EXTENSIBLE MARKUP LANGUAGE MIGRATION FRAMEWORK FOR MALAYSIAN CASE LOGISTICS DATA EXCHANGE

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My deepest gratitude to all that have given me support and loved me

My beloved husband
Syed Abdul Fattah Al-Qudsy

My Parents,
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ABSTRACT

The process of effectively exchanging standardized format of data among logistics stakeholders and Customs Department plays a pivotal role in logistics industry today. Electronic Data Interchange (EDI) is widely used as a standard data exchange among logistics stakeholders in Malaysian logistics industry. Based on previous studies, EDI users had difficulties in reading and understanding the transaction message, and the cost of implementation and operation is high. Moreover, EDI groups the transaction messages into batches for transmission, which slows down the transmission and makes the data difficult to be transmitted. Consequently, these limitations have barred both the small and new companies to take part in the industry. Extensible Markup Language (XML) is an open standard and universal language, whereby its coding tags can be used to define specific domain or areas. On top of that, XML can be easily read, process and validate. It provides a mechanism for data exchange across platforms and applications at a low cost. With the advancement in the technology, the availability of XML and its benefits can overcome the problems associated with EDI. The result obtained from the preliminary survey indicated that there is a gap on the non-usage of XML as the standard data exchange among the Malaysian logistics stakeholders. Hence, the two main objectives of the research are to identify factors on non-usage of XML as standard data exchange and to propose a suitable XML migration framework that suits the current data exchange and business process. Case study is chosen as the appropriate method, due to its nature and suitability to undergo the research objectives. Four case studies were conducted and data were collected through interviews, observation and document analysis. The important findings acquired from this research are logistics stakeholders are unfamiliar with XML and the unavailability of migration framework from EDI to XML. These results support the proposed XML Migration Framework for Exchange of Logistics Data that will facilitate and assist logistics stakeholder to migrate from EDI to XML. The framework has been evaluated using expert evaluation. The contribution of this research practically highlights the migration components and benefits of XML migration, which are the reduction of implementation and operation costs, while eliminating part of the current data exchange process. In future, this research can be expanded to focus on schema development, network and security in order to support logistics operation as a whole.

ABSTRAK

Proses pertukaran data secara effektif dalam bentuk standard di kalangan syarikat logistik dan Jabatan Kastam memainkan peranan penting dalam industri logistik pada hari ini. Standard pertukaran data semasa yang dikenali di kalangan syarikat logistik dalam industri logistik di Malaysia adalah *Electronic Data Interchange* (EDI). Berdasarkan kajian lalu pengguna EDI mempunyai masalah untuk membaca dan memahami mesej transaksi EDI, tambahan pula kos pelaksanaan dan operasinya yang tinggi. Selain itu, mesej EDI dikumpul dan dihantar dilakukan secara kelompok melambatkan penghantaran data. Justeru, kekangan ini telah menimbulkan halangan kepada syarikat-syarikat kecil dan syarikat-syarikat baru untuk mengambil bahagian dalam industri logistik ini. *Extensible Markup Language* XML adalah standard terbuka dan bahasa sejagat serta tag dalam pengekodan boleh ditakrifkan mengikut domain atau bidang itu sendiri. XML juga mudah untuk dibaca, diproses dan validasi. Ia menyediakan satu mekanisme pertukaran data bagi semua platform dan aplikasi dengan kos yang rendah. Dengan kemajuan teknologi, serta adanya XML beserta faedahnya boleh mengatasi masalah seperti tersebut di atas. Hasil daripada kaji selidik rintis yang dijalankan menunjukkan terdapatnya jurang yang menunjukkan XML tidak digunakan sebagai pertukaran data standard di kalangan pihak berkepentingan logistik Malaysia. Oleh itu, dua objektif utama penyelidikan ini adalah untuk mengenalpasti faktor-faktor XML tidak digunakan sebagai standard pertukaran data logistik dan untuk mencadangankan kerangka kerja migrasi XML yang sesuai dengan arus pertukaran data dan proses perniagaan semasa. Kajian kes dipilih sebagai kaedah yang bersesuaian kerana ciri dan kesesuaiannya untuk memenuhi objektif penyelidikan ini. Empat kajian kes telah dijalankan dan data diperoleh melalui temubual, pemerhatian dan analisis dokumen. Hasil daripada penyelidikan ini menunjukkan bahawa pihak yang berkepentingan logistik tidak begitu biasa dengan XML dan belum ada lagi kerangka kerja migrasi daripada EDI ke XML. Hasil tersebut menyokong cadangan kerangka kerja migrasi XML bagi pertukaran data logistik yang akan memudahkan dan membantu pihak berkepentingan logistik untuk migrasi dari EDI ke XML. Kerangka kerja tersebut telah dinilai menggunakan penilaian pakar. Sumbangan penyelidikan ini secara praktokalnya menonjolkan komponen migrasi dan manfaat terhadap migrasi XML yang akan mengurangkan kos dan eliminasi sebahagian daripada proses pertukaran data semasa. Pada masa hadapan, penyelidikan ini boleh diperluas dengan memberi tumpuan kepada pembangunan skema, rangkaian dan keselamatan dalam menyokong operasi logistik secara keseluruhannya.

