A Review on Factors Affecting the EDI System Migration in Logistics

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Abstract

The purpose of this paper is to review and analyze the state of the art of research in system migration. It is reviewed by elements of migration which are business, technology and people. The review of literature on system migration research is based on 70 referred journals, proceedings, thesis and books published from 1997 to 2010 in ISI, SCOPUS, Science Direct and IEEE explore, Emerald and JSTOR. The major findings show that there is high number of research that focused on element of technology particularly software. It is also identified that there are only a few research focused on element of people that provide migration frameworks to support organizations preparing to migrate from legacy system. Important issues highlighted in EDI migration are system integration, security and cost. None of literature found that propose migration framework from EDI to XML.

Keywords: ***System Migration, EDI, Logistics, literature review model.***

1. Introduction

The new and emerging technologies in computer and information technology (IT) play significant reasons that drive for migration, making faster access is possible, lower cost, and enhanced services. The rapid changes of IT is giving reflective changes in many areas such as banking, education, politic and administrative, library sciences, engineering and logistics and supply chain management.

Legacy systems are successful and therefore mature, and likely have been in existence for a long period of time. A consequence is that legacy software is built using technologies available at the time it was constructed, as opposed to the most modern software technologies. Older technologies are more difficult to maintain, and this is the major issue for many legacy system owners.

A logistic technology is changing the nature of business operation; it reduced the cost of transaction and redefining organizations and their interconnections [1]. IT in logistics plays a pivotal role in firm success. Specifically, research indicates that firm success is strongly dependent on effective information sharing [2]. In recent years, a lot of technology was used to enhance the capability of logistics business process especially in data interchange. Among the technologies are Electronic Data Interchange (EDI), Internet-based EDI, eXtensible Markup Language (XML), RosettaNet and others.

Initially this study wants to focus on migrating from EDI to XML in logistics and supply chain management. However, because computer science and Information System (IS) is an interdisciplinary field straddling other discipline so must look not only within discipline but also outside the field [3]; in a way to have a wide view and understanding on the migration situation in more general and to learn how different field experienced their migration successfully or coupe with the failure. Besides, this paper also wants to review which elements of migration that significant and highlighted from the previous research.

In the first part, this paper will discuss briefly on system migration and motivation for migration. Then, in the second part, this paper explains the methodology of reviewing systematically. Based on the analysis of 70 articles in selected journal and proceeding, this paper will highlight more on the previous research that had been done by researcher regarding elements of migration which

related to system migration in different area of research. Next, this paper will discuss those findings and discover some of the gap and future research base on analysis stated. Finally as a conclusion this paper will gather all the issues and subtopic that has discuss in this paper together with some suggestion and recommendation in author point of view.

2. System migration

When discussing on migration, it is related to managing changes. The earliest researcher that introduces models for managing change was Kurt Lewin in 1947. The model consist of unfreezing, change or moving and refreeze [4] . Today, researchers and organizations are more focusing on several aspects for example factor of migration and migration plan that are essential in system migration. In general, system migration is defined, as the process of replacing one automated system with another from a different vendor or remaining with the current vendor and upgrading the present system in order to obtain enhancement and improved performance [5]. The transition from the old business processes and computer programs to the new business processes and computer programs can be facilitated by ensuring that business, technical, and people issues [6] are considered to take into consideration in a way to have successful migration. Table1 shows the elements of migration and their sub elements[6].

Table 1: Elements of migration

Elements of Migration	***Sub Elements***	***Description***
Business	**Conversion strategy**	Process which the new system is introduce into the organization. Consists of conversion style, conversion locations, conversion modules and evaluating the choices
	Business process	Keeping small technology hiccups in the new system from turning into major business disaster
Technology	**Hardware installation**	Installing any needed hardware to support new system
	Software installation	Installing to-be system that under development or additional software to make the system operational
	Data conversion	Technically the most complicated part and require to convert data to make it compatible and can match with the new system environment
People	**Management policies**	Provide goals, define how work process should be performed, and determine how organizational members are rewarded
	Costs and benefits	From the perspective of the organization, from different viewpoints of potential adopters or stakeholders. Consists of benefits of to-be system, certainty of benefits, costs of transition and certainty of costs
	Adoption motivation	Providing clear and convincing evidence and benefits of the need for change by using informational and political approach.
	Training	Providing the employees the skills needed to adopt the change through careful training

In this paper, we adopted the above element of migrations.

