DEVELOPING A NATIONAL EDI STRATEGY
CHALLENGES AND PROSPECTS

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ABSTRACT

Increasing pressures of global/domestic markets are forcing countries to adopt new information exchange methods to adjust to emerging trade practices. Consequently, Electronic data interchange (EDI) is recognized of critical importance. The aim of the thesis is to increase understanding of the issues involved in developing a national EDI strategy for Egypt. A pluralist methodological approach was adopted and a specific analysis procedure was developed to fulfill three main objectives: a) to identify the lessons learned from a mature EDI market (the UK), b) to investigate their transferability to Egypt, c) to derive a set of policy recommendations to develop an EDI strategy. The analysis was undertaken at national, industry sector and organization levels. EDI Context, Infrastructure for implementation, and Capacity to Change were investigated within the CIC framework. Fieldwork was carried seeking empirical evidence. This included questionnaires with British organizations in seven industry sectors, interviews with informants in Britain and Egypt, and case studies on Her Majesty's Stationary Office and the Customs and Excise Authority: a potential Egyptian EDI user. Analysis of the requirements of EDI markets in Britain and Egypt was undertaken. Lessons learned from the UK experience are identified. Criteria to arrive at transferable ones are set out.

Findings indicate that national and country-specific needs, government role, VANS and EDI coordinating bodies are important for the success of a national EDI industry. Despite industry differences, business benefit can be achieved by integrating EDI applications with core business processes. At the organization level, results emphasize the role of EDI as a systems integrator and a corporate change agent. Policy recommendations for developing national EDI industry in Egypt, resulting form the transferable lessons learned from the UK experience and accommodating local constraints, are put forward within the CIC framework. Finally main conclusions, contribution and future research areas are given.

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LIST OF NOTATIONS AND ABBREVIATIONS

ANA	Article Number Association, London – England
BPR	Business Process Reengineering
CEA	Customs and Excise Authority, Cairo- Egypt
CIC	Framework presented by the study. Acronym denoting Context, Infrastructure and Capacity to Change.
CSF	Critical Success Factors
E-Commerce	Electronic Commerce
EDI	Electronic Data Interchange
EDIFACT	Electronic Data Interchange For Administration, Commerce and Transport
FDI	Foreign Direct Investment
FEI	Federation of Egyptian Industries
GATS	General Agreement for Trade in Services
GATT	General Agreement on Trade and Transportation
GOE	Government of Egypt
HEART	HMSO Enquiry Access and Rapid Trading
HMSO	Her Majesty's Stationary Office, England
HS	Harmonized Commodity Classification and Coding System
IDSC	Information and Decision Support Center, Cairo – Egypt
INS	International Network Services
IS	Information Systems
JIT	Just-in-Time Production Systems
PEST	Denoting Political, Economic, Social and Technical
PIP	Project Implementation Planning Framework presented by the study. Acronym denoting Partners, Infrastructure and Processes.
QR	Quick Response Production Systems
SME	Small and Medium Enterprise
TRADACOMS	Trading and Communications Standard, U.K.
TQM	Total Quality Management
UNCTAD	United Nations Conference on Trade and Development
VANS	Value Added Network Suppliers
WTO	World Trade Organization

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

The increasing competitive pressures from both global and domestic markets are forcing countries to adopt new trade practices and standards. Nations are required to adjust to new methods of information exchange, open up their telecommunications systems and learn to take full advantage of harmonized procedures, standards, and practices for trade documentation. In achieving these goals, electronic data interchange (EDI) is recognized of critical importance in international trade facilitation[1]. Industrialized countries are rapidly adjusting to meet these new challenges. Developing countries must also follow suit or otherwise risk exclusion from the international economy and face severe competitive disadvantage. Views on the role that may be played by information and telecommunication technologies in the development process, range from optimism about the opportunities they create, to pessimism about the capabilities of developing countries to exploit these technologies to their benefit (Talero and Gaudette, 1996).

Simplifying and speeding up of trade information flows offer significant national benefits. Singapore, for instance, claims that properly applied trade facilitation is already saving it in excess of one percent of its gross domestic product each year (US$ 700 million in 1994). Taiwan and Korea have similar success experience with customs administration and Australia with tourism sector promotion. Hence, net gains are efficient trade and higher government revenue. At the enterprise level the adoption of quick response (QR) and just in time (JIT) strategies, particularly those supported by EDI, enables the textile and apparel industries across Asia and Latin America to compete intensely for a larger global customer base. Furthermore, car manufacturing operations worldwide are reporting savings of US$ 200 per assembled vehicle in cost savings through JIT and EDI practices (Schware and Kimberley, 1995a).

As a result, reengineered trade processes based on trade facilitation principles and EDI have become a global phenomenon. This is reflected in the growth trends of EDI use worldwide, both in terms of the number of users and volume of transactions.

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[1]Trade facilitation implies an optimum use of international standards throughout the trade administration process (Schware and Kimberley, 1995a).

PAGINATION AS IN ORIGINAL

There are at least 50 countries actively using EDI for trade facilitation and clearance purposes. In addition, recent statistics, released at the end of 1999, indicate that the number of EDI users operating according to national and international standards (excluding financial EDI users) is estimated to be in the region of 260 000 users[2], 77% of whom are in the US and Europe reaching 100 000 each. This figure is expected to exceed one million users by the end of 2000, that is a four fold increase over a one year period (Kimberley, 2000). However, it was indicated that a credible estimate of the total number of EDI users and recent estimates of the volume of trade conducted using EDI was difficult to obtain. Suffice to mention that, EDI is currently adopted by the world's top 5000 businesses, major suppliers and banks. Furthermore, governments in developed countries and major multinationals mandate the use of EDI in managing large volume trading transactions.

No wonder, therefore, that western countries have been expending much energy in recent years in defining international trade standards and instituting the EDI and electronic trading infrastructure. Yet, for developing countries, establishing the EDI industries and electronic trading communities is more complex. This is reflected in the shallow take up of EDI in the Middle East and North Africa. The total number of EDI users in the region does not exceed 3000 users, despite the initiatives undertaken in certain countries, e.g. Tunisia, Lebanon and Israel (Kimberley, 2000). Therefore, there is an urgent need for developing countries to establish their national EDI industries. If current traditional practices continue, they will have to struggle more and more for survival in the international market of free trade.

Whilst, it is acknowledged that there are a number of lessons to learn from mature western EDI markets, not all these lessons are directly transferable to developing countries. Arguably, the technical problems of developing a national EDI industry apply to both developed and developing countries, though with varying size and consequences. Hence, there are many major lessons from the industrialized world that can be of great benefit. However, the contextual environments differ substantially, mainly in terms of dominance of traditional business practices, limited available resources, poorly developed infrastructure and the constraints imposed by the socio-political and economic setup.

The figures only apply to standard-based EDI users including national and international standards.
There is assumed to be no double counting.

national socio-political and economic structure, accounting for inter-industry trading constraints and recognizing the legislative requirements and the organizational processes[3]. Moreover, it is believed that the candidate implementing authority is expected to demonstrate the *political will* and the *capacity* to mandate change dictated by EDI adoption in order to promote the successful EDI diffusion in a national setting. It is, therefore, believed that for Egypt there exists a need for recommendations to address its specific requirements taking into account the prevailing *context* especially the substantial cultural resistance to change. This resistance stems from long years of traditional practice and the deeply rooted values in past systems and procedures which invest themselves in social, legal and procedural constraints. The result is a limitation on the diffusion of both domestic and international electronic trading. These issues are discussed later in Chapter 5.

1.3 OVERALL AIM OF THE RESEARCH

The overall aim of this thesis is to increase understanding of the issues involved in developing a national EDI strategy for Egypt. The main focus is not only confined to addressing the technical aspects of EDI implementation, but also extends to incorporate the surrounding contextual factors. These factors are fundamentally different between nations at varying stages of EDI development. Besides, they influence the extent of successful development of the national EDI industry. Unfortunately, the academic literature on EDI offers little to support policymakers in that direction. It primarily focuses on technical and organizational matters relating to enhanced business performance and streamlining business processes. Similar to the wider area of IS research, there is little explicit mention of the socio-political and cultural factors in the planning and strategy formulation environments and also on how they interact with the process of implementation (Madon, 1991).

In pursuit of its aim, the thesis compares the electronic trading requirements of a mature EDI market, the UK, with those of a nascent developing country, Egypt. It draws on the lessons learned from British industries and leading organizations to define the factors critical to successful EDI adoption in a national setting. The work then examines the Egypt-specific contextual factors and the technical

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[3]Conference paper (EDI and Trade Facilitation: Best Practice and Lessons from Experience) presented in Morocco focused on incorporating the contextual aspects in developing a national EDI strategy (Cox and Ghoneim 1998a).

infrastructure/know-how requirements for implementation that influence establishing a national EDI industry. It also examines the potential impact of EDI in relation to the Customs and Excise Authority (CEA) in Egypt. The contextual factors inherent in the customs administration are believed to be representative of the problems and challenges faced by other developing countries in introducing EDI in a national setting. Primarily, the study aims at providing a set of policy recommendations for developing a national EDI strategy for Egypt based on first hand empirical evidence and taking into account the prevailing contextual and technical environment and the transferable experience of the industrialized world.

1.4 RESEARCH OBJECTIVES AND MAIN ISSUES ADDRESSED

Bearing in mind the overall aim of the thesis, the research objectives are defined as follows:

- To identify the lessons to be learned from the experience of a mature EDI market, the UK, at the national, industry-sector and organization levels.
- To investigate the transferability of the UK EDI lessons to Egypt.
- To formulate a set of policy recommendations and implementation guidelines for developing a national EDI strategy for Egypt.

Therefore revealing the factors that govern developing a national EDI strategy was a priori in the current work. This involved examining not only the issues related to EDI implementation at the national level, but also investigating the factors that shape the role of industry and organizations in establishing the EDI strategy.

Accordingly, it was necessary to attempt to answer the following four questions.

1.4.1 What are the Factors that Need to be Considered when Developing a National EDI Strategy?

In order to address this question a national level analysis was performed. A study of the UK EDI industry was undertaken to identify the factors critical to EDI strategy formulation and development. For instance, the complex domestic trading pressures and constraints are on top of these factors. Similarly, the role of the EDI coordinating bodies and service providers in developing national EDI trading standards and promoting EDI-based electronic trading is instrumental. Another important factor is the role of government in institutionalizing and regulating electronic trading. Allowance is also made for industry and organization-specific characteristics and

requirements that are likely to influence EDI adoption at the national level. It is believed that these factors are critical to developing a national EDI strategy and should be carefully examined at the national level.

1.4.2 What is the Role of Industries in Developing EDI Strategy?

In order to address this question an industry level analysis was undertaken. It was found that identifying industry-specific characteristics and requirements is a prerequisite obligation for developing a national EDI strategy. Thorough understanding of these characteristics must be attained together with the dynamics that promote or inhibit the use of EDI within and across industries. Whilst EDI is now viewed in many industry-sectors as a cost of staying in business, there has been limited research into the particular industry-sectors that promote or hinder sector-specific EDI development. Therefore, it is felt necessary to conduct empirical research to investigate the factors that influence and/are influenced by EDI adoption within industry-sectors. The lessons from the study established two sets of recommendations. First, are those related to targeting industry-sectors in developing countries that could efficiently promote EDI. Second, are those recommendations needed to identify the industry-specific success determinants to promote EDI adoption within specific selected industry-sectors.

1.4.3 What is the Role of Organizations in Developing EDI strategy?

In order to address this question an organization level analysis was carried out. A study was conducted to identify the role played by organizations in developing a national EDI strategy. Many factors are involved at this level and can be classified in terms of inter and intra-organization characteristics. Some factors in each group may seem similar, but still can differ in implementation and context. Hence, they should be subjected to detailed investigation and analysis. Furthermore, the implications of each factor also differ in many ways and need to be examined and assessed. The potential strategic benefits that can emerge from this assessment form a third category of long-term gains. Good knowledge of these factors is really important as they help in persuading the trade administration of a country to accept EDI adoption and development. Furthermore, this knowledge will provide valuable guidance to senior management and practitioners in developing corporate EDI strategies. It is the lack of understanding of the above factors that can hinder successful implementation.