TABLE OF CONTENTS

CHAPTER	TITLE	PAGE
	DECLARATION	ii
	DEDICATION	iii
	ACKNOWLEDGEMENT	iv
	ABSTRACT	v
	TABLE OF CONTENTS	vii
	LIST OF TABLES	xi
	LIST OF FIGURES	xii
	GLOSSARY OF TERMS	xv
	LIST OF APPENDICES	xvi
1	**INTRODUCTION**	
	1.1 Introduction	1
	1.2 Background of Problem	3
	1.3 Problem Statement	7
	1.4 Research Questions	8
	1.5 Research Objectives	8
	1.6 Scope of Research	9
	1.7 Significance of Research	9
	1.8 Structure of the thesis	10
2	**LITERATURE REVIEW**	
	2.1 Introduction	12
	2.1.1 Literature review process	13
	2.1.2 Flow of Literature Review	14
	2.2 Previous Research of IT in Logistics	16
	2.3 Logistics Standard Data Exchange	21

2.3.1 Definition of Standard Data Exchange 21
2.3.2 Electronic Data Interchange (EDI) 24
2.3.3 Extensible Markup Language (XML) 28
2.4 XML Framework 30
2.5 Motivation for Migration 31
2.5.1 The Need of Migration Framework 32
2.5.2 Migration issues of non-usage of XML 34
2.6 Migration Framework 35
2.6.1 Migration Efforts 35
2.6.2 Migration Theory and Model 37
2.6.3 Readiness Towards Migration 45
2.6.4 Component of XML Migration Framework 49
2.7 Chapter Summary 50

3 RESEARCH METHODOLOGY
3.1 Introduction 51
3.2 Research Approach 53
3.3 Research Strategy 55
3.3.1 Chosen Strategy: Case study 56
3.4 Research Design 57
3.5 Research Operational Framework 59
3.5.1 Surveys 60
3.5.2 Sampling Method 62
3.5.3 Sample Size 62
3.5.4 Questionnaire 62
3.5.5 Data Collection 63
3.6 Research Flow 66
3.7 Chapter summary 69

4 DATA COLLECTION AND ANALYSIS
4.1 Introduction 70
4.2 Preliminary Result on Screening Survey 72
4.2.1 Respondent's and Companies Profile 72
4.2.2 EDI Usage 73

4.2.3 EDI to XML Migration 75

4.3 A General Overview of Selected Case Study 82

4.4 Main Case Study: Customs Department (Kastam DiRaja Malaysia-KDRM) and Embedded Unit of Analysis 1: CTM in Custom Department (KDRM) 82

