that implementing EDI in business also reengineered order placing process. Continuous replenishment process (CRP) has been pushed to reduce cost and improve performance of the channel. The relationship of product-market is measured by the variables like warehouse performance keeping stockouts as constants. Inventory turns and stockout levels are dependent variables. EDI enables performance improvement by allowing different methods to be implemented which improves performance. Based on the survey carried out on grocery stores, the regression result indicate that CRP usage is not impacted on increased EDI usage. The results of survey states that firms using CRP for product replenishment have 50 percent higher inventory turns than the firms without CRP.

Ganesh D. Bhatt [3] explores the impact of EDI on business improvement. It compares EDI with Business Process Improvement (BPI). BPI makes business efficient and satisfies customer needs by smoothening the structure of the firm and promoting the cross-functional relationships with other firms. Process improvement initiatives develop products with no defects and upgrades the quality standards. Satisfying customer needs by identifying the dynamically created needs, expectation through continuous survey. EDI adoption is encouraged by providing free software for suppliers. For the system, the information intensity of industry is the moderator variable. Amount of information required to reconstruct a process in dynamic environment is information intensive.

B.   EDI Adoption.

1)   In Marketing:

Lisa Williams Walton [4] describes EDI adoption in marketing. Competition among firms leads to demand and more marketing. The firms exchange data by EDI which reduces cost and delay in time. It creates a long-term commitment between the firms. EDI is done between two phases of marketing. A marketing channel is between customer and a supplier. A logistic channel is between supplier and a carrier. A regression model applied on both channels are significant at .05 level. In marketing channel, EDI is to remove excessive usage of paper for transaction. The electronic tie-up between customer and supplier reduces the competitors' invasion in the relationship. In logistic channel, carriers are imposed to follow EDI by suppliers to maintain good relationship and a firm base.

2)   In Buyer-Supplier Relationship:

Basuki Y. Iskandar et al. [5] states hypothesis on EDI adoption like increased transactions and sales with customers suppliers would adopt EDI, buyer's migration to EDI forced suppliers to shift to EDI. The analysis is made on buyer-supplier relationship over EDI adoption and integration. The longer relationship between supplier and buyer, more transactions, the more products sold to customers promotes EDI. The buyer depending more on supplier for the products necessitates EDI. Trading partners communicate via EDI is a managerial factor influencing EDI. The technical capability of a supplier and organization size controls EDI adoption.

EDI adoption model takes hypothesized independent variables and control variables as input and on success of EDI adoption, EDI integration is done. A regression analysis is done based on whether EDI process is utilized or not. If adopted, then the extensive usage of EDI will measure the integration of EDI.

Pauline Ratnasingham [6] discusses the impact of risk in EDI. Trading partners are required to agree and follow the rules made. In internet or web-based transactions, explicit trust provides low security. Traditional trust activities with implicit trust provides high security. EDI technology provides implicit trust among trading partners where low to medium security level on new partners and medium to high level security on old trading partners. The risk taken by the firm on believing other firm is assessed by doing risk analysis and risk management. The risk analysis includes risk identification, evaluation, arranging risks according to priority.

Martijn R. Hoogeweegen et al. [7] assess the value of EDI process actions. The benefits of EDI are categorized as information processing which is related to cost of exchange of information and physical processing which is related to resource utilization indicating physical process. CAVALIER (Comprehensive Approach for the Value Analysis of EDI-Investments) approach is used for value analysis. In this approach, the current situation is compared with EDI applied scenario, to know the benefits over cost displacements. The problem is defined, conceptual modelling is applied on it,

data is collected, analysis of current situation is done, a scenario is defined and analysed, more scenarios are analysed and then a scenario with best cost value is implemented are the steps in CAVALIER.