1.4.4 How Can the UK Experience be Transferred to Egypt?

Based on the UK EDI experience, a large number of lessons learned are drawn. These lessons, however, need to be filtered for transferability to Egypt. A set of criteria is identified for this purpose, based on the prevailing relevant pressures and constraints in the country. Egypt-specific national and international trade agendas, socio-political interactions, economic pressures and infrastructure constraints are investigated. These have serious implications on institutionalizing electronic trade and setting-up the national EDI industry. In order to arrive at practical conclusions, the work was complemented by a case study of the Customs and Excise Authority to pursue direct national gains to the Government of Egypt, through potential EDI implementation.

1.5 CONTRIBUTION OF THE RESEARCH

There are four main contributions of this research.

1.5.1 First Contribution

Without understanding the importance of the national socio-political and economic context, the success of a national EDI implementation is questionable. The first contribution of this thesis is to improve understanding of the EDI context and process of implementation. This understanding helps in the early planning of a national EDI strategy and leads to an increased awareness amongst policymakers and government officials of the importance of the issues involved.

1.5.2 Second Contribution

Another contribution of this research is the augmentation of the EDI body of knowledge with empirical data. The thesis provides a thorough investigation of the factors involved in EDI adoption in Britain supported by several statistical indicators. This is based on a large questionnaire survey across seven sectors within the British industry. In addition to this quantitative data, qualitative information is supplied through a series of semi-structured interviews with learned persons, politicians, senior management and technical consultants, and two case studies in the UK and Egypt. The former case considers Her Majesty's Stationary Office (HMSO) where the use of EDI provided strategic benefits and expanded the intra-organizational role and potential of EDI as a systems integrator and a corporate change agent. Whereas, the latter case study investigated potential introduction of EDI to the Customs and Excise Authority (CEA) in Egypt as one of the main elements of achieving sound national benefits.

1.5.3 Third Contribution

A third contribution of this research is the provision of a conceptual framework and a set of policy recommendations and implementation guidelines to aid concerned politicians and practitioners in Egypt to initiate and then manage the process of establishing the national EDI infrastructure. This is achieved by explicitly considering the importance of the EDI Context, Infrastructure for implementation and Capacity to change, denoted throughout this work as the CIC framework.

1.5.4 Fourth Contribution

The thesis as a whole is believed to have contributed positively in setting an example on how a developing country can benefit from the experience of modern EDI application in the developed world. It gives an example on how developing countries, other than Egypt can use the outcomes of this research to establish their own national EDI strategy. Thus, the innovative ideas, applications and recommendations given in this thesis are setout bearing in mind the importance of the issues of technology transfer. Furthermore, the outcome of the research is particularly valuable to the developed countries which are directly involved with developing countries in information infrastructure development and related technical assistance programmes. The research findings and recommendations enhance their insight and knowledge of the requirements and constraints particular to developing countries.

1.6 STRUCTURE OF THE THESIS

A summary is given below of the chapters that follow.

Chapter 2 reviews the pertinent research issues and gives a précis of the relevant EDI literature. It examines the various perspectives typically applied in the existing EDI literature and raises the need for a more integrative approach for the study of EDI and more empirical research to substantiate controversies. It argues that current knowledge in the field is inadequate to guide policymakers towards the development of a national EDI strategy. It further suggests that the large body of literature on EDI does not account nor cater for the requirements of developing countries.

Chapter 3 discusses the methodology developed in the thesis. It considers the methodologies typically applied in IS research and justifies the mode of inquiry advocated for the study. It details the analysis procedures, data processing and statistical analysis techniques deployed within this research work.

Chapter 4 is devoted to examining the UK EDI market characteristics in order to identify the critical success factors for its implementation and to define appropriate lessons learned from industry-sectors and organizations. This is based on the previously mentioned UK questionnaire and HMSO case study. The chapter examines EDI-specific benefits and barriers which are defined and discussed at a national, industry-sector and organization levels. The chapter also reviews the implementation requirements (infrastructure and know-how) which set the technical foundation of the EDI industry.

Chapter 5 investigates the potential for adopting EDI in Egypt. It examines the pressures and constraints to developing a national EDI industry in the country. The case of CEA is investigated to practically illustrate many of the inherent direct gains to the Government of Egypt, if EDI is applied.

Chapter 6 puts forward a set of policy recommendations and implementation guidelines for developing a national EDI strategy for Egypt. These recommendations are based on the reviewed literature and the UK experience examined in this thesis, bearing in mind the Egypt-specific constraints. The derived recommendations are setout within the CIC framework.

Finally, Chapter 7 presents the main conclusions, discusses the methodological, theory-relevant issues and limitations of the study and describes areas for future research. The chapter concludes with a summary of the research contributions.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

The aim of this chapter is twofold. First, to review and assess the current body of literature on EDI to identify and evaluate potentially transferable lessons. Second, to review the literature pertinent to contextual analysis in the wider area of IS research which is relevant to the current research objectives. A review of EDI definitions is presented in Section 2.2. Section 2.3 then considers the literature on the impact of EDI on inter-organizational relations and competitiveness. Section 2.4 discusses the benefits associated with EDI implementation and Section 2.5 reviews the technical dimensions of EDI implementation particularly with respect to the widely cited integration implications of EDI and its role in business process reengineering (BPR). Section 2.6 traces the extent to which developed models and theoretical principles have increased the understanding of the complex task of designing and developing EDI solutions. Section 2.7 presents a critique of the EDI literature with respect to fulfilling the research objectives. The literature on the contextualist school of thought that influenced the work is given next in Section 2.8. Section 2.9 encapsulates the summary and conclusions of the chapter. Finally, in Section 2.10, the chapter concludes with the contribution of this literature review to the thesis.

2.2 EDI DEFINITION

Numerous definitions and descriptions of Electronic Data Interchange or EDI exist in the literature and sometimes differ in their degree of complexity and level of detail. In support of the objectives of this research, the following EDI definitions are adopted.

- Within the wider group of information systems (IS) and inter-organizational systems (IOS) applications, EDI presents a major effort to facilitate trade. The International Data Exchange Association defines EDI as *'the transfer of structured data, by agreed message standards, from one computer to another, by electronic means'*. Most EDI definitions (Emmelhainz, 1990a; Pfeiffer, 1992) are based on this definition that distinguishes EDI from other IOS. Differentiation is based on: the technology facilitation of the seamless exchange of information and data between computer applications with minimal or no human intervention rather than mere computer to computer communications; the technology utilization of electronic networks (normally

value added networks) rather than data carriers (e.g. magnetic tapes or disks) for regular transmission of large quantities of documents; the technology use of structured, formatted messages conforming to standards.

- From an inter-organizational perspective, Cash and Konsynski (1985) classify EDI as a subset of the broader class of IOS, stating that it is *"automated information systems shared by two or more companies"* (p.134). Along the same line of definition, Delhaye and Lobet-Maris (1995) emphasize EDI's coordination capacity between firms.
- Swatman and Swatman (1992) redefined EDI as a sub-class of distributed IS where the users of the systems are organizations rather than individuals and where messages conform to one standard. They differentiate EDI from other IOS essentially on the basis of its cooperative, rather than its competitive role (see Section 2.3.3).
- Kimberley (1991) highlights EDI's ability to replace inefficient and error prone paper-based procedures. However, Swatman and Swatman (1992) argue that it is not the replacement of electronic messaging from the formally paper-based communications which provides the major capabilities of EDI, but it is rather the associated changes in operation and function within and between organizations that makes the difference. Since trading partners usually operate incompatible internal hardware and software systems, they have to agree on a number of technical and organizational issues in order to guarantee the fully automatic handling of trade related messages. These technical compatibility issues are addressed in Section 2.5.1.

Typically earlier EDI definitions focused on the technical aspects of EDI implementations (see Brawn, 1989; Coathup, 1988; Ferguson and Hill, 1989; Rochester, 1989; SITPRO, 1989), whereas, definitions formulated in the 1990s marked the inter-organizational aspects of EDI adoption (see Delhaye and Lobet-Maris, 1995; Holland *et al.*1992b; Saxena and Wagenaar, 1995; Swatman and Swatman, 1992).

Based on the review of the various EDI definitions, three aspects were identified which are of particular relevance to the scope of this thesis. First, attention is brought to the definitions of EDI which consider its *business* orientation. These definitions do not only focus on the technical aspects, but also extend to incorporate either the inter-organizational or business perspectives. Second, Swatman and Swatman's (1992) discussion regarding the *cooperative* role of EDI versus its *competitive* role has serious implications on inter-organizational relations on the one hand and industry restructuring on the other. This is discussed in further detail in Section 2.3.3. Third, EDI as a subset of inter-organizational systems, by definition implies that its effects

will extend beyond organizational boundaries to the wider trading community. Consequently, this will entail a wider scope of study of the pertinent EDI context and infrastructure-related aspects (Chapters 4 and 5).

There are, however, four aspects of EDI, which have not been sufficiently highlighted in the existing definitions. First, EDI applications are not confined to trading applications and manifest themselves across various industry-sectors. Traditionally, EDI has been associated with retail applications, particularly the exchange of orders and invoices. Accordingly, there is a danger that shallow knowledge of the scope of EDI applications may hinder the establishment of national EDI industries in countries where retail industries are not particularly developed. It may be concluded, therefore, that it is important to emphasize the diversity of EDI applications and their potential across various industry-sectors. To illustrate, EDI is progressively being utilized across industry-sectors such as services, utilities and government (Section 4.4.3). Second, although it is acknowledged that EDI has been defined as a subset of IOS, which implies that its impact extends beyond organizational boundaries to the wider trading community, there has been no explicit statement of the requirement to consider the context in which the technology is embedded. This is further discussed in Section 2.8. and in Chapters 4, 5 and 6. Third, definitions make no mention of the EDI capacity to streamline business processes. As discussed in Section 4.5.3, the EDI role may be extended to systems integration, which takes the role of EDI a step beyond the traditional inter-organizational application. Fourth, these definitions are fairly static in nature. They do not account for EDI's capacity to influence organizational performance and processes. Moreover, the definitions do not reflect EDI's *capacity to change* to accommodate the changing business and technical environment. As a tool, EDI is technically subject to definition and redefinition of the *structured data*. This technical feature of EDI allows for flexibility to alter the data definition to accommodate the continuously changing business requirements and technical platforms. As such EDI provides a valuable business asset, which is yet to be tapped for business benefit. This is manifested in the number of industry applications that are continuously being based on EDI platforms. As such, the technology presents an opportunity for change, but does not dictate which form the change will take. These issues are addressed in detail in Chapters 4 and 5.

There are also a number of pertinent EDI characteristics to consider within the context of this research. First, integration across organizational functions and between

organizations is a major distinction between EDI and other forms of electronic transaction (Reekers, 1995). To implement electronic exchange of structured documents, traditional paper-based organizational processes require both internal and external adjustment. Second, the impact of EDI adoption extends beyond organizational boundaries. EDI adoption affects both intra and inter-organizational trading processes, distribution of tasks, managerial authority and decision making process as well as inter-organizational coordination structures and interdependence. Third, inter-organizational trading is governed and institutionalized in accordance to well-established legislation. As a result, Government regulations and processes are important (Reekers, 1995). Fourth, the role of EDI has evolved from a predominant focus on internal efficiency enhancements and decision making support (Galbraith, 1974; Simon, 1962), to that of a fundamental enabler in creating and maintaining business networks which allow integration of previously segregated applications into a single coherent architecture (Bradley *et al.*, 1993; Cash, 1985; Cox and Ghoneim, 1998b; Kaufman, 1966; Venkatraman 1994).

From the above, it is clear how the complexity of EDI implementation extends beyond that of technical concerns. Accordingly, it is believed that, an understanding of EDI dynamics is fundamental to successful implementation. Consequently, it is encouraged that policymakers and practitioners involved in articulating a national EDI strategy and establishing the industry are well-informed of the particular nature and potential of the technology they are in process of institutionalizing.

There has been a great deal of academic research in the area of EDI. To date literature has focused on a number of perspectives that are typically addressed independent from one another. These are discussed hereinafter.