4.5 Embedded Case Study 90

4.5.1 Embedded Unit of Analysis 2: Kontena Nasional Berhad 90

4.5.2 Embedded Unit of Analysis 3: Total Logistic Services (M) Sdn. Bhd 92

4.6 Within Case Comparison 95

4.7 Interview with Dagang Net Technologies Sdn. Bhd. 96

4.8 Chapter summary 97

5 PROPOSED FRAMEWORK AND EVALUATION

5.1 Introduction 98

5.2 XML Migration Framework Version 1 100

5.2.1 Overall Migration Framework 101

5.2.2 Migration Guidelines 102

5.3 Evaluation Methods 104

5.3.1 Evaluation for XML Migration Framework 105

5.3.2 Questionnaire Design 106

5.3.3 Distributing Questionnaire 106

5.4 Evaluation Outcomes 107

5.4.1 Section One 107

5.4.2 Section Two 108

5.5 Chapter Summary 109

6 CONCLUSIONS

6.1 Introduction 110

6.2 Research Summary 112

6.3 Research Contributions 112

6.4 Recommendation and Suggestion for Future Research 113

REFERENCES **115**
Appendices A-J 127- 184

LIST OF TABLES

TABLE NO.	TITLE	PAGE
1.1	Cost of SMK DagangNet Implementation as of July 2005	5
1.2	EDI Charges for NSW Implementation 2010	6
2.1	Previous researches on IT in logistics	18
2.2	Element of migration (Dennis, *et al*., 2010)	40
2.3	Categorizations of Findings from Migration Framework Literature	51
3.1	Characteristics of Qualitative Research (adapted from Creswell, 2003)	56
3.2	Summary of Research Objectives, Research Questions and Methods	60
3.3	Population of Logistics Companies in Malaysia	63
3.4	Summary of Questions Asked and Scale Used in Questionnaire	65
4.1	Profile of Respondents and Company	74
4.2	Findings Based on Element of Migration and ADKAR: Embedded Unit of Analysis 1	91
4.3	Findings Based on Element of Migration and ADKAR: Embedded Unit of Analysis 2	93
4.4	Findings Based on Element of Migration and ADKAR: Embedded Unit of Analysis 3	96
4.5	Within Case Comparison	97
5.1	XML Migration Guidelines	105
5.2	Expert's position and background	109
5.3	Findings from section two evaluation question	110

LIST OF FIGURES

FIGURE NO.	TITLE	PAGE
1.1	Organizational of Chapter 1	2
1.2	Organization of Thesis	11
2.1	Organization of Chapter 2	14
2.2	Literature review model	15
2.3	Literature Review Flow	16
2.4	Previous Researches on IT in logistics	21
2.5	Overview of EDI Transaction (Segev, *et al*., 1996)	26
2.6	Style of Migration from Previous Research	34
2.7	Migration issues focus from previous research	47
2.8	The ADKAR Model of Change Management	48
3.1	Organization of Chapter 3	54
3.2	The Inductive Logic of Research in Qualitative Study	55
3.3	Basic Types of Designs for Case Studies (Yin, 2009)	58
3.4	Research Operational Framework	61
3.5	Survey process	62
3.6	Interview process	66
3.7	Research Flow to Achieve Objective 1	68
3.8	Research Flow to Achieve Objective 2	69

4.1	Organization of Chapter 4	73
4.2	Standard Data Exchange Used	76
4.3	Type of EDI Currently in Use	76
4.4	EDI Management	77
4.5	Familiarity With XML as Standard Data Exchange	78

4.6	Availability of XML Migration Framework	78
4.7	Conversion Strategy	79
4.8	Contingency Plan Based on Business Process	79
4.9	Hardware Installation	80
4.10	Software Installation	80
4.11	Data Conversion	81
4.12	Management Policies	82
4.13	Cost and Benefit	82
4.14	Motivating People for Adoption	83
4.15	Training	83
4.16	Port Klang Community	84
4.17	SMK-DagangNet Infrastructure Interface	87
4.18	EDI message flow in SMK	88
4.19	EDI interface at Customs West Port	90
4.20	EDI System Interface at Total Logistics	95
5.1	Organization of Chapter 5	101
5.2	XML Migration Framework Version 1	102
5.3	XML Migration Framework for Exchange of Logistics Data	104
6.1	Organization of Chapter 6	113

GLOSSARY OF TERMS

ePCO	-	Electronic Preferential Certificate of Origin
IATA	-	International Air Transport Association
PAA	-	Pre-Declaration Message Format (XML)
SMK	-	Sistem Maklumat Kastam
EDI	-	Electronic Data Interchange
EDIFACT	-	EDI For Administrative Commerce and Transport
XML	-	eXtensible Markup Language