3. Motivation for migration

There are a variety of reasons that a migration of a legacy system may be needed. The reasons can lays into several factors which are coding languages, staffs, platform, cost and policy and can be concluded as part of elements of migration which are business, technology and people.

Based on [7] legacy languages like EDI are hard to support. The legacy languages and development tools needed to support the legacy system are increasingly difficult or expensive to obtain. In consequence of legacy languages; people are scarce. People that know the legacy languages are becoming difficult to find and retain. Younger staffs are reluctant to learn "legacy" languages because it does not appear as value added for their long-term career.

On top of that, legacy software does not integrate well with other IT systems. The architecture of legacy languages often does not provide itself to building bridges to other IT systems that have grown up around it. Based on [8], [9] and [10] lack of interoperability across systems means those different agencies for instance in a contact of logistics and supply chain are Ministry of Transportation, Port Authorities/Terminal Operators, Customs Department, Ministry of International Trade and Industry

must expend considerable resources to build custom interfaces for dealing with EDI standard because the language is not human readable, and vendor company that manage the EDI with monopolistic cause the cost of legacy system for instance EDI by VAN becomes expensive. In addition, in library science experience, some of the vendor is no longer viable and lacks of confidence in former vendor to manage their existing system are some of the reasons for migrating.

In line with [7], others researchers which are [11],[12],[9] also highlighting high cost in implementing, operating and maintaining legacy system which in this case is EDI is a factor that motivate some of the organizations to migrate from legacy system.

Other than that, many legacy systems run on legacy hardware systems and the platform is hard to support. Such hardware systems are becoming more expensive to maintain, and personnel that know these systems are also more difficult to find [13], [14].

In many instances, the result is that information that could be valuable for decision-making is simply not available. Commonly agreed-upon data standards refer to migrating from legacy system would yield substantial benefits, including improved efficiency, better information quality, and increased flexibility to make use of emerging software that best addresses particular business requirements.

4. Methodology of review

This paper combines styles of doing literature review from three authors, Webster and Watson [3], Levy and Ellis[15] and Adam [16], as detailed out in Figure1. The purpose is to facilitate theory development, gap of research, and uncovers areas where future research is needed.

As shown in Fig. 1, the first stage is extract. It involves identifying the articles to be included in this review. The second stage is structuring the review. This stage involves designing and executing a detailed protocol that prescribed how to capture and analyze the data. Third stage entails analyzing literature to identify gaps. The last stage is report findings. This stage requires synthesizing the analyzed details and deriving the research findings.

The research issues presented that relate to system migration is based on organized literature review of system migration, logistics, Supply chain, Information systems and Information technology published from 1990 to 2010. The numbers of articles reviewed were 67, gathered from books, thesis, referred journals and proceedings of well established conferences and indexed by ISI, SCOPUS, Science Direct and IEEE explore, Emerald and JSTOR. This paper also used resources from books or academic resources based on the belief that practitioners and academics have to referring books or any academic references in order to have concrete and firm of understanding towards any research issues. This also because most of the book's authors are also do research and referring journals and papers in order to give state of the art input to the readers.