2.3 LITERATURE RELATED TO EDI IMPACT ON INTER-ORGANIZATIONAL RELATIONS AND COMPETITIVENESS

2.3.1 EDI Impact on Inter-organizational Relations

The first perspective considers the strategic impact of EDI on inter-organizational relations and firm competitiveness (Benjamin *et al.,* 1990; Cash and Konsynski, 1985). It is concerned with EDI's ability to facilitate the restructuring of the industry as a whole as well as its ability to transform individual partnerships, e.g. EDI's potential to transform relationships between trading partners by bringing them closer (Baker, 1991; Holland *et al.*, 1992b; Johnston and Carrico, 1988). Central to this perspective, is

EDI's impact on inter-organizational supply relations (Child, 1987; Cunningham and Tynan, 1993; Konsynski, 1993; Shoembar, 1992), its effect on the balance of power and control between trading partners (Saunders and Clark, 1992; Webster, 1995) and it capacity to induce new types of IT-mediated relationships and hybrid governance structures (Holland and Lockett, 1993; Malone *et al.*, 1987).

Furthermore, in recent years, literature has reflected wide-spread debate as to the potential of EDI to either gain or sustain *competitive* or *strategic* advantage. It is believed that some ambiguity exists in the literature between the terms *competitive advantage* and *strategic advantage*. In this study, *competitive advantage* is considered to be a short-run advantage based on such factors as first mover influence. *Strategic advantage* refers to longer-term advantage which enables the organization to improve business performance permanently.

2.3.2 EDI Competitive Advantage

The potential of EDI to achieve competitive advantage for organizations has been disputed. A number of authors, particularly in the late 1980s, suggested that there is competitive advantage to be gained from EDI implementations (Hudson, 1989; Robinson and Staton, 1987, also cited in Holland *et al.*, 1992b; see also: Benjamin *et al.*, 1990; Harris, 1985; McFarlan, 1984; Philip and Pedersen, 1997; Rackoff *et al.*, 1985). Moreover, a number of case studies (Banjamin *et al.*,1990; Cox and Ghoneim, 1998b) investigate EDI induced competitive advantage and identify the associated critical success factors. Other authors have debated the capacity of EDI to create and sustain competitive advantage (Clemons and Row, 1991; Freeney and Ives, 1990). Some have focused on interpreting its impact in terms of changes in competitive position (Johnston and Vitale, 1988; Porter and Millar, 1985), or industry structure (Barrett and Konsynski, 1982; Cash and Konsynski, 1985). Clemons (1986) argues that while a short-term competitive advantage from EDI is possible for an organization which is the first in its market sector to link to suppliers, the arrival of competitors rapidly erodes any possibility of *sustainable competitive advantage*. This is illustrated by the American Airlines' SABRE reservation system and the McKesson Corporation's Economist order entry system (Clemons and Row, 1988; Copeland and McKenney, 1988).

2.3.3 Sustaining EDI Competitive Advantage

From those authors that accept the potential of EDI to gain competitive advantage, there have been several attempts to define the factors which effect its sustainability. Swatman and Swatman (1992) define three factors that influence EDI-induced competitive advantage sustainability: (a) where EDI has been instrumental in gaining market share, particularly when competitors were forced to withdraw (see Cash, 1985; Copeland and McKenney, 1988), (b) where strategic alliances are formed, as within the banking community or within the European Airlines reservation system (see Brearley, 1989; Swatman and Clarke, 1990) or within the European airline reservation clearing house STIA (see Amerongen, 1987), (c) and/or where the market share has been substantially redefined in the organization's favor (Harvard Business School Case, 1985; 1988). They suggest that sustained competitive advantage is feasible where EDI is integrated with the organizational structures, depending on the implementing organization's ability to redesign its business processes appropriately. Interestingly, they note that the failure of EDI to provide long-term sustainable competitive advantage implies that EDI is essentially a cooperative rather than a competitive phenomenon. Other research focuses on the role of IT in enabling inter-firm co-operation (partnership style relationships, value-adding relationships, and information partnerships), suggesting that inter-firm collaboration, often centered around IT initiatives, might be a more fruitful route to competitive success (Hamel *et al.*, 1989; Henderson, 1990; Jarillo, 1988; Johnston and Lawrence, 1988; Kanter, 1992; Ohmae, 1989). Within a theoretical framework, Mata *et al.* (1995) developed a model on the basis of resource-based theory as a means of assessing sustainability of IT-induced competitive advantage. The model is applied to four attributes of IT: capital requirements, proprietary technology, technical IT skills and managerial IT skills to determine competitiveness sustainability.

2.3.4 EDI Competitive Necessity

At the other extreme, a number of researchers have emphasized EDI's competitive necessity (as opposed to competitive advantage). Keen (1991) views EDI as a business necessity that does not bring competitive advantage by itself. Reekers and Smithson (1994) justify the lack of post implementation evaluation on the grounds that EDI is simply regarded as a competitive necessity. EDI may also be seen as a necessary way of doing business and a pre-requisite for competing in certain markets (Benjamin and Scott Morton, 1986; Benjamin *et al.*, 1990, McNurlin, 1987, Rochester, 1989;

Swatman and Clarke, 1990). Empirical analysis endorses the view that a significant number of EDI users are motivated by competitive necessity (Benjamin *et al.*, 1990; Cox and Ghoneim, 1998a, refer also to Section 4.4.3.1). The implementation of EDI schemes within highly competitive industries such as the automotive industry (Hill, 1988; Hollands, 1989; McNurlin, 1987) are suggestive that EDI is perceived as a competitive necessity.

2.3.5 EDI Strategic Advantage

In so far as strategic advantage is concerned, there are a number of factors which will influence the extent of *strategic advantage* or degree of success achieved. For example, the position of an organization within the supply chain will determine its market power and, hence, the potential to gain strategic advantage through EDI. Clearly, focal organizations have the power to *strongly encourage* EDI trading with their suppliers and, where suppliers themselves are not operating in highly differentiated markets, they have the power of persuasion over their customers. It will also depend on the dynamics of the market place and the organizational capacity to build on its existing strengths and its ability to exploit the available technology innovatively. The strategic potential of an EDI implementation will also be influenced by the prevailing market conditions. For example, the volatile market conditions resulting from policy changes in the British public sector during the early and mid-1990s, created a new window of opportunity for introducing technologies previously used predominantly in the private sector (Cox and Ghoneim, 1998b; see Section 4.5.3). Finally, the potential to gain strategic advantage from a technological implementation is influenced by the extent to which the technology enhances an existing advantage already enjoyed by the organization. The widely quoted successful introduction by Merrill Lynch of their Cash Management Account is an illustration of this (Cash *et al.*, 1993). Merrill Lynch already had a unique range of banking products which it offered to its clients but was able to use IS to integrate these products to provide even more sophisticated services which could not be replicated by competitors as they could not supply the same range of base products. The case of HMSO described in this thesis (Chapter 4) shows how this organization, when moving into the private sector, exploited its position within the public sector, taking advantage of the volatile British political environment as well as its reputation as a supplier to central government to successfully grasp the opportunity to integrate disparate systems and achieve strategic advantage through EDI implementation. This case study serves the current research

objectives directly and the lessons learned have been utilized in selecting the candidate organization in Egypt and provided the basis of the proposed EDI implementation solution. This is discussed further in Chapters 5 and 6.

It is acknowledged that both developed and developing countries are keen to adopt new technologies, systems, processes and methodologies to enhance their competitiveness, market penetration and leadership. In that respect, the EDI literature portrays a favorable EDI capacity to cater for improved inter-organizational structures and firm competitiveness. This thesis holds that whilst opportunities for organizations, operating in developed nations, to gain competitive advantage from the introduction of EDI are limited, this opportunity remains in a few market sectors. In the UK, for instance, within the retail and manufacturing sectors, EDI usage is widespread and is no longer a source of differentiation but simply a cost of staying in business. However, in those sectors such as the pharmaceutical industry and organizations moving from the public sector into the private sector where EDI is less widespread, the potential to gain competitive advantage from its implementation remains (see Chapter 4). Similarly, for Egypt, the potential to gain competitive advantage from the adoption of a national EDI industry exists. Developing countries, such as Tunisia and Lebanon, are attempting to establish their national EDI strategies primarily on the belief that both competitive and strategic advantage in the region will be attained. These nations have the opportunity to build on the lessons learned from the West, both in terms of the competitive and strategic advantages achieved not only as a result of inter-organizational, inter-industry or international trade, but also with respect to the integration of disparate organizational systems providing immediate quantifiable results for organizations in these countries (see Chapters 4 and 5).

2.4 LITERATURE RELATED TO EDI BENEFITS

The second perspective concentrates on the impact of EDI on organizations, particularly with respect to the benefits associated with EDI implementation.

EDI benefits have been widely investigated in the literature. Iacovou *et al.* (1995) argue that perceived EDI benefit is the only variable that has been consistently identified as the most important motivational factor driving EDI adoption. Consequently, a large number of authors were keen to assess the impact of EDI adoption on firms. The following account, therefore, considers the literature on the strategic and operational benefits associated with EDI implementation (Banerjee and

Golhar, 1993b and 1994b; Benjamin *et al.*, 1990; Bergeron and Raymond, 1997; Cox and Ghoneim, 1994 and 1996a; Janssens and Cuyvers, 1991; Reekers, 1994; Reekers and Smithson, 1994; Riggins and Mukhopadhyay, 1994; Swatman and Swatman, 1992; Webster, 1995). Massetti and Zmud (1996) survey previous empirical studies and discuss the competitive and comparative EDI-specific opportunities, which were widely cited in the literature (Bakos, 1991; Hinterhuber and Levin, 1994; Konsynski, 1993; Nygaard-Andersen and Bjorn-Andersen, 1994; O'Callaghan and Turner, 1995; O'Sulivan and Geringer, 1993; Premkumar and Ramamurthy, 1994; Swatman *et al.*, 1994; Venkatraman and Zaheer, 1994), in general or on specific accounts of how particular organizations have applied EDI to attain situational benefits (Emmelhainz, 1987; Haugen and Behling, 1994; Mackay, 1993; Moynihan and Norman, 1994; Panepinto, 1993; Paper and Rai, 1994; Seideman, 1994; Sokol, 1995; Zimmerman, 1992). A typical list of benefits can be found in a number of references (Benjamin *et al.*, 1990; Cox and Ghoneim, 1996a; Emmelhainz, 1990b; Reekers and Smithson, 1994; see also Coathup, 1988; Colberg, 1990; McNurlin, 1987; or Dearing, 1990; Hill, 1988; Love, 1989; Wood, 1988, see also the questionnaire form in Annex 1). Benefits typically associated with EDI adoption are discussed in detail in Chapter 4. Furthermore, a number of authors have been particularly interested in assessing EDI impact on market structure (Clarke, 1992; Malone *et al.*, 1987) and transaction costs (Konsynski and McFarlan, 1990; Malone, 1987). Despite this extensive literature, Reekers (1995) raised a concern that there has been limited research into the implications of EDI for the balance of organizational power relationships and non-contractable attributes such as innovation, quality and information sharing (Bakos and Brynjolfsson, 1993; Saunders and Clark, 1992).

2.4.1 EDI Direct Benefits

Most literature on this topic tends to focus on a variety of direct benefits. Emmelhainz (1993) concludes that direct benefits of EDI include: (a) labor-savings in the areas of data transcription, controls, error investigation and correction, (b) fewer delays in data handling, which is reflected in improving the internal operations of a firm through a reduction in process-cycle time, (c) providing better responsiveness to customers through better speed of communications, (d) improving trading partner relationships through better understanding of their requirements and processes, and (e) increasing the ability to compete, both domestically and internationally through enhanced systems efficiency and effectiveness. Meanwhile, Dearing (1990) notes that whilst the long-

term strategic benefits of EDI may be the most significant, they are the hardest to quantify.

2.4.2 EDI Benefits Associated with Production Systems

Significant benefits are also reported when EDI is implemented together with other production systems. For example, EDI is already perceived as a prerequisite for JIT and QR inventory and production systems (Benerjee and Golhar, 1993a and 1993b; DuBois 1990; Kekre and Mukhopadhyay, 1992; Knill, 1989; O'Brien and Head, 1995; Offodile and Arrington, 1992; Robinson and Stanton, 1987; Rochester 1989; Sadhwani and Sarhan, 1987; Skagen, 1989) where limited stock holding is dependent on rapid and accurate communication of purchasing needs. Furthermore, Dudman (1993) suggests that applying EDI and Total Quality Management (TQM) together in areas such as JIT can achieve striking results.