3)   Inter-firm Relationship:

Eric Brousseau [8] explains the necessity of standardizing EDI process for inter-firm transactions. The EDI communication done with different organization follows its own standard. Likewise, an organizational standardization is also required for EDI since the received EDI documents should be analysed and processed by the internal teams of the organization. EDI promotes automation of inter-firm communication. The operational messages among the business firms are according to the EDI standards. Hence, these uniform messages are exchanged, and the messages received respectively are processed by the inter-firm departments in more uniform manner. Formation of EDI standards are tedious since standards should cover all the divergences of the partner organizations.

J. Reed Smith et al. [9] describes the Full Information contract between supplier and purchaser since both have access to each other's ERP system via EDI. A supplier analyses the capacity and inform purchaser about the same and makes a commitment in the form of Supply Chain contract. Sources of demand for supplier are from the committed customer and other general customers. Committed customers know the distributing capacity of the Supplier not the production capacity. Profit is considered as total revenue leaving cost of production.

Farhan Mahar et al. [10] explains the factors to be considered in implementing an ERP system. ERP system is structurally and functionally different from companies to companies impacting the development procedure of the system. The process of development, testing and continuous support is required for the ERP system to achieve successful implementation. ERP systems are more complex due to variety of data management involved in it also, maintains integrity. ERP implementation involves ERP selection, communication, legacy system integration and training to users.

III.   ARCHITECTURE

EDI procedure can be explained using layered architecture. EDI process involves 3 layers. Layer1, is collection of data and organizing it in an electronic document format. The sources of data collected will be from human entry, other data file formats like csv files. Layer 2 involves translator software which translates the data present in internal format into acceptable EDI format. The translator software maps the internal data to the EDI format. The translated data is ready to be exchanged with the business partners.

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┌─────────────────┐
│   Data in       │
│ internal format │
└─────────────────┘
        ↕
┌─────────────────┐
│  EDI Translator │
└─────────────────┘
        ↕
┌─────────────────┐
│    EDI Data     │
└─────────────────┘
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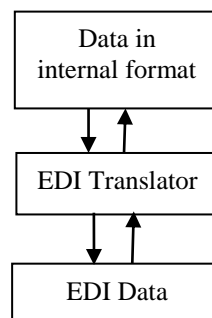
Fig 1: Layers of EDI process

EDI is structured exchange of business documents. There are different types of EDI systems used across various business units. Direct or Point-to-point EDI creates a direct link between partners through which both partners can know other individually. EDI Network Service Provider is used to overcome the complexities in protocols used for the exchange of data. EDI via AS2 uses the internet services to transfer data among partners securely and in reliable manner. AS2 system has client-server interaction process where server should always be up and running to receive the messages from client. Web EDI type of EDI has forms created by the supplier organization and is filled by the consumer organization. The forms will have necessary fields comprising all the information regarding the order placed by the customer. The process of placing orders and viewing the delivery status of the ordered items can be done at any place using mobile devices. Hence the name Mobile EDI. EDI outsourcing is a way where a third party will be responsible and managing the EDI process between business partners. EDI software is the one which is developed by the company on its own to maintain the EDI process. This software is private and secure for the exchange of data.

IV.   IMPLEMENTATION PROCEDURE

EDI implementation involves a structured and effective approach. The fundamental requirement is to have an organizational structure with a dedicated EDI team, responsible for the EDI implementation. EDI team comprises of

members with in-depth knowledge on EDI. A strategic review on the organization implementing EDI is done which includes the number of suppliers, consumers involved in the transaction of the company. Few strategies considered while implementing EDI are reduce redundant steps in business cycle, reduce manual effort, improve relationship among business partners by providing speed delivery. An in-depth analysis to be carried on to which extent the EDI should be implemented. The cost benefits are analysed for the functional areas where EDI to be implemented. An EDI survey is done across organization to account the EDI impact on the daily process. The internal network infrastructure needed for the EDI traffic is analysed. The analysis done on network connections provide knowledge to develop a compatible and profitable EDI system. The developed EDI system is to be integrated with the existing system. The data format used internally by an organization and EDI format should be mapped by a programming team. The technically skilled team should have a thorough knowledge on both internal ERP system and the EDI system with the business partner. The interface developed by the programmers takes EDI format as input and converts it to a internally acceptable format and feed to the internal ERP system. The EDI data is mapped to the internal format and verified thoroughly. Once the EDI translation system is working fine, the process is allowed to be used by the selected business partners called pilot customers in pilot mode. The pilot customers initially send dummy orders to test the EDI process. Later, send real orders to refine the procedure in the end users' point of view.