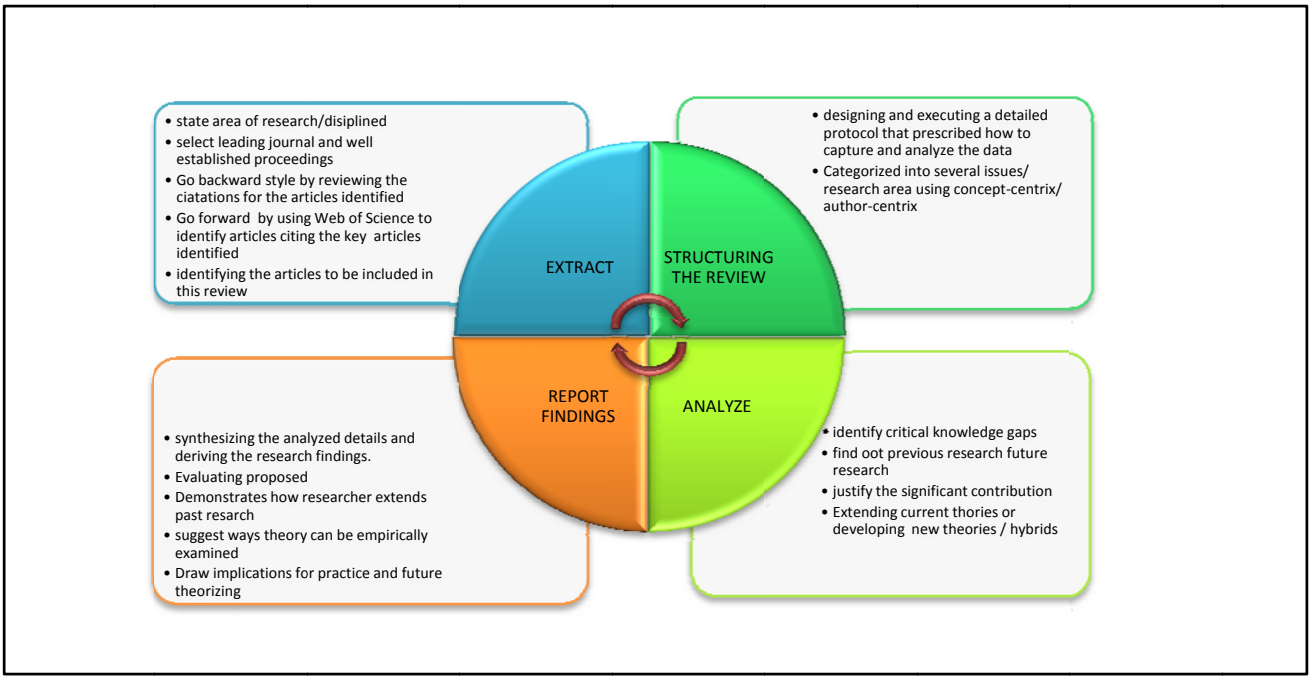

Fig. 1 Literature Review Model

The terms and keyword used for the search are shown in Table 2.

Table 2: Terms and keywords searched

Research search engine	***Terms and keywords***
ISI Web of Science	System migration plan, Technology migration in government service sector, technology migration, change management, migration strategy, EDI System Migration, EDI to XML migration.
IEEE Explore	
Emerald	
EBSCO Host	
ProQuest	
ProQuest Thesis & Dissertation	
JSTOR	
Google Scholar	