LIST OF APPENDICES

APPENDIX	TITLE	PAGE
A	XML Type and Clustering	127
B	XML Framework : Literature Review Summarized	129
C	Previous Research on Migration: Literature Review Summarized	143
D	Data Collection Permission Letter	159
E	Online Survey Questionnaire	161
F	Mailed Survey	173
G	Interview Question	178
H	NVIVO Transcribing and Data Analysis	180
I	Framework Guidelines and Evaluation Questionnaire	181
J	Research Publication	184

CHAPTER 1

INTRODUCTION

1.1 Introduction

Extensible Markup Language (XML) has been regarded as more flexible and less expensive to implement and use than EDI whereas the benefits of XML do not outweigh its costs. However, the utilization of XML in logistics as a standard data exchange is still low. Currently, the current standard data exchange that is widely used in Malaysia among logistics companies is an old fashioned EDI system. This thesis aims to study the migration issues from EDI to XML within the context of Malaysian logistics stakeholders. This chapter introduces the reader to the area of concern of the research examined by this study. It begins with an introduction of the chapter and gives an overview of the sections. The organization of this chapter is shown in Figure 1.1 on the following page.

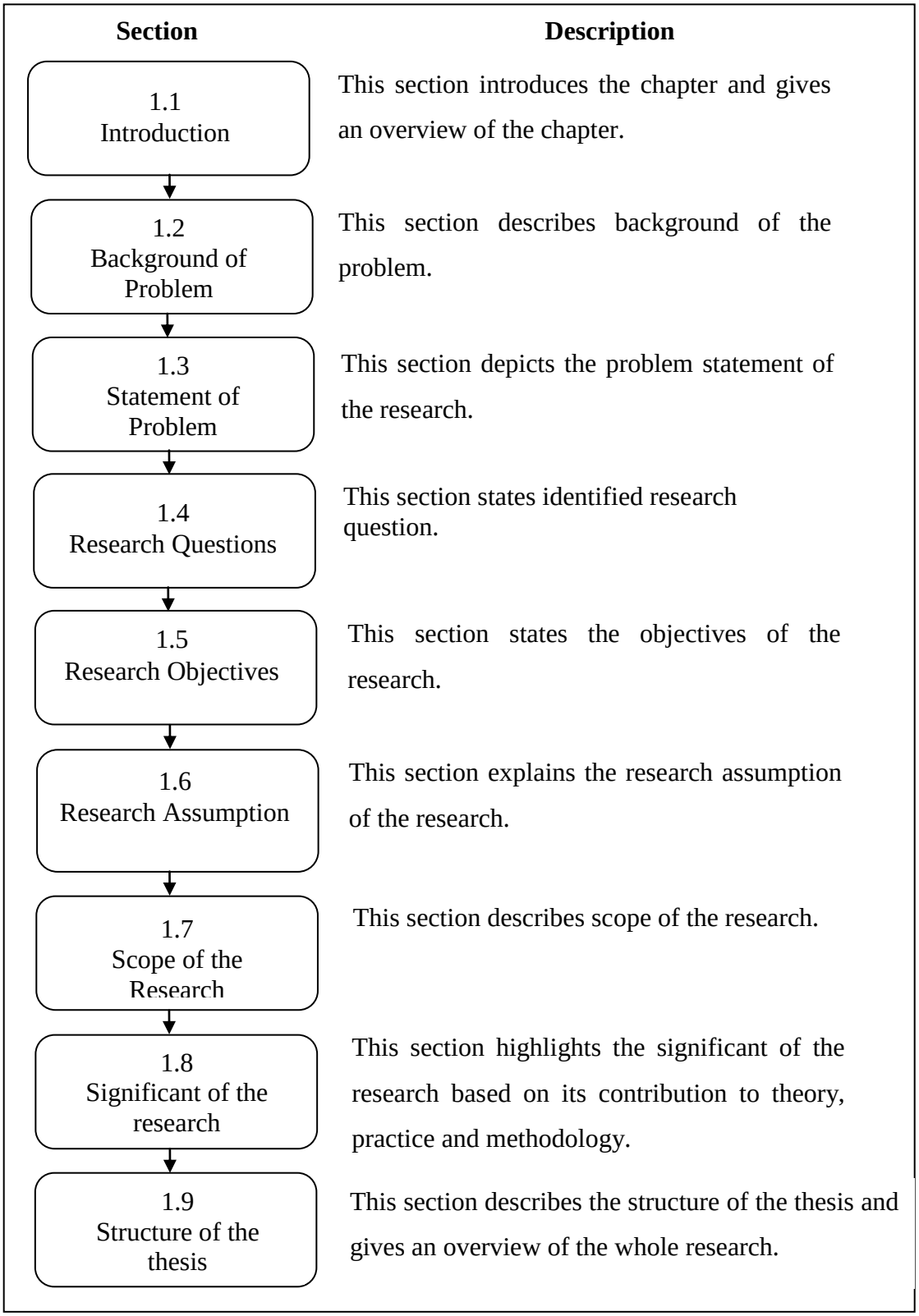

Figure 1.1: Organizational of Chapter 1

1.2 Background of Problem

The rapid changes in computer and information technology are having reflective changes on logistics management (Schary and Coakley, 1991). Supply chain management (SCM) and logistics is the 21st century global operations strategy for achieving organizational competitiveness (Gunasekaran and Ngai, 2004).

Previous studies conducted by Ang *et. al.* (2003) and Krishapillai (2007) have stated that the standard data exchange among logistics companies and customs was Electronic Data Interchange (EDI) using the international standard of UN / EDIFACT (United Nations / EDI for Administration, Commerce and Transport). In Malaysia, EDI technology has been the standard data exchange and being used by logistics companies since 1994. EDI is mainly used for import export activities such customs declaration, duty payment and port released (Krishnapillai, G., 2007).