2.4.3 Sector-specific EDI Benefits

In addition, a number of researchers developed particular interest in attainable industry-specific benefits (Thissen and Stam, 1992), such as retail (Brady and Targett, 1995; Cadete and Coelho, 1996; Holland and Lockett, 1992; McKinnon, 1990), pharmaceuticals (Dearing, 1992), services and insurance (O'Callaghan, 1992; O'Callaghan *et al.*, 1992), manufacturing (Reekers and Smithson, 1996) or transportation industry (Premkumar *et al.*, 1997). It is worth noting that many of the vendors and industry magazines have addressed a number of the issues critical to successful implementation on an industry level. Such references have not been included here deliberately as they are mostly used as marketing/promotional material and not presented as academically researched cases. Contrary to the conclusion by Swatman and Swatman (1992) that 'the list of the resultant benefits which are to be found in the business literature are remarkably similar indicating that organizational experiences have been fairly consistent', the 1993 market survey of British industries reported differentiated benefits across various industry-sectors (Cox and Ghoneim, 1996a, see Section 4.4.3.2). This allegation suggests that an in-depth analysis of sectoral characteristics, requirements and experiences is necessary.

2.4.4 Assessing EDI Benefits

However, research into the much needed cost-benefit analysis related to implementing EDI is fairly limited. The problem of quantifying EDI potential benefits has been

sporadically discussed by some authors (e.g. Rochester, 1989; Skagen, 1989). Such studies, particularly those which are specific to developing countries, can be of great benefit to senior management who are skeptical of the value of EDI adoption. A general business justification for EDI can be derived from the IOS literature where Barrett and Konsynski (1982) argue that participation in IOS leads to cost reductions, primarily due to lower inventory costs, more accurate knowledge about product availability, a shorter order processing cycle, lower transaction costs and productivity improvements. Also, Malone *et al.* (1987) imply that electronic communication, brokerage, and integration effects reduce transaction costs and facilitate a shift towards electronic markets. Similarly, Gurbaxani and Whang (1991) suggest that IOS use can alter production, internal coordination, and market transaction costs. Mukhopadhyay *et al.* (1995) criticize the recent studies of IT business value saying that they *"... are at best inconclusive"* (p.137) and conduct a study to estimate the dollar benefits of improved information exchanges between Chrysler and its suppliers that result from EDI. They model the EDI impact in terms of improved information exchange on the one hand and preparing and processing documents electronically on the other. Results suggest substantial annual savings of $220 million have been achieved as a result of EDI implementation. The results also indicate that rigorous evaluation can be performed to justify EDI investment costs in particular and IT costs at large.

Ironically, despite the extensive body of literature on EDI benefits, it is believed that EDI community development has been delayed by a general lack of awareness of EDI business benefits and a specific lack of understanding of the potential strategic benefits that can accrue from effective utilization of EDI core applications. Confining EDI to a technical platform hindered the business community's capacity to exploit EDI as an infrastructure for strategic initiatives such as business processes reengineering. Parker *et al.* (1995) suggest that where there is a slow rate of EDI diffusion it may be attributed to the lack of understanding of the EDI strategic benefits (Healy, 1991; Keen, 1986; Schnaidt, 1992; Turnbull, 1990; Valovic, 1993). Accordingly, they designed TREAT (Teaching Realistic EDI And Telecommunications) to address this concern. Findings support the fact that EDI implementation is influenced by the participants' educational background. TREAT, as a potential educational tool, would be useful if tailored to developing countries requirements. It would serve to enhance senior management and policymakers understanding and awareness of EDI implementation issues at the early stages of articulating the national EDI strategy.

To summarize the discussion so far, there has been a growing interest in recent years in assessing the business benefits associated with EDI implementation. However, a fair amount of speculation exists which lacks supporting empirical evidence. Inspite of the extensive body of literature *describing* EDI benefits, quantitative research is still lacking substantial empirical justification. The research described in this thesis contributes empirical support to this discussion (Chapter 4). Although the findings contribute towards an appreciation of industry specific benefits, there remains a requirement for periodical follow-up surveys to assess changes in users' perceptions. Ideally there is also a requirement for in-depth case studies monitoring the pre and post EDI implementation performance measures and employing modalities to follow-up on the changing organizational performance variables in parallel to EDI implementation developments. This dynamic research modality is unfortunately not practical within the timeframe allocated to postgraduate research.

For developing countries, at large, and for Egypt, more specifically, the body of literature specific to EDI benefits is particularly appealing, as the cited benefits represent the target objectives for both the policymaking and the business community advocating the use of electronic trading and EDI in particular. Industry-specific benefits are especially interesting in the early stages of developing the national EDI strategy as they provide guidelines to realigning business requirements with the necessary investment resources. For example, benefits reported by the manufacturing industry played an instrumental part in promoting the use of EDI within the Federation of Egyptian Industries (FEI). This is mentioned in Chapter 5.

A major concern however, is the fact that only a limited number of studies into the benefits of EDI adoption actually consider the context in which implementation takes place. The notion of incorporating the contextual environment in which EDI implementation is embedded is often not adequately described nor accounted for. Moreover, the implementation strategies and relevant changes in processes associated with the benefits achieved are typically not well-documented even in the literature that deals with benefits associated with EDI adoption. It clearly appears that there is a need for in-depth research which relates the extent of benefit achieved to the process of implementation in order to identify the relevant critical success factors. The identification of such factors is particularly pertinent and valuable in developing a national EDI strategy. This thesis is believed to have offered a contribution in this direction (see Chapters 4, 5 and 6).

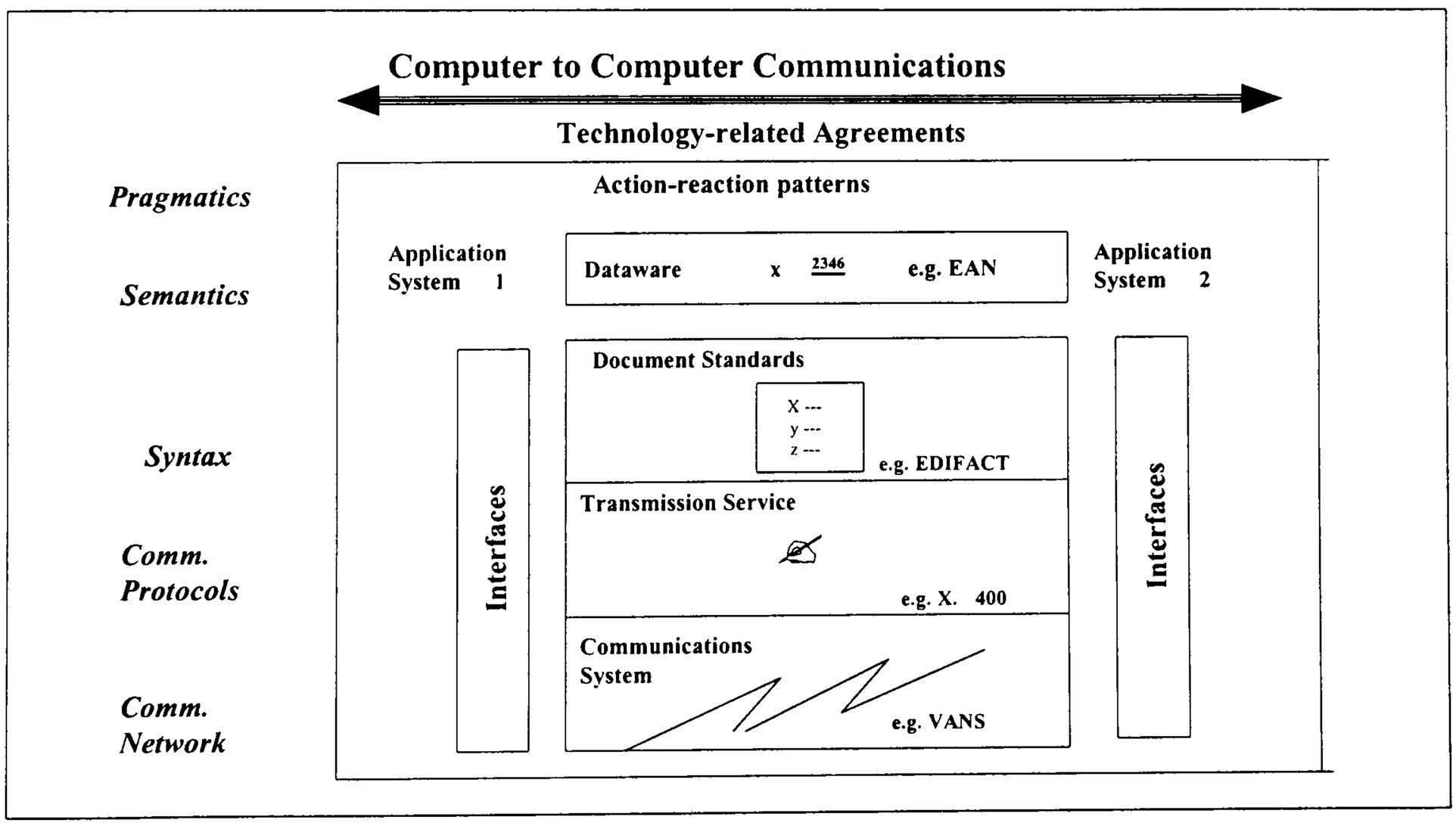
2.5 EDI LITERATURE RELATED TO TECHNICAL IMPLEMENTATION AND INTEGRATION

The third perspective focuses on the technical aspects related to EDI implementation and its role in business process reengineering.

The establishment of a national EDI industry infrastructure requires sound knowledge of the typical technical barriers and difficulties encountered in EDI implementation. This section provides an overview of the EDI basic compatibility requirements, technical implementation and integration challenges.

2.5.1 EDI Compatibility Requirements

EDI implementation entails, by definition, the presence of basic technical requirements which are briefly described hereinafter. As illustrated by 'The Layered EDI Communication Model' (Figure 2.1), EDI compatibility requirements can be classified into communications networks, communications protocols and document standards.



Source: Adapted from Kubicek and Seeger (1993) and Reekers (1995).

Figure 2.1 The Layered EDI Communication Model.

In principle, the communication network establishes the physical connection based on standards of transmission and switching equipment. These data carriers may be either private lines or public telecommunications networks and services. There are fundamentally two basic alternatives for communications networks, either through a point-to-point link between applications of different organizations or through the use of third party networks or value added networks and services. By way of illustration,

the former underlined EDI use in Germany and the later was most prominent in the UK (Reekers and Smithson 1994; see Chapter 4, Section 4.3.3).

Communication protocols define addressing, transmission and delivery of electronic messages, for example, X.400 Message Handling Systems and File Transfer Access and Management (FTAM). Requirements for communications networks and protocols are primarily catered for by the value added network suppliers (VANS). In recent years, these VANS have been instrumental in facilitating technical connectivity and developing the electronic trading community. Their role in developing the EDI trading community is described in further detail in Chapter 4, Section 4.3.3.

EDI standardization is more commonly associated with the development of the 'Document Standard' defining the syntax (i.e. sequence, format and content of messages) for software and hardware independent transmission of information (Pfeiffer, 1992; Reekers, 1995). Standard communications rules have been instrumental in the development of EDI (Janssens and Cuyvers, 1991; Senn 1992; Trauth and Thomas, 1993). Reekers (1995) argues that, the absence of standard communications rules, in the early stages of electronic information exchange, led to multiple initiatives across various nations and industry-sectors, and resulted in multiple nation-specific or industry-specific applications, as in the case of the VDA in the automotive industry in Germany, or SWIFT in the international banking sector. These initiatives limited the use of electronic information exchange to particular domains.

	National	**International**
Generic	ANSI X.12 (US) TRADACOMS (UK)	EDIFACT
Industry Specific	TRADACOMS (initially)	SWIFT EDIFACT subsets: - ODETTE (automotive industry - EDIFICE (electronics industry) - CEFIC (chemical industry)

Source: Reekers, 1995, Pfeiffer, 1992.

Table 2.1 Categories of EDI Document Standards.

National standardization led to the development of more generic national standards such as ANSI X.12 (American National Standard Institute) in the USA or TRADACOMS (Trade Data Communications Standards) in the UK. Meanwhile, the significance of EDIFACT (Electronic Data Interchange for Administration, Commerce and Transport) stems from its initiation as the single international, sector independent standard for electronic trading and from its global orientation aimed at harmonization

of trading practices (Table 2.1). Sharing the same philosophy, sector-specific subsets such as ODETTE, EDIFICE and CEFIC were developed to cater for the automotive, electronics and chemical industries, respectively.