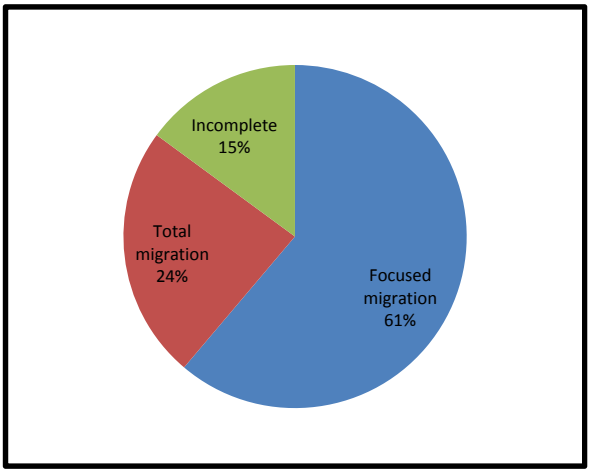

Fig. 2 Style of migration from previous research

Fig. 2 shows the percentages of migration style that highlight nature of article with respect to element of migration. It is divided into three categories namely total migration, focused migration and incomplete. These percentages are based on literature survey and keywords shows in Table 2. Focused migration (61%) is article that discussed only certain element of migration. Where total migrations show that, 24% of the article from the literature survey are discussing on all element of migration. The rest of the portion holds by 15% of incomplete article which none of it discuss any of the element.

Table 3: element of migration and several authors that has been done the research

Element of migration	Sub element	Authors
Business	Conversion strategy	[17], [18], [19], [20], [21], [22], [23], [24], [25], [26], [27], [28], [29], [30], [31], [32], [33], [34], [35], [36], [37], [5], [38], [39], [6], [40], [41],[42], [43], [44], [45], [46], [39], [47]
	Business contingency plan	[17] , [48], [18], [19], [14], [23], [27], [28], [29], [32], [33], [38], [5], [39], [6], [40], [41], [42], [43],[44], [45],[39],
Technology	Hardware installation	[18], [13], [49], [27], [33], [5], [6], [40], [41], [42], [44]
	Software installation	[17], [18], [50], [20], [51], [52], [53], [21], [14], [54], [49], [55], [27], [56], [29], [31], [32], [33], [34], [35], [36], [5], [39], [57], [58], [59], [6], [40], [41], [60], [61], [42], [43], [62], [44], [45], [46], [63], [47]
	Data conversion	[17], [18], [50], [51], [52], [22], [24], [25], [26], [64], [65], [30], [31], [32], [33], [36], [31], [5], [39], [57], [6], [40], [41], [60],[42], [44] , [63]
People	Policies	[18], [48], [19], [66], [13], [67] [33], [5], [6], [40], [41], [58], [14], [26], [40], [42], [43], [44]
	Cost & benefits	[17], [18], [48], [19], [66], [33], [34], [21], [14], [5], [68], [6], [41], [42], [44]
	Adoption Motivation	[17], [18], [48], [19], [66], [33], [13], [69], [14], [5], [6], [28], [32], [35], [38], [39], [41], [42], [43], [44], [45],[35]
	Training	[33], [5], [6] [41], [32], [48], [19], [69], [42], [44], [45]

5. Summary of review and discussion

5.1 Finding of literature survey

Fig. 3 shows the number of previous papers on migration. They are grouped according to the main element of migration which consists of business, technology and people. The details of sub element of migration for each main migration are show in Table 3.

The most popular research involving system migrations were software installation (20%), followed by conversion strategy (18%) and data conversion (14%). The least research that has been done in system migration was

referring to hardware (6%), cost and benefits (7 %) and training (6%).

Based on the graph, its shows that there was lack of research in people (element of migration) which were consists of policy, cost & benefit, adoption and training. System migration has been conducted in many domains but most of it just focuses on technical migration itself and lack of implementation issue. Most of computer system will be successfully adopted if management policies support its adoption. Previous study or research shows that most of the migrations are focusing on the technical aspect such as database migration, security, network, software, data translation and mapping.