Despite the importance of EDI in data exchange and its wide implementation among logistics companies, it has some limitations. One such limitation is that partners using EDI often work through message brokers known as Value-Added Networks (VAN) to provide message translation and switching. The added expense of using VAN has been a barrier to information sharing for smaller companies. In addition, EDI groups messages into batches for transmission, a process that slows down the transfer of information (Kim, 2005). Studies conducted on Malaysian logistics industry have found that EDI usage in Malaysia might be high in volume, but very low and limited in terms of diversity, breadth and depth. There was hardly any transaction between other business partners except with the Royal Malaysian Customs Department. Further investigation revealed that initial investments, requirements of trading partners and software related issues were the major problems by companies who want to implement EDI (Ang, *et al*., 2003). Since EDI is very structured, the set-up cost and required expertise are relatively high, limiting applications to situations involving high transaction volumes (Gangeswari, 2007). A study conducted for enterprises in South East Europe have found the use of EDI was

28 percent and forecasted that its implementation would decline to 18 percent due to problems associated with the use of the systems Ketikidis , *et al*., (2006).

However, preliminary study from this research has come up with different findings. A survey was conducted on 30 logistic transportation companies, which are shipping agents, freight forwarders and forwarding agents, where seven or 23.3% of the subjects responded. From the survey, it was found that 72% of companies were using EDI as standard data exchange, 14% percent were using EDI and XML, and another 14% were using a combination of EDI, XML and other standards such as plain text format (FTP), Cargo-Imp IATA for air freight and RosettaNet. The preliminary study also found that none of the respondent used VAN EDI but 86% percent used InternetEDI. These findings are in contrast with the findings by Ketikidis.

Furthermore, even though the preliminary study found that some companies were already using XML or RosettaNet, but the usage is not for import/export declaration and customs clearance between customs and logistic transportation companies. This is supported by Dagang Net Technologies Sdn. Bhd. (2010), eLogistics (RosettaNet) that represent manufactures, retailers, customers and MNC's (Multinational Companies). In fact, the standard bodies of EDI messages were EDIFACT and not XML by W3C (World Wide Web Consortium).