Salminen (1994) explored the EDIFACT standardization problems and discussed the important issues in future developments, namely: terminology, orthogonality, upward compatibility, and the synchronization of international and local standardization, consistency, modelling methodology and compatibility with other EDI standards. EDIFACT gains its importance from its promise to standardize international trading. Nations embarking on the development of a national EDI industry resort to adopting EDIFACT standards to integrate in global electronic trading.

The actual standard setting process and the impact of standardization have been addressed by a number of researchers in the field of EDI (Schware and Kimberley, 1995a; Webster, 1994). The conversion of business transactions into electronic format has been mainly driven by a few powerful hub organizations that have forced their trading partners (spokes) into EDI (Pfeiffer, 1992; Reekers and Smithson, 1994). Typically, hub organizations recognizing the potential efficiency gains, proactively pioneered the development of EDI standards and in due course *persuaded* their trading community to connect to EDI. Whilst EDI benefits are generally weighted in favor of hub-organizations, the ultimate benefit of staying in business is often quoted as the main reason for spokes to adopt EDI. Reekers' (1995) analysis of the standardization process showed that standardization is not only a technical construct, but is also a social construct resulting from conflicts stemming from incompatible interests of the trading parties involved. Webster (1994) also describes message standardisation as a critical and highly political process.

From a policymaking perspective, countries in the early stages of developing a national EDI strategy, such as Egypt, have the opportunity to leapfrog the standardization process and adopt the international standards which would facilitate their process of integration in the global economy. In fact, a number of developing countries are members of the committees on EDIFACT development as observers with a view to adopting this standard in due course. Participating in the process of standard setting and adoption is essential in the early stages of articulating the national EDI strategy in order to effectively and efficiently promote EDI diffusion and the electronic trading community development bypassing barriers associated with use of multiple standards.

2.5.2 Technical Implementation and Integration

A number of researchers have focused on examining the EDI-specific technical implementation difficulties typically encountered (Arunachalam, 1997; Drury and Farhoomand, 1996; Gottardi and Bolisani, 1996; Premkumar *et al.*, 1994; Rao *et al.*, 1995; Senn, 1992) particularly with respect to criteria for selecting VANS (Janssens and Cuyvers, 1991; Norris and Waples, 1989; Tyler, 1990), trading standards (Banerjee and Golhar, 1993b; Emmett, 1991; Farnum, 1994, Trauth and Thomas, 1993; Webster, 1993), cost justification (Hoogeweegen *et al.*, 1996) as well as legal and security concerns (Banerjee and Golhar, 1994a; Fitzgerald, 1994; Jamieson and Low, 1991; Lim and Jamieson, 1996; Riggins and Mukhopadhyay, 1994; Rihaczek, 1994, Williamson, 1991). Difficulties typically encountered in EDI implementation are discussed in detail in Section 4.4.3.6.

Implementation problems can be organizational rather than technical. This is reflected in the survey conducted by Cox and Ghoneim (1996, Section 4.4.3.6) which identifies the fact that the main EDI implementation problems stem from a failure to recognize the contextual and organizational environment within which the EDI system is implemented. The survey also found that the main concern was the integration of the technology with internal systems and the lack of adaptation of traditional business processes (Section 4.4.3.6.3). Rao *et al.* (1995) argue that implementation commitment including the involvement of internal users and trading partners, as well as the extent of usage and degree of integration, are important factors in determining the level of competitive advantage achieved as a result of EDI implementation.

The EDI literature also addressed EDI integration with internal processes in terms of benefits achieved. EDI integration is the process during which a firm alters its business practices and applications so that they interface with its EDI applications (Iacovou *et al.*, 1995). Benjamin *et al.* (1990), Bergeron and Raymond (1992) and Bouchard (1993) suggest that the integration level of EDI is positively related to achieved benefits. Iavacou *et al.* (1995) assert that non-integrated systems will offer adopters direct benefits only, such as reduced transaction costs and higher information quality, whereas an integrated system will offer both high direct benefits and the ability to take advantage of indirect benefits such as increased operational efficiency, better customer service, and improved trading partners relationships. Clark and Stoddard (1994) argue that this more complete integration, which requires inter-organizational design and

policies, is essential to achieve performance improvements and the full beneficial impact of EDI. Integration in these studies was primarily concerned with integration with internal processes across internal structural boundaries to maximize strategic opportunities (see, for example, Benjamin and Scott Morton, 1986; Brophy and Monger, 1989; Crescenzi, 1988; Gopal, 1986; Henderson and Venkatramann, 1989 or Rockart and Short, 1989). Strategic benefits and competitive advantage have been largely attributed to the extent of EDI integration with organizational processes (Swatman 1994, Swatman *et al.*, 1994; Wilmot, 1988). The extent of EDI integration with internal and external business processes (Bergeron and Raymond, 1992) as well as with core business activities (Cox and Ghoneim, 1996), has been identified as a determining factor to achieving maximum business benefit.

2.5.3 Role of EDI in BPR

In the literature, the role of EDI in BPR has been contested. A number of authors, considered the role of EDI in BPR as an enabling mechanism and vehicle for business process re-design and business scope redefinition (Benjamin *et al.*, 1990; Swatman, 1994; Venkatraman, 1991). Spinardi *et al.* (1996), however, have questioned the relationship between EDI and business network redesign. They argue that there is little evidence for *"the much touted vision of EDI and BPR"* whilst Swatman (1994) argues the reverse. A considerable number of studies emphasize that long-term advantage can only be achieved by business redesign (Benjamin *et al.*, 1990; Hammer, 1990; Swatman and Swatman, 1992; Venkatraman, 1994). Consequently, EDI is seen as a key strategic tool in the re-conceptualization of the entire business network and the individual firm's place within it. Swatman (1994) uses a case study of BHP Steel to illustrate a success story of how EDI can be used to reengineer business processes and thus provide long term competitive advantage. Further, Swatman *et al.* (1994) discuss EDI as a BPR enabling mechanism and propose a model of EDI integration with the level of organizational maturity. Wagenaar and van der Heijden (1995) contribute to a more profound understanding of the capabilities of EDI in inter-company BPR, and propose a simple contingency model, which relates generic EDI-induced redesign opportunities to specific business contexts. Cox and Ghoneim (1998b) extend EDI's intra-organizational role to one of systems' integrator and corporate change agent based on an in-depth analysis of a public sector organization in the UK (Section 4.5.3). Clark and Stoddard (1996) describe a framework to illustrate the importance of merging technological and process innovation in order to transform organizations,

processes and relationships. EDI has also been cast as a *"pivotal technology for business process reengineering"* (Engel, 1994; Johansson *et al.*, 1994; Teng *et al.*, 1994, cited in Massetti and Zmud,1996, page 331). Further studies by Borthick and Roth (1993), Holland *et al.* (1992b) and Kremar *et al.* (1994) endorse this notion. As a result, Clark and Stoddard (1996) called for the development of a framework for business process redesign based on merging technological and process innovation in order to transform organizations, processes and relationships.

In the study conducted by Chatfield and Bjorn-Andersen (1996) EDI reengineering capacity is addressed on a national level. Their analysis, focused on export procedures in Australia, shows that EDI benefits include circumvention of technical trade barriers, risk reduction, and facilitation of global electronic commerce, as well as reduction of transaction costs of exporting. The study negates the rational top-down approach, which is typically prescribed in BPR literature.

Three shortcomings of the above mentioned approaches are as follows. First, most of these studies focused on changes in systems processes and did not account for a number of corporate strategies which may have been undertaken at the time of systems reform. These approaches are criticized for undertaking the analysis in isolation from the contextual setting leading to possibly misleading conclusions. Second, the analysis did not account for the relevance of the systems examined to core corporate activity. Third, there remains a requirement for empirical support. The research described in this thesis contributes to this particular body of literature in two ways by calling for and supporting the requirement for integrating EDI with core business activity in order to achieve maximum business benefits and by examining the EDI potential intra-organizational role as a systems' integrator and a corporate change agent based on the HMSO case study. Both contributions are particularly important when EDI implementation is considered in developing countries and more specifically in Egypt (see Chapters 4, 5 and 6).

The literature review reveals that, before 1990, limited research was focused on aspects of EDI system integration. Since then, however, significant research has been dedicated to examining aspects of internal integration of EDI, developing hypothesis and constructing conceptual models. Some empirical research, based on process studies, has given useful insights into the interaction between process and technology adoption with the organization as evident from the literature review. These aspects of

EDI implementation have been useful in approaching the GOE with a proposal for the CEA. The organizational requirements, constraints and proposed solution are discussed in detail in Section 5.7.

2.6 EDI THEORETICAL AND CONCEPTUAL FRAMEWORKS

2.6.1 Review of Literature on EDI Theoretical Models

The fourth perspective is concerned with EDI theoretical and conceptual models. In an attempt to identify frameworks and/or conceptual models that would fulfill the objectives of the current work, this section reviews the relevant body of literature. Research directions are being explored which attempt placing EDI research within a conceptual theoretical framework. This approach calls on the wider management and industrial literature to interpret factors that influence and are influenced by EDI adoption (Delhaye and Lobet-Maris, 1995; Reekers and Smithson 1996). Other authors aim to extrapolate critical success factors and develop implementation models which highlight both internal and external organizational requirements (Holland *et al.*, 1992b; Iacovou *et al.*, 1995).

The issue of theory deficiency with respect to EDI has been raised by some researchers and has led to recent theoretical frameworks. Within this direction, five theoretical approaches seem particularly relevant: the organizational theory, the industrial theory, transaction costs theory, resource dependency theory and the network approach. For example, Delhaye and Lobet-Maris (1995) built a conceptual model for EDI adoption to explain inter-firm disparities and message standards choice. They argue that the co-ordination structure regulating the relationship between firms and the cooperation *governance* structure linking partners generate specific information needs, which in turn require specific technical solutions. These key factors will be determined by the production structures of the firms on one hand and the commercial relations between firms on the other. The model is supported by various academic theories, namely, social shaping of technology (Mac Kenzie and Wajcman, 1985), industrial economics, using Brousseau (1991) and organizational theory to explain the coordination structures between firms. Mintzberg (1982) and Porter (1986) allow for differentiating the firms' situations according to their type of coordination structure and investigating where EDI can develop depending on where coordination processes are sufficiently formalized. Similarly, Reekers and Smithson (1996) use transaction cost theory (Williamson, 1975; Williamson 1979), resource dependency theory (Pfeffer and Salancik, 1978) and the network approach (Axelsson and Easton, 1992) to explain the

inter-organizational effect of EDI and assess its future impact particularly in the European automotive industry. However, Reekers (1995) calls for more attention to be brought to the EDI-specific conceptualization of different theoretical perspectives, particularly at the network level (Aldrich and Whetten, 1981; Kambil and Short, 1994). Galliers *et al.* (1995) consider the socio-technical aspects of EDI implementation. They suggest that strategic information systems planning (SISP) is a suitable infrastructure within which EDI implementation may be considered from a strategic as opposed to tactical perspective. Within this framework, for maximum effect, EDI needs to be integrated with business reengineering and business strategy. Their work describes the SISP theory and current practice and present guidelines for its application to EDI.

The modelling approach has also been utilized to bring EDI-specific implementation and diffusion requirements to center stage. A number of writers have developed various models particularly with respect to EDI diffusion (Johnston and Carrico, 1988) or to provide organizational adoption guidance (Holland *et al.*, 1992b; Iacovou *et al.*, 1995) or implementation guidelines (Cox and Ghoneim, 1996). Johnston and Carrico (1988) offer a simple evolutionary three-stage model. Stage one *traditional* where EDI use is confined to supporting operations, stage two *evolving* where EDI is seen to support business strategy and finally stage three *integrated* where EDI is integral to strategy. At the organizational level, Nelson (1990) offers a simple stage model to describe the maturity of organizations' use of EDI. A three-level categorization is used to reflect the extent of EDI use within an organization and the kind of benefits most likely to be realized at the different stages. Holland *et al.* (1992b) suggest a model of strategic implementation which illustrates how factors such as the nature of markets and distribution channels, organizational structures, and processes and buyer power influence the implementation of EDI with suppliers and customers. They identify five generic EDI strategies and discuss the impact of market share and IT expertise on each. To illustrate the evolving role of EDI in BPR and business network redesign, EDI is mapped against Venkatraman's business scope redefinition model in Section 4.5.3.7.