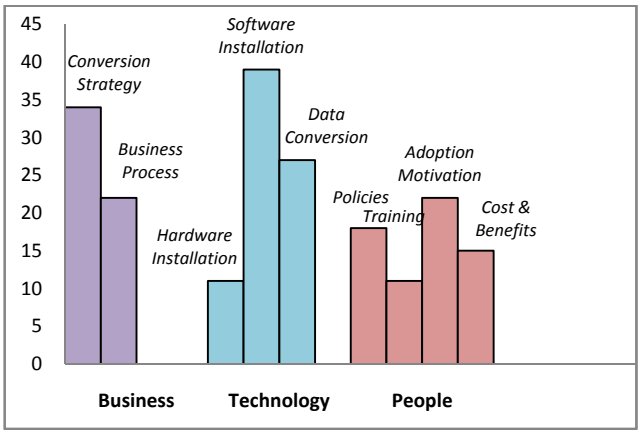

Fig. 3 Main element and sub element of migration based on previous research

5.2 Preparing for migrating from EDI

Jun and Cai [70] discussed on key obstacle to EDI success and EDI benefit. The authors revealed a total of seven broadly-defined EDI obstacles, namely managerial leadership, costs and benefits, technical, organizational, trading partner relationships, security and legal issues. The major reason that make those companies which already implementing EDI to migrate and reluctant to abandon their current system because they already invested millions of dollars on EDI infrastructure. Furthermore, since large VAN (Value Aided Network) suppliers, such as General Electric and Sterling Commerce, are constantly improving their Internet-based EDI technologies with enhanced security measures and cheaper cost structures, the EDI diffusion rate will be greatly increased by joining smaller organization into the EDI group.

On the contrary, based on Kim [9] and Ang [11], most of domestic import/export transport companies operate the EDI business by VAN as the document interchange method. This incurs the VAN suppliers or vendors with monopolistic, so the cost of EDI by VAN becomes expensive.

Many research pointed out that the easiness of integrating EDI with existing information system is an important factor whether or not businesses adopt EDI. Adopting new technologies is a great challenge to a business. The challenges to the management are the possible changes of business process, structure and planning. Although adopting new technologies will increases productivity, but it may give an impact on users. Users may jeopardize the expected throughput. Developers may face a steep learning curve of understanding new technologies. All of these require continual training to minimize impacts [71].

Medjahed [72], identified three sets of parameters that together exhaustively define how B2B Ecommerce applications interact on the Web. The first set (applicable to enabling technologies and prototypes) consists of the following parameters: communication layer, content layer, and business process layer. The second set (applicable to enabling technologies and prototypes) consists of the following parameters: coupling, autonomy, heterogeneity, external manageability, adaptability, security, and scalability. The third set (applicable to commercial B2B platforms) consists of the following parameters: major modules, communication standards, content and business process standards, and key technologies.

Security is also one of the major issues in Internet-Based EDI. Minxi [73] discussed several security services needed to cater current Internet-Based EDI. There are confidentiality, integrity, availability, controllability, non-repudiation. According to the security problems of Internet-Based EDI system, giving corresponding solutions are data encryption and message authentication.

Nurmilaakso [74], explores how organizational and technological factors explain the adoption of e-business functions in 4570 European companies and the migration from EDI-based to XML-based e-business frameworks in 329 European companies. According to a linear regression model, a company with a wider scope, having more enterprise information systems or exchanging standardized data has more e-business functions in supply chain integration. A logistic regression model implies that large companies or companies with high skills of employees or having more e-business functions are more likely to replace EDI-based with XML-based e-business frameworks in supply chain integration.

Tan [12], investigate the innovative characteristics, benefits, and barriers influencing internet-based information and communications technology (ICT) adoption among the small and medium enterprises

(SMEs). The results suggest that internet-based ICT adoption provides a low cost yet effective communication tool for customers. However, security continues to be a major barrier. Finding on cost as a barrier is mixed. The inferential statistics reveal that relative advantage, compatibility, complexity, observability, and security are significant factors influencing internet-based ICT adoption.

From the review of relevant literatures discussed above, the most significant and important characteristics that need for migrating from EDI with respect to elements of migration are data security, data communication, cost effective, organization business process that support e-business function and companies desirability and ability to migrate to the new standard of technology.

6. Conclusions

In this paper researchers discussed a survey on researches that have been done in system migration. It summarizes the current trends of the system migration, identifies the gaps, and how these trends affect the system migration. Most of the migration focused on specific strategy and technique, but lacking at issues on people element which consists of policies, cost and benefits, adoption and training.

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