In addition, in 2010 Malaysia has successfully implemented National Single Window (NSW) and has appointed Dagang Net Technologies Sdn. Bhd as an e-commerce solution provider. The ten ASEAN nations have agreed on the implementation of NSW as a common system for processing of cargo clearance tasks when member countries trade with each other's. Based on National Single Window Malaysia case study by Salleh, (2010), the NSW combined eDeclare, ePayment, ePermit, eManifest and ePCO in single sign-on which are then integrated with ASW (ASEAN Single Window) thru Gateway Hosting using PAA Pre-Declaration message format . Unfortunately, there is no XML implementation for logistics

standard data exchange especially for import/export declaration, customs clearance among logistics transportation companies and Customs Department.

Table 1.1 shows the cost of EDI implementation, which also known as SMK DagangNet (Gangeswari, 2007). The cost of SMK implementation varies depending on its type as shown in Table 1.1. Stand-alone system costs higher than web-based EDI as stand-alone system requires users to purchase software, besides this type of system also entails costs for maintenance and licence's renewal. However, monthly charges are similar for both systems where these are charges subject to number of mailboxes subscribed and usage of data element.

Table 1.1: Cost of SMK DagangNet Implementation as of July 2005

<table>
<tr><td rowspan="2">Cost</td><td colspan="2">Type of SMK DagangNet</td></tr>
<tr><td>Web-based</td><td>Stand-alone</td></tr>
<tr><td>One-time</td><td>RM 1400 (rent EDI software)</td><td>RM 6000 (purchase EDI software)</td></tr>
<tr><td rowspan="2">Annual</td><td rowspan="2">RM 600</td><td>RM 725 (maintenance)</td></tr>
<tr><td>RM 525 (renewal for software licence)</td></tr>
<tr><td>Monthly</td><td colspan="2">Fees for mailbox subscription * + Usage (RM 1.20 X Kilobyte)
*:- First mailbox- RM 180 and additional mailbox- RM 90</td></tr>
</table>

Table 1.2 shows EDI charges for National Single Window (NSW) implementation in 2010 (Salleh, 2010), where the charges were based on EDI-Volume, document-based, registration and mailbox charges. Compared to the previous charges shown in Table 1.1, there are EDI usage and mailbox charges by Dagang Net Technologies Sdn. Bhd before and after NSW implementation. Thus, this clearly shows that there are non-usage of XML among logistics transportation companies and Customs Department as standard of logistics data exchange.

Table 1.2: EDI Charges for NSW Implementation 2010

Type of Charges	EDI Charges	
EDI-Volume-based charges	First two years RM 0.88/kb	Subsequent years RM0.80/kb
Document-based charges	RM 5.00 for each approved document	
User registration	RM 500 for corporate customers and RM200 for *Small and Medium Enterprise (SME). This is a one-time charge only	
Mailbox charges	RM160.00 per month for corporate customers and RM90.00 per month for SMEs	
	Subsequent mailbox at RM90.00 per month for corporate customers and SMEs	

XML is emerging as the information transfer medium between firms and service providers that have transaction volumes to justify the use of EDI. XML has become a near-universally accepted and supported mechanism for data exchange across platforms and applications. XML data structures, known as schemas, provide a mechanism to develop and adopt common formats for universal data exchange, thereby, allowing separate information systems to communicate. XML provides a formal, self-documenting structure to share data, independent of the software that produced it. It also provides a mechanism for long-term archiving of data that might otherwise be difficult to access when host applications are retired. XML schemas have been developed in many industries, including publishing, insurance, education, and electronics. Cross and other industry experts believe that the deployment of XML ultimately may improve data exchange among companies in a low cost (X. Lu, Ye, Yang, and Yu, 2009).

The potentials of XML can overcome the weaknesses of EDI; however, in the context of Malaysian logistics industry, there are still non-usage of XML as standard data exchange, especially in import/export declaration and customs clearance.

Preliminary study has found that all respondents did not have any XML migration framework to migrate from EDI to XML.

Therefore, it is vital to explore the current situation of logistics standard data exchange in the context of Malaysia logistics industry in order to understand the non-usage of XML as standard data exchange and suitable framework to assist them to migrate from EDI to XML.