Iacovou *et al.* (1995) focused their research on the EDI impact on small and medium enterprises (SMEs). They developed a framework for EDI adoption by small businesses. The authors identify three major factors influencing EDI adoption practices in small businesses, namely, organizational readiness, external pressures and perceived benefits. Raymond *et al.* (1996) empirically validate an evaluation model of the potential for EDI in SMEs, in view of their EDI implementation within the context of a

network enterprise. The theoretical underpinning and concepts used in their model originate from the diffusion of innovation theory, transaction costs analysis, inter-organizational systems in distribution and logistics, and meta-organization theory.

Damsgaard and Lyytinen (1996) adopt a multi-tier approach to propose a multi-theoretical framework to study EDI diffusion in Finland. The framework takes into account the macro, meso and micro factors and distinguishes between five patterns that mold diffusion patterns in three diffusion arenas: local dyadic relationships, industry networks and national initiatives. *"The analysis demonstrate that EDI diffusions is a complex interplay of organizational, industry and institutional factors. On the theory plane our study calls for the need to orchestrate multilevel, multi-theoretical approaches to study the diffusion of complex and networked technologies"* (page 471).

The major contribution of these theoretical frameworks is the enlargement of the boundaries studied for EDI. These studies have used conceptual models for analyzing various perspectives of organizational dynamics involved in the EDI implementation. Nevertheless, these conceptual frameworks only provide a static view of the implementation process. Besides, they provide limited guidance, towards the research objectives of this study. For example, as mentioned earlier, there has been no explicit focus on highlighting the relationship between the context of implementation and the process of implementation. As such, there remains a paucity of research into the theoretical perspectives related to EDI implementation. This view is supported by previous assessments. For example, in the words of Reekers (1995, page 51) *"The shortcomings and inconclusive results of previous research show the need for more diverse perspectives on EDI, emphasizing the context that shapes its use in a more subtle and less EDI-focused view. The development of theories that highlight a broader context within which changes are taking place and the role of EDI in these changes is currently under-researched."* Therefore, it is concluded that, while various approaches to EDI appraisal exist, they do not describe how planners can apply these approaches effectively given the situational factors they face.

2.6.2 EDI Trade Facilitation and International Trading

With respect to international trading, there has been limited attempt to develop conceptual models catering to the global trading requirements. The conceptual EDI-specific technology transfer framework developed by Saxena and Wagenaar (1995) takes into account two dimensions of the transfer process. The breadth, defining the

scope of technology transfer, and the depth, defining the maturity of EDI use at an organizational, industry-sector and country-level. The framework defines the critical success factors of the transfer process for the various levels of breadth and depth and provides an insight into the key areas that require concurrent management, namely, strategy development, infrastructure development and education. The framework also addresses the coordination requirements for each of those areas. Although the framework lacks empirical support, it is a valuable contribution to EDI-specific technology transfer literature, given the limited research in the field.

There are a number of other studies into aspects of international trading that were most valuable to this study, but differ in their degree of complexity and detail. Schware and Kimberley (1995a) review the extent of EDI global presence based on a study conducted in 1995. The study summarizes the experience of various nations and identifies critical aspects of implementing trade facilitation initiatives. The authors defined the various implementation modalities in terms of the extent of government intervention ranging from total funding and management by government, to a cooperative arrangement with the private sector, or complete lack of intervention. Such classification is very valuable as it implicitly provides the various scenarios and associated risks and gains. The authors also published a separate report as a guide to best practice (Schware and Kimberley, 1995b) where they focused particularly on the implementation aspects within emerging trade facilitation initiatives, namely: the legal and regulatory requirements, the skills and technology infrastructure, local business considerations, investment costs and benefits, technology and cost options.

Farhoomand and Boyer (1994) investigate the aspects that influence EDI adoption in a national setting. They conclude that legal, cultural, political and economic factors sway EDI successful adoption and diffusion. Building on these results, Farhoomand and Pace (1995) survey 137 companies using EDI in international trade to investigate various issues that surround global electronic trading. Lack of standards, systems cost and security concerns were identified as the major barriers at the firm level, while cultural and political differences were identified as international hurdles. Their research calls for the development of articulated theories to address the fundamentals of electronic trading at the global level. Furthermore, Farhoomand and Tuunainen (1996) examine the barriers to global international trade and present a conceptual model classifying these barriers in five broad categories: *technical*, encompassing factors such as inadequacy of telecommunications links, lack of communications

protocols and security concerns, *political*, such as regulations and public policy affecting trans-border data flow, customs clearance, foreign use and ownership of telecommunications infrastructure and financial payment transactions, *cultural*, notably language, *economic environment* and *legal issues* are also examined.

At the same time, a number of nation-specific studies were conducted in the early 1990s to examine factors that influence and are influenced by EDI adoption. Banerjee and Golhar (1991) examined national drivers and barriers to EDI in the USA. Reekers and Smithson conducted a series of comparative studies, between the USA. and Germany (Reekers, 1994), within Europe, namely, Germany, Ireland, Spain and the UK (Reekers and Smithson, 1993) and between Germany and UK (Reekers and Smithson, 1994). Furthermore, in-depth analysis of the UK market has been conducted by Cox and Ghoneim (1996). These studies provide empirical assessment of the widely advocated EDI benefits and difficulties.

To summarize the discussion so far, it is implicit that pressures to adopt EDI at a national level stem either from domestic business initiatives to increase efficiency or from global pressures in terms of international trade facilitation initiatives adopted as part of a national strategy. Consequently, national level analysis requires examining both external international pressures, namely, the political and economic pressures, and the domestic trading requirements and technical constraints. This research differentiates between global political and economic pressures and domestic trading requirements. These pressures dictate a major agenda for structural adjustment to integrate in the global economy. The reader is referred to Chapters 4 and 5 for a full discussion of the pressures pertinent to the UK and Egypt.

In terms of the lessons learned, it is believed that there are a number of lessons that may be directly transferable to developing countries, particularly in terms of utilizing EDI to enhance inter-organizational relations, and enhancing organizational efficiency and competitiveness. Chapter 6 is dedicated to discussing the lessons learned and their transferability to Egypt. With respect to EDI integration and business process reengineering aspects, further research is required given the anticipated cultural resistance to change. Research results discussed in Chapter 4, suggest that adapting traditional business processes has been a major hurdle reported by British industries, despite their acceptance of the strategic and business value of adopting EDI. Similarly, for developing countries, EDI integration is expected to be even more challenging.

There is a requirement, therefore, for investigating these issues based on a study conducted in a developing country. This particular area of research still requires empirical evidence to substantiate recommendations. In the interest of the research objectives, this requirement has been accommodated in the current work. This involved investigating developing countries characteristics, particularly those pertinent to Egypt's contextual drivers and constraints at large and the case of CEA in particular. The investigation of this case provides such a contribution.

2.7 CRITIQUE OF THE EDI LITERATURE

The reviewed EDI literature is vast in terms of breadth (coverage of various perspectives) and depth (depending on the particular aspect being investigated), yet specific areas of interest still remain under-researched particularly with respect to developing a national EDI strategy. Furthermore, there seems to be general tendency to independently focus on particular aspects of EDI implementation such as organizational competitiveness, technical difficulties, or building a theoretical framework. These efforts are gratefully acknowledged and provide the EDI literature with interesting thought for current and future research. In terms of catering for this research objectives, the main problem with the current body of EDI knowledge is the lack of a comprehensive research framework to assess both the causes and consequences of the technology. This concern is endorsed by Reekers (1995) who calls for the requirement for a single, coherent theoretical framework which covers the complexity of the entire process.

Another major shortcoming revealed by the literature review, is the insufficiency of case studies and empirical research to support raised arguments. Detailed accounts of how successful implementation of EDI is achieved are not widely documented. This lack of evidence contributes to the prolongation of the academic debates. For example, on the potential of IS, in general, and EDI in particular to gain or sustain strategic advantage with well-rehearsed arguments raised both for and against, or regarding the extent to which IS the concept of BPR are compatible as discussed in Sections 2.3.5 and 2.5.3, respectively. This research contributes to these debates by providing empirical support as detailed in Chapter 4.

The underlying concern throughout the literature review has been the fundamental requirement for a more diverse perspective on EDI emphasizing the context that shapes its use in a less narrow and technical view. In order to put forward policy

recommendations for developing a national EDI strategy, it is fundamental to consider the contextual environment in which the implementation process is taking place. The examination of the EDI literature, suggests that there is a need to call on the wider area of IS contextual analysis to provide an institutionalized framework of analysis to define the EDI-specific aspects that affect and are affected by the EDI adoption. This objective pursues identifying these factors at a national, industry-sector and organization levels. The following section addresses this issue.

2.8 CONTEXTUALIST ANALYSIS IN IS RESEARCH

There has been a growing trend in recent years towards the socially focused IS research. A number of writers acknowledged the significance of such socio-political factors in the implementation of IS in developing countries (Eres, 1981; Sanwal, 1988; Walsham, 1990; Walsham et al., 1990). However, the social context within which EDI systems are implemented are not adequately investigated. Research effort to date, particularly with respect to EDI, is fragmented and there remains a shortage of well-based theory and methodologies on how to address the relevant *contextual* aspects. This has had negative implications for EDI implementations since much of the current practice still adopts a rather simplistic technology approach. The sheer complexity and special IOS nature of the EDI technology, suggests the need for incorporating the contextual setup in the analysis to strengthen the theoretical base on the one hand and more empirical studies to substantiate findings on the other.

Talero and Gaudette (1996) assert that national IT strategies should be primarily demand driven to be effective. In the same way, any useful analysis of potential EDI implementation must therefore start from an understanding of the contextual setup in order to define the demand parameters and business requirements pertinent to industries and organizations involved in the implementation. The supply-push approach to technical development, which has dominated IS research has often provided useful insights, but does not explain the variance observed in the patterns and processes of adoption, nor the differences in the successful use of the technology across organizations (Kraemer and King, 1990; Walsham, 1993).

It is therefore believed that, in order to define concrete policy and institutional recommendations to remove the social and cultural constraints that inhibit the development of the EDI community, it is necessary to identify the wider socio-political and economic variables that influence EDI adoption at the national, industry-sector and

organization levels. It is acknowledged that research into EDI-specific contextual characteristics is still in its infancy and its impact has been limited to date. Therefore, contextual analysis offers a useful contribution to understanding the linkages between process and multi level context. To this end, the aim of this section is to review the literature pertinent to contextual analysis in the wider area of information system. It should be noted, however, that the scope of this particular section is not to survey the literature on contextual analysis in its entirety, but rather to introduce only the work which influenced this study.

The concept of context has received considerable attention in the management literature. Contextual analysis draws on the impact of changing socio-political context on features of inter-organizational context and interest group behavior over time. Walsham (1993, page 5) states that:

> *"Context is concerned with the multi-level identification of the various systems and structures within which the information system is embedded. This can include such obvious elements as the organizational department within which the system is being used, the organization as a whole, and the various sectoral, national and international contexts within which the organization is located. A more subtle set of contexts for information systems are the various social structures which are present in the minds of the human participants involved with the system, including designers, users and any of those affected by the system. Their interpretation of reality, their shared and contested sense of the world, create complex interacting contexts within which the information system, as a human artefact, is drawn on and used to create or reinforce meaning."*

Contextualism has been best described as the systematic description of the properties and relationships of processes and the changes in the context through which such processes emerge, and in turn influence the context. Madon (1991) asserts that the key to the analysis lies in establishing relationships between the variability in context, process and outcome. She argues that the process itself is seen as a continuous interdependent sequence of actions which is being used to explain the origins, continuance and outcome of the phenomena. As such, the context is not just treated as descriptive background, but offers a useful contribution to understanding the linkages between process and multi-level context. Given the current research interest to investigate the context-related setup within which EDI systems are embedded, this study makes explicit acknowledgement of the work of Pettigrew (1985, 1987, 1990), Kling and Scacchi (1982), and Walsham (1993) whose work provided valuable input to the thesis. The work was also influenced by the research efforts of Madon (1991), Avergou and Doukidis (1993), Rogers (1983) and Reekers (1995).