The EDI translate document is saved in the organizations internal transaction database via ERP system. ERP system manages business processes and internal employee information. Developing and maintaining own ERP system by an organization is profitable. A technical team maintaining ERP system will be responsible for the working and no extra cost need to be invested to acquire licenses for the users. Usually, ERP system allows users to place orders through the organizations website. But the orders received by EDI systems need a different ERP system to process the orders. The EDI document translated by the EDI process are inserted to database a backend ERP system. A backend ERP system is a software which takes EDI translated document as an input and saves it in the transaction database.

V. CONCLUSION

Electronic Data Interchange is a process which takes place between business partners electronically. Developing own EDI software by an organization provides security and reliability over data exchanged. EDI data is used as input to backend ERP system. This integrated procedure of EDI and ERP is used in Automotive Industry, Financial Services Industry, Retail Sectors, High-Tech Industry. The integrated procedure is used widely by the companies since large transactions are done via EDI and more profit is gained.

REFERENCES

[1]. Kavita Choudhary, Umasanker Pandey, Malay Kumar Nayak, Durgesh Kumar Mishra, "Electronic Data Interchange: A Review", Third International Conference on Computational Intelligence, Communication Systems and Networks, IEEE Computer Society, pp 323-327, 2011.
[2]. Theodore H. Clark, Ho Geun Lee, "EDI-Enabled Channel Transformation: Extending Business Process Redesign beyond the Firm", International Journal of Electronic Commerce, Vol. 2, No 1, pp 7-21, 2016
[3]. Ganesh D. Bhatt, "Business process improvement through electronic data interchange (EDI) systems: an empirical study", Supply Chain Management: An International Journal, Vol. 6 Iss 2 pp. 60 – 74.
[4]. Lisa Williams Walton, "Electronic Data Interchange (EDI): A Study of Its Usage and Adoption Within Marketing and Logistics Channels", Transportation Journal, Vol. 34, No. 2, pp. 37-45, 1999.
[5]. Basuki Y. Iskandar, Susumu Kurokawa, and Larry J. LeBlanc, "Adoption of Electronic Data Interchange: The Role of Buyer-Supplier Relationships", IEEE Transactions on Engineering Management, Vol. 48, No. 4, pp 505-517, 2001.
[6]. Pauline Ratnasingham, "Implicit Trust in the Risk Assessment Process of EDI", Elsevier Science Ltd, Computers & Security, Vol. 18, pp 317-321, 1999.
[7]. Martijn R. Hoogeweegen, Robert J. Streng, Rene W. Wagenaar, "A comprehensive approach to assess the value of EDI", Elsevier Information & Management, Vol. 34, pp 117-127, 1998.
[8]. Eric Brousseau, "ED1 and inter-firm relationships: toward a standardization of coordination processes?", Elsevier, Information Economics and Policy, Vol 6, pp 319-347, 1997.
[9]. J. Reed Smith, Jeffrey Yost, Harold Lopez, "Electronic Data Interchange and Enterprise Resource Planning Technology in Supply Chain Contracts", Elsevier, Computers & Industrial Engineering Journal Pre-Proof, 2020.
[10]. Farhan Mahar, Syed Imran Ali, Awais Khan Jumani, Muhammad Owais Khan, "ERP System Implementation: Planning, Management, and Administrative Issues", Indian Journal of Science and Technology, Vol 13(01), pp 1 – 22), 2020.