1.3 Problem Statement

In the context of logistics industries in Malaysia, preliminary study shows that only 14% of the logistics related companies were using XML as the standard data exchange. Therefore, there is a need to study the current situation in order to identify the factors and understand the non-usage of XML as logistics standard data exchange in Malaysia.

Based on the literature review, few studies have been done on XML migration and found that there is a lack of suitable migration framework to migrate from EDI to XML. Most of the studies were focused on XML implementation and adoption (S. W. Kim, Jung, and Kim, 2005; Nurmilaakso, 2008a; Yen, Huang, and Ku, 2002). Some of the studies were only focused on technical migration and such schema, network and security (Gregory, 2000; X. Lu, et al., 2009; Miyazawa and Kushida, 2000). Also, previous researches have focused on different parts of logistics material management, such manufacturing, purchasing and order processing (S. W. Kim, *et al*., 2005; Nurmilaakso, 2008a, 2008b; Nurmilaakso, Kettunen, and Seilonen, 2002; Nurmilaakso, Kotinurmi, and Laesvuori, 2006). Another researcher has stated migration or transition from EDI to RosettaNet XML would be a big job (Wagner, 2001). Although Intel then has 35 big trading partners on RosettaNet, the transaction volume was still very small as less than 1% of the company's trading volume was done with RosettaNet standards. Thus, it is important to have XML migration

framework that will assist logistics transportation companies and Royal Malaysian Customs Department prepare for XML migration.

1.4 Research Questions

Based on the problem statement described in the previous section, two research questions outlining this research are identified.

i. What are the factors of the non-usage of XML among the logistics transportation companies and Royal Malaysian Customs Department?

ii. What are the appropriate components that need for developing migration framework to assist the Royal Malaysian Customs Department and logistics companies to migrate from EDI to XML?

1.5 Research Objectives

The main objectives of this research are:

i. To identify factors that causes the non-usage of XML as a standard data exchange among logistics transportation companies and Royal Malaysian Customs Department.

ii. To develop XML migration framework with appropriate components that can be used to assist the Royal Malaysian Customs Department and logistics transportation companies migrate from EDI to XML.

1.6 Scope of Research

The scopes of this research are limited as followed:

i. This research is done in the context of Malaysian logistics Industry. The main focus of the study is the Royal Malaysian Customs Department (*Jabatan Kastam DiRaja Malaysia)*, which will be referred as Customs Department, while the business partners of the Customs Department, such as the forwarding agents, freight forwarders and shipping agents are the sub-case study.

ii. The output of this research is a migration framework that consists of a model and guidelines that can assist XML migration. Therefore, this research is only involved in the planning phase; the design and implementation of the XML migration process are not taken into account.

1.7 Significance of Research

Each research is important in its own right. This study will attempt to confirm the factors that led to the non-usage of XML as found in the literature review, and provide new factors as to why companies did not used XML. This study also will provide a XML migration framework and guidelines to assist the KDRM and logistics companies to migrate from EDI to XML. As most of the previous studies focused on EDI or XML adoption, the framework would be beneficial as it will reflect the findings from the case study in this research.

1.8 Structure of the thesis

This thesis consists of six chapters. The structure of the thesis, as shown in Figure 1.2, is grouped into three sections: positioning the research, body of research and outcomes. The thesis presents the development of the research in a structured and coherent manner. There are inter-relationships between different chapters and sections of the thesis and they are clearly stated in the chapters.