The interaction between process and structure overtime is central to Pettigrew's (1985) contextual analysis. The three basic elements to contextual analysis defined by Pettigrew are: the process, the context and the outcome components of the process under investigation. The importance to see organizational change as linked to both inter-organizational and broader contexts, and not to try to understand projects as episodes divorced from the historical, organizational or economic environment from which they emerge is highlighted. Pettigrew (1987) identifies vertical and horizontal levels of analysis and the interconnections between those overtime. The vertical level refers to the interdependencies between the outer and inner contexts, namely, the impact of socio-economic context on interest group behavior. The horizontal level of analysis involves the sequential inter-relatedness between phenomena in historical, present and future time. The strength of Pettigrew's approach is its emphasis on multi-level contexts, on process and on the links between process and context. This linkage is critical to the understanding of how IS in organizations are constrained by the context in which they are developed and how in turn they contribute to maintaining or altering this context.

While Pettigrew's analysis contributed to the contextualist approach, it is necessary to acknowledge the concerns of other researchers regarding some of his theory shortfalls to account for them in this study. For example, Murray (1989) argues that the approach is good at describing the events, but does not explain why they occur in the first place, and whether the events in the single firm are typical and representative of the broader sociological or economic trends. He is particularly concerned that the focus is primarily on managerial issues at the expense of structural constraints which arise from the broader socio-economic context. Madon (1991) argues that whilst Pettigrew emphasizes the understanding of the socio-politcal context of the process, he does not provide a means to explain the way in which power is wielded between the various interest groups.

Another valuable approach to the study of context in the domain of IS research is the work on 'web models' provided by Kling and Scacchi (1982). According to web models, an IS is a complex social object constrained by its social relations, infrastructure and history. The context refers to both the focal situation and the wider context within which the system is implemented. Web models have been used as an example of rich analysis of the context of IS. Further work by Kling and Iacono (1989) examine specifically *change* aspects. They look more broadly at the organizational context in which the IS are embedded and highlight how systems and organizational structures can become institutionalized and difficult to change, thus constraining further IS development. The

web models help draw boundaries around the focal computer system and examine how its use depends on a social context of complex social actions.

Walsham's (1993) framework for contextual analysis pulls together various theoretical approaches (Giddens, 1979, 1984; Kling and Scacchi, 1982; Kling, 1987; Kling and Iacono, 1989; Pettigrew, 1985, 1987, 1990; Walsham and Han, 1991) and synthesizes them into a broad framework, designed to interpret IS in organizations. The key components of the framework and associated conceptual elements are content, social context, social process and finally the linkage between social context and social process. The framework components are described in detail in Section 4.5.4. Walsham (1993) argues that a good framework should not be regarded as a rigid structure, but rather as a valuable guide to empirical research. His work concludes with a synthesis of the major issues implicated in IS strategy formulation, systems evaluation, design and development, and implementation.

Madon (1991) highlights the need to improve the understanding of the social context within which the IT systems at large are implemented and how this context shaped and was shaped by the process of technological intervention. Avgerou and Doukidis (1993) called for the need to consider features of the broad national and international context, as well as to consider the characteristics of the local markets and cultural aspects as key success determinants in the application of IS. Rogers (1983) recommends incorporating the social context in the study of the diffusion of innovations. This notion is further supported by Reekers (1995) and Farhoomand and Tuunainen (1996) who suggest incorporating the broader context within which EDI implementation is proposed on an organizational level and national level, respectively.

The above outlined contextual school of thought has been particularly useful to this study on five main fronts. First, inline with the thesis research directions, they stress the importance of incorporating the investigation of the contextual environment in IS research. Second, they recommend conducting the research at different analysis levels to ensure consistency and homogeneity of the factors examined. Third, they incorporate the process of technical implementation as an integral part of the analysis. Fourth, this school of thought views the description of the examined contextual environment and processes as a critical form of knowledge because it encourages theoretical and empirical development concerning the management process. Finally, they account for the *change* aspects avoiding the *static* nature associated with

implementation frameworks. As such, these theoretical frameworks provide valuable guidance in carrying out this research work, with respect to examining the UK EDI market (Chapter 4) investigating the Egypt-specific pressures and challenges, and analyzing CEA setup and potential EDI application (Chapter 5). Furthermore, this guidance has been fundamental to developing the CIC conceptual framework (Section 4.7.1) and to articulating the policy recommendations (Chapter 6).

2.9 SUMMARY AND CONCLUSIONS

It is evident from the reviewed literature that EDI has been an important concern to researchers across various IS and management science research domains. To recapitulate, the reviewed literature seems to focus on a number of perspectives that are typically addressed independent from one another. The first perspective considers the impact of EDI on inter-organization structures. In principle, this perspective is concerned with the EDI ability to facilitate the restructuring of the industry as a whole as well as its ability to transform individual partnerships. This perspective also addresses the wide spread debate as to the potential of EDI to either gain and sustain a competitive advantage. The second perspective focuses on the strategic and operational benefits associated with EDI adoption. The third perspective addresses the technical issues related to EDI implementation. It concentrates on EDI integration aspects and its role in business process reengineering. The fourth perspective is concerned with EDI theoretical and conceptual models which call on the wider management and industrial literature to interpret the factors that influence EDI adoption. Finally, the wider contextual literature, applicable to the current research objectives, was examined to seek guidance in investigating and defining the contextual environment pertaining to EDI. From the literature review, it is evident that each of the above-mentioned perspectives highlights important aspects of the EDI implementation process. However, there remains a concern that there is no single coherent theoretical framework which covers the complexity of the entire process. In part, the current work provides support for the ongoing debates and frameworks. For example, industry-sector analysis, discussed in Section 4.4, provides empirical support for the widely cited benefits associated with EDI implementation. The survey findings argue for integrating EDI applications with core business activity to achieve maximum business benefit. The results are based on an in-depth analysis of the factors contributing to the differentiated benefits reported by the British industry. Similarly, the case of HMSO given described in Section 4.5, supplies illustrative knowledge of the achievement of a

strategic advantage through the judicious use of EDI. It also complements the work undertaken by Swatman (Swatman, 1994; Swatman *et al.* 1994) on the use of the technology to achieve business transformation in the private sector by illustrating this effect in the public sector. Finally it demonstrates the use of EDI as an enabler of business change and systems integration.

However, the majority of the recent EDI literature neither account for nor cater for the emerging requirements of developing countries to establish their national EDI infrastructure. Although, it is acknowledged that the reviewed literature provides valuable input to the current research objectives, it requires further filtering and adapting to accommodate the constraints prevailing in developing countries. This exercise is carried out for Egypt (see Chapter 6). Furthermore, given that the reviewed literature does not provide a clear set of guidelines towards the development of a national EDI strategy for Egypt, further research work had to be conducted. It was necessary to undertake a study of a mature EDI market in contrast to that of Egypt to identify transferable lessons. This involved field work in the UK (Chapter 4) and in Egypt (Chapter 5).

2.10 CHAPTER CONTRIBUTION

The contribution of this chapter to the thesis is twofold. First, it reviews the relevant EDI literature. Assessment of the literature resulted in a critique of the technical view of EDI and the mechanistic view of organizations. Hence, a wider perspective to EDI appraisal, considering the *context* is justified. Second, the chapter highlights the lack of literature on the subject of formulating national EDI strategies and stresses the urgent need for extending the academic literature and research through further empirical studies of EDI implementation.

It clearly appears, therefore, that what is really needed in this thesis is to cover EDI implementation in its situational context. Neither EDI potential impact nor its implementation process can be viewed independently from the context within which the technology is implemented. A more realistic integrative theoretical approach to the study of EDI is called for to convey the true complexity of the subject area. This need for a more comprehensive integrative approach, is also endorsed by Delhaye and Lobet-Maris (1995), Reekers (1995) and Saxena and Wagenaar (1995).

CHAPTER 3 - REVISED

RESEARCH METHODOLOGY

3.1 INTRODUCTION

Ascertaining the most appropriate methodology for a particular research is a challenge. Some methodologists argue for the primacy of the traditional empirical approach whilst others strongly advocate the suitability of the emerging interpretive techniques for IS research. While the former produces generalized evidence based on employing scientific reasoning, the later captures the richness of the prevailing phenomena under investigation. The purpose of this chapter is to present the research methodology and the analysis procedure adopted in the current work. These required considering the following three basic inputs, which are also shown in the flow chart of Figure 3.1,

- the research objectives as outlined in Chapter 1 and reiterated hereinafter,
- the literature review and the relevant theoretical background (Chapter 2), and
- the methodologies typically applied in IS research, taking into consideration their respective advantages and disadvantages, and the pertinence of each for investigating the current research objectives.

For the sake of convenience, Section 3.2 briefly reiterates the objectives of the thesis. Section 3.3 outlines the theoretical background which influenced the current work. Section 3.4 gives a review of the methodologies typically employed in IS research. The adopted research methodology and the analysis procedure for this research are described in Section 3.5. Detailed explanation of the analysis procedure for examining the EDI industry in the UK is given in Section 3.6. The relevant procedure to investigate the potential EDI application in Egypt is presented in Section 3.7. Finally, the analysis procedure undertaken to define a set of recommendations to develop a national EDI strategy for Egypt is described in Section 3.8. The main methodological implications and chapter contribution are given in Section 3.9.

3.2 BRIEF REVIEW OF THE OBJECTIVES OF THE STUDY

As the analysis technique aims at fulfilling the objectives of the thesis, given earlier in Chapter 1, these objectives are briefly reiterated hereinafter, for convenience. The overall aim of this research is to increase the understanding of the issues involved in developing a national EDI strategy for Egypt. Hence, the objectives of the thesis were defined as follows:

- To identify the lessons learned from the UK EDI experience at the national, industry-sector and organization levels.
- To investigate the transferability of the lessons learned in support of establishing an EDI industry in Egypt.
- To articulate a set of policy recommendations and implementation guidelines to developing a national EDI strategy for Egypt.

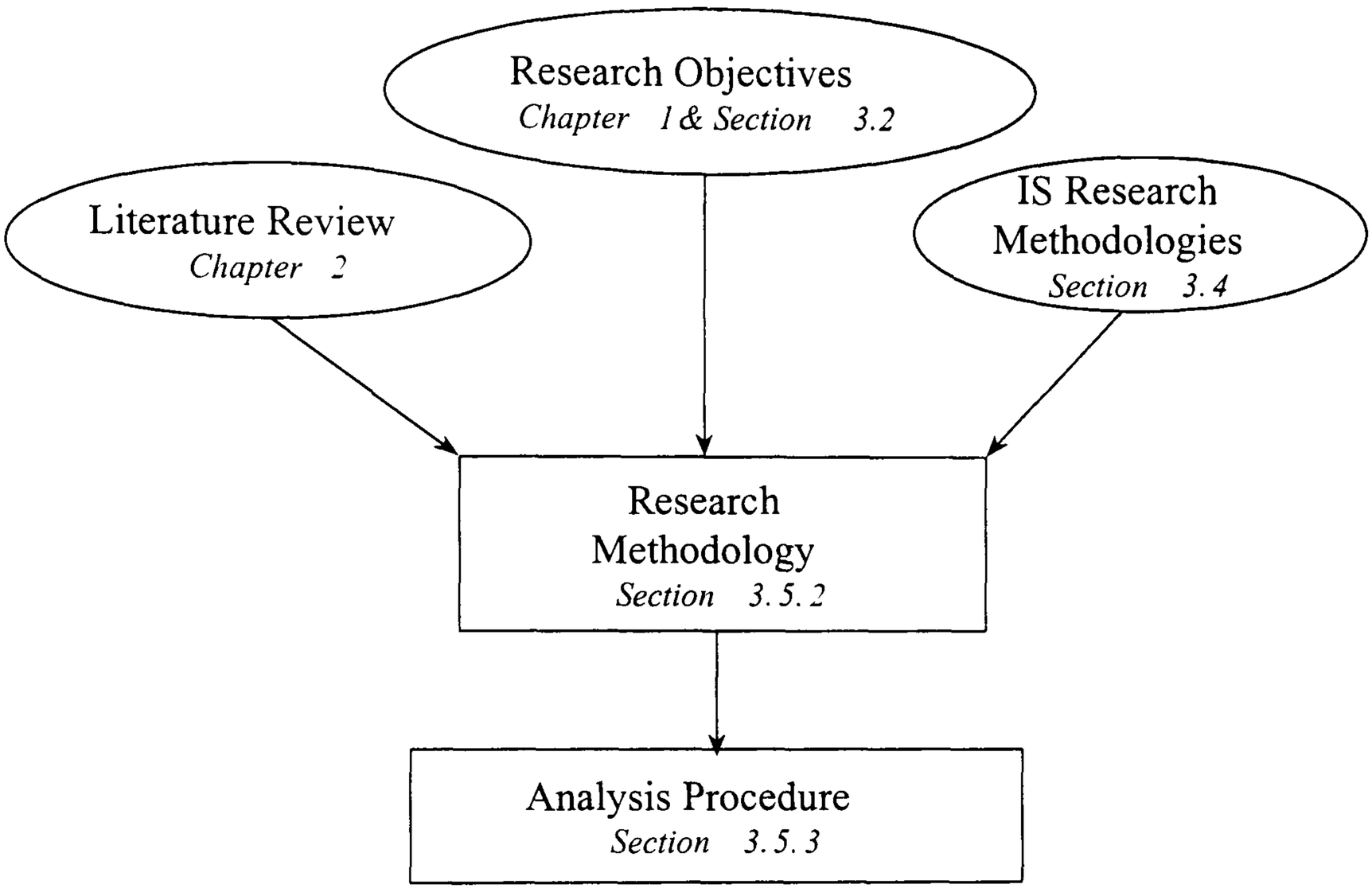


Figure 3.1 Inputs to the Adopted Research Methodology.

This involved:

- Identifying the context-related factors that typically influence/are influenced by EDI adoption in a national setting.
- Identifying the technical infrastructure-related challenges that are typically encountered in EDI implementations.
- Adopting an innovative non-traditional approach to assessing EDI potential. Extending the use of the technology beyond conventional applications and examining its intra-organizational role.
- Investigating EDI's capacity to accommodate change. Considering the basic EDI functionality within a different implementation perspective to accommodate dynamic business requirements and technical developments.
- Extrapolating the transferable lessons from a mature EDI market (UK) and investigating their applicability in Egypt.

Clear identification and assessment of these aspects of EDI implementation will contribute towards fulfilling the research objective in three ways. First, it will determine the primary motivational drivers that stimulate EDI adoption in a national

setting. Second, it will outline the determinants crucial to successful implementation of EDI. Third, it will practically illustrate the transferable factors based on first hand experience with EDI implementation. Therefore, improved understanding of the critical issues involved when formulating a national EDI strategy can be achieved.

3.3 THEORETICAL BACKGROUND

The contextual school of thought outlined earlier in Section 2.8, especially the insight gained from reviewing the theories of Pettigrew (1985, 1987 and 1990), Kling and Scacchi (1982) and Walsham (1993) was a very useful input to the adopted methodology. This is irrespective of variation between some points of interest in the current thesis and some concepts of those theories. It is clear from Chapter 2 that the above mentioned theories deal with IS, at large, and at an organization level in particular. Whereas, the current research addresses national and industry level domains, in addition to that of the organization and deals with EDI as a subset of IS. The contribution of these theories to the current work is briefly presented hereinafter, and referenced wherever applicable throughout the thesis.

Benefiting from the above mentioned theories had varied forms and modalities. For instance, an analogy was made utilizing the vertical and horizontal analysis adopted by Pettigrew (1985) at the organization level. In this analogy, vertical analysis included the three levels of interest in the thesis, namely, the national, industry-sector and organization levels. The horizontal temporal analysis concentrated on perception of two time periods, the pre and post EDI eras in British industries, with a more detailed historical application at HMSO.

Furthermore, the current work benefited alot from the definitions given by Walsham (1993) especially those pertinent to: social context, social process and the elements implicated in the interaction between context and process. Similarly, the definitions of history, infrastructure and the social relations which are focused on the social dimension as defined by Kling and Scacchi (1982) were particularly useful. Their work contributed to enriching the analysis and understanding of the cultural and political social behavior of the participants involved in EDI implementation.

The emphasis on the social dimension extended the analysis beyond the technical implementation concerns to also include the social context and process, as defined by Walsham (1993), see Sections 2.8 and 4.5.4. Accrodingly, in the current work, the

social context and human-related factors were stressed in many occasions during the study of the development and evolution of EDI in the UK and in investigating the potential for introducing the technology to Egypt at the national and organization levels. It was also useful to learn from the Walsham (1993) study of change using the structuration theory. However, in this study, dealing with change, focused on the EDI technical competency to accommodate emerging business and technology changes. It was, therefore, necessary to investigate the extent of EDI integration with core business processes in an attempt to interpret its potential impact.

Finally, the theoretical analytical framework developed by Walsham (1993) facilitated the process of examining the social context and process at HMSO (see Section 4.5.4). Furthermore, the views of the same author on strategy formulation were utilized loosely in the current thesis for evaluation, design and development of the solution proposed to CEA in Egypt.

3.4 RESEARCH METHODOLOGIES IN INFORMATION SYSTEMS

IS research methodologies can be classified into hard methods, following the positivist tradition and soft methods following the interpretive tradition (Galliers, 1992). It is argued that the positivist research tradition is the most dominant approach (Orlikowski and Baroudi, 1991; Walsham, 1993). The strength of the this approach, employing systematic scientific deductive reasoning processes in examining the impact of information technologies on organizational behavior and producing generalised phenomenal evidence, has been widely cited (Kaplan and Duchon, 1988; Markus and Robey, 1988; Symons, 1991). Typically, this research approach engages statistical techniques in assessing data gathered from field surveys. The positivist approach is, therefore, considered appropriate for studying the EDI-specific pre-implementation organizational motivational factors and post implementation effects. However, this deterministic approach does not consider the interaction between IS and specific organizational contexts that might result in different responses to the introduction of information technology. It has often been criticized for neglecting social reality and abstracting from the contextual richness (Galliers, 1992; Hirschheim and Smithson, 1988; Kaplan and Duchon, 1988; Orlikowski and Baroudi, 1991), thus limiting insight into the causes and processes of the phenomena studied (Strauss and Crobin, 1990).

The interpretive research tradition based on case study inquiries encompasses, by definition, the social reality (Walsham, 1993). It is primarily concerned with the deep

understanding of the organizational phenomena and the social context in which IS are implemented (Boland, 1985; Checkland, 1981; Pettigrew, 1985). It is argued that the interpretive approach is most appropriate where the phenomenon examined is highly complex and non-quantifiable (Banoma, 1985; Benbasat *et al.*, 1987; Boland, 1987; Galliers, 1992; Glaser and Strauss, 1967; Lee, 1989; Orlikowski and Baroudi, 1991; Yin 1994). Case studies can also provide new insights based on empirical observations due to their highly iterative nature and their tight links to data (Strauss and Corbin, 1990). Therefore, they are regarded as appropriate for conducting empirical research (Walsham, 1993), in addition to offering more detailed understanding of the complexity of the investigated phenomena (Miles and Huberman, 1994; Saunders and Clark, 1992). Walsham (1993) argues that case studies allow for analysing a greater number of variables than it is possible with any of the hard research approaches. Yin (1994) supports this argument and adds that case studies in the meantime retain the holistic and meaningful characteristics of real-life events. Therefore, the case study approach is frequently selected to investigate EDI's strategic potential and to examine EDI's role in business process redesign. Furthermore, because EDI constitutes complex IS that are inseparable from their intra- and inter-organization setups within which they are situated, this mode of inquiry is considered particularly useful (Markus and Robey, 1988; Reekers, 1995; Symons 1991).

The reviewed EDI literature reveals that, to date, previous studies have typically either adopted the positivist approach, based on survey techniques (Banerjee and Golhar, 1991; Reekers, 1994; Reekers and Smithson, 1994), or the interpretive method based on case study inquiries, focusing on a particular industry-sector (Reekers and Smithson, 1996) or specific organizational issues (Swatman, 1994). The choice of the current research methodology did not only consider the benefits associated with each of the positivist and interpretive schools of thought, but also accounted for their respective critiques and limitations as cited in the literature. To illustrate, Orlikowski and Baroudi (1991) highlighted the shortcomings of the positivist approach, whereas Lee (1989) addressed those associated with the interpretive approach. Orlikowski and Baroudi (1991) raised a concern that the adoption of traditional empirical techniques in IS research has often produced misleading and conflicting results. Their concern is based on an examination of 155 IS research articles published between 1983 and 1988. The majority of this work adopted a positivist approach. They argue that this approach, more suited to natural sciences, has limited both the studied phenomena and the way of

studying them. Consequently, it hampered the development of theory in the field and hindered the practice of IS implementation. At the same time, although the interpretive approach has been considered particularly suitable for research that attempts to understand the prevalent phenomena in its own setting as previously discussed, it has been criticized for its lack of objectivity. For example, Lee (1989) raised a concern that the case study approach cannot offer generalization in the statistical sense and, hence, gives minimal contribution to existing knowledge. Meanwhile, Benbasat *et al.* (1987) and Craig (1988) argue in favour of the interpretive tradition. They indicate that indeed various solutions can be proposed in order to counteract the above mentioned drawbacks and to provide was of encapsulating the findings from the work. Similalry, Craig Smith (1989) argues that the validity of an extrapolation from case studies, depends not only on the representativeness of such cases in a statistical sense, but on the plausibility and cogency of the logical reasoning used in describing the results from the cases and in drawing conclusions from them.

3.5 ADOPTED STUDY METHODOLOGY

3.5.1 Issues Influencing the Selected Methodology

This section is devoted to the justification of the adopted methodology for this research. However, it is felt necessary to discuss the following three important issues, that had great influence on the developed methodological ideas, beforehand.

First, the importance of analysing the *context* surrounding IS implementation has been repeatedly noted in the literature review (Section 2.8). Nevertheless, previous research into EDI seems to have failed to describe how the EDI-specific *context* (political, economic, social and technical) influence formulating EDI strategy in a national setting. As *context* plays an instrumental role in the adoption and use of the EDI technology, it is argued that EDI contextual drivers and constraints are to be accounted for in developing a national EDI strategy. The adopted methodology should, therefore, account for such consideration.

Second, formulating a national EDI strategy is a complex process. It involves institutional regulations, sector-specific standards and inter-organization trading agreements which influence/are influenced by both the contextual and implementation setups. Many of the problems associated with developing a national EDI strategy can be attributed to the lack of understanding of the contextual issues mentioned earlier which need to be addressed in a more focused manner at three levels. These are the

national, the *industry-sector* and the *organization* levels. At the *national* level, it is necessary to understand the various modalities of the role of government in regulating electronic trade and establishing the EDI industry and to appreciate the role of EDI coordinating bodies and service providers in institutionalizing electronic trading. Whereas, at the *industry-sector* level, industry-specific characteristics and the factors critical to promoting or inhibiting EDI diffusion need to be addressed. Finally, at the *organization* level, it should first be acknowledged that in practice, it is the organization which is challenged with the actual EDI adoption and implementation. Hence, organizational lessons, drawn from the organizations practical experience, play a fundamental role in the decision as to how the technology can be utilized to meet corporate objectives. In addition, and of equal importance, though unfortunately often neglected, are the problems resulting from inappropriate synchronization of the vision of the role of EDI and the methods adopted at the national, industry-sector and the organization levels. These facts are acknowledged when setting out the research methodology. Furthermore, factors related to the *context* vary from one of the above mentioned levels, to the other. It is evident, therefore, that the techniques required to examine these variables also differ according to the specific research requirements, data availability and the available literature relevant recommendations. Hence, again the developed methodology had to cater for such complexity.

Third, it is also apparent from the literature that there is a requirement for empirical studies to support the widely hypothesized impact of EDI. Augmenting this research domain with first hand data, based on field surveys and case studies, contributes towards the notably required theory building realm of EDI implementation. Consequently these requirements directed the design of the research methodology.

3.5.2 Selection of the Pluralist Approach

In view of the research objectives, literature review, the ideas mentioned in Section 3.5.1, and building on the strengths of the positivist and interpretive methodological approaches emerging from the IS literature, a pluralist research investigation approach is adopted. This includes conducting field surveys and case study investigations. This pluralist approach is also justified because EDI is a contemporary phenomenon associated with complex *inter* and *intra* organizational impact which require different assessment tools. Such comprehensive approach is clearly ideal for addressing the wide and varied issues that have to be investigated in formulating a national EDI

strategy, in general, and to provide the policymaking circles in Egypt with clear policy recommendations for its development, in particular. It is also believed that adopting the proposed *three-tier analysis* (i.e. analysis at the three national, industry-sector and organization levels) provides a coherent, focused method for examining the factors that influence EDI within each level. This coherence would certainly enhance the credibility of the research results and improves the replicability of its findings as previously discussed.