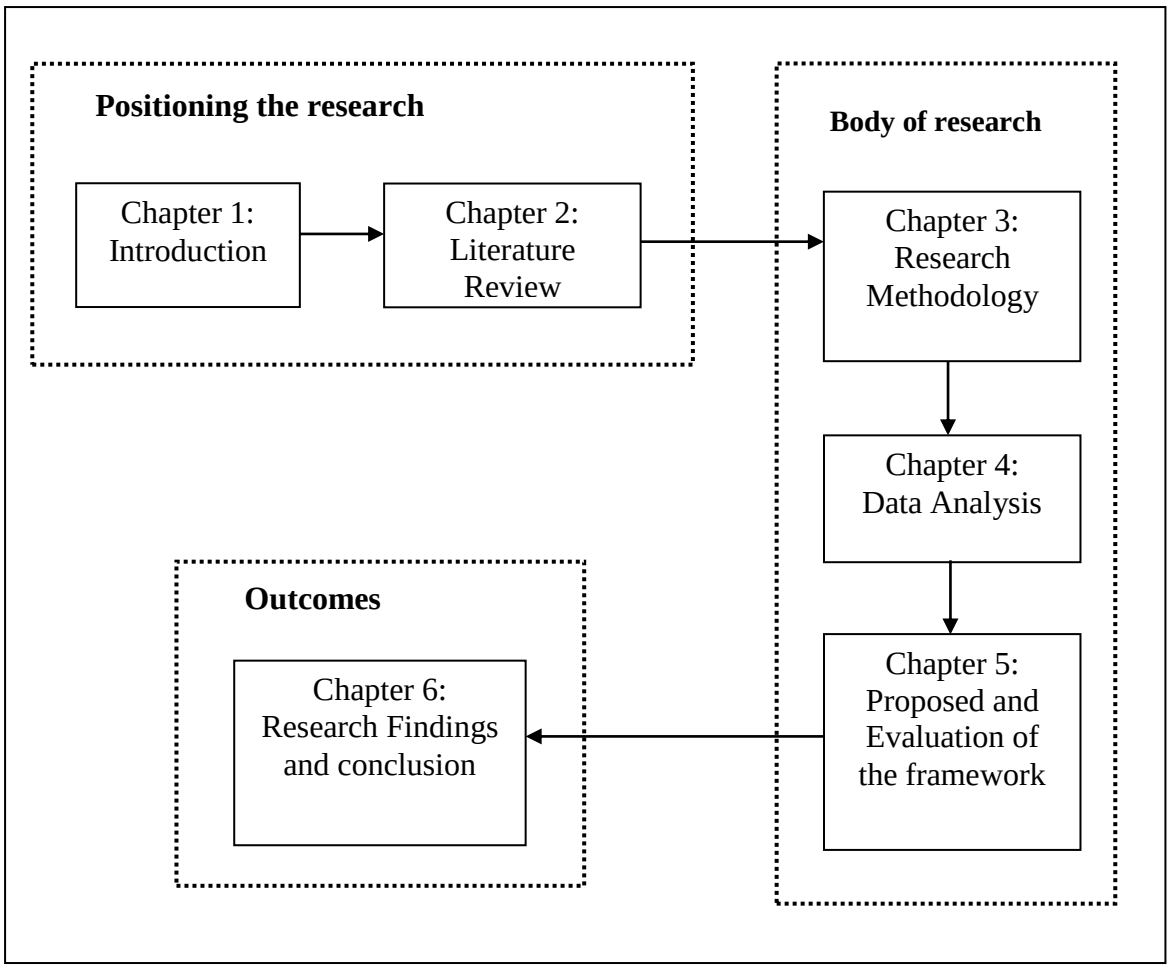

Figure 1.2: Organization of Thesis

Chapter 1 provides an overview of the thesis. It describes the background of the problem, statement of the problem, objective of the study, scope of the study, and their significance, as well as the structure of the thesis.

Chapter 2 discusses literature review on technology in logistics industry, EDI and XML technology, migration technology to support the research problem background while highlighting previous related researches that have been done to support this research.

Chapter 3 elaborates on the research methodology used in accessing the case studies conducted in this chapter. This chapter also gives an overview of qualitative research followed by the description of qualitative research approaches in information systems research and the case study methodology. Explanation on the step-by-step process for data collection and analysis are also discussed.

Chapter 4 reports on the case studies conducted. This chapter also discusses the results and findings from the case studies. The outcome from this chapter is important in developing the migration framework proposed in Chapter 5.

Chapter 5 discusses the proposed XML migration framework. It also provides the details of each phase in the migration framework together with the guidelines for the companies. The end of the chapter discusses the verification and validation of the migration framework.

Chapter 6 discusses and concludes the overall research process, and reports on the research achievements, constraints, aspirations, and future research plans.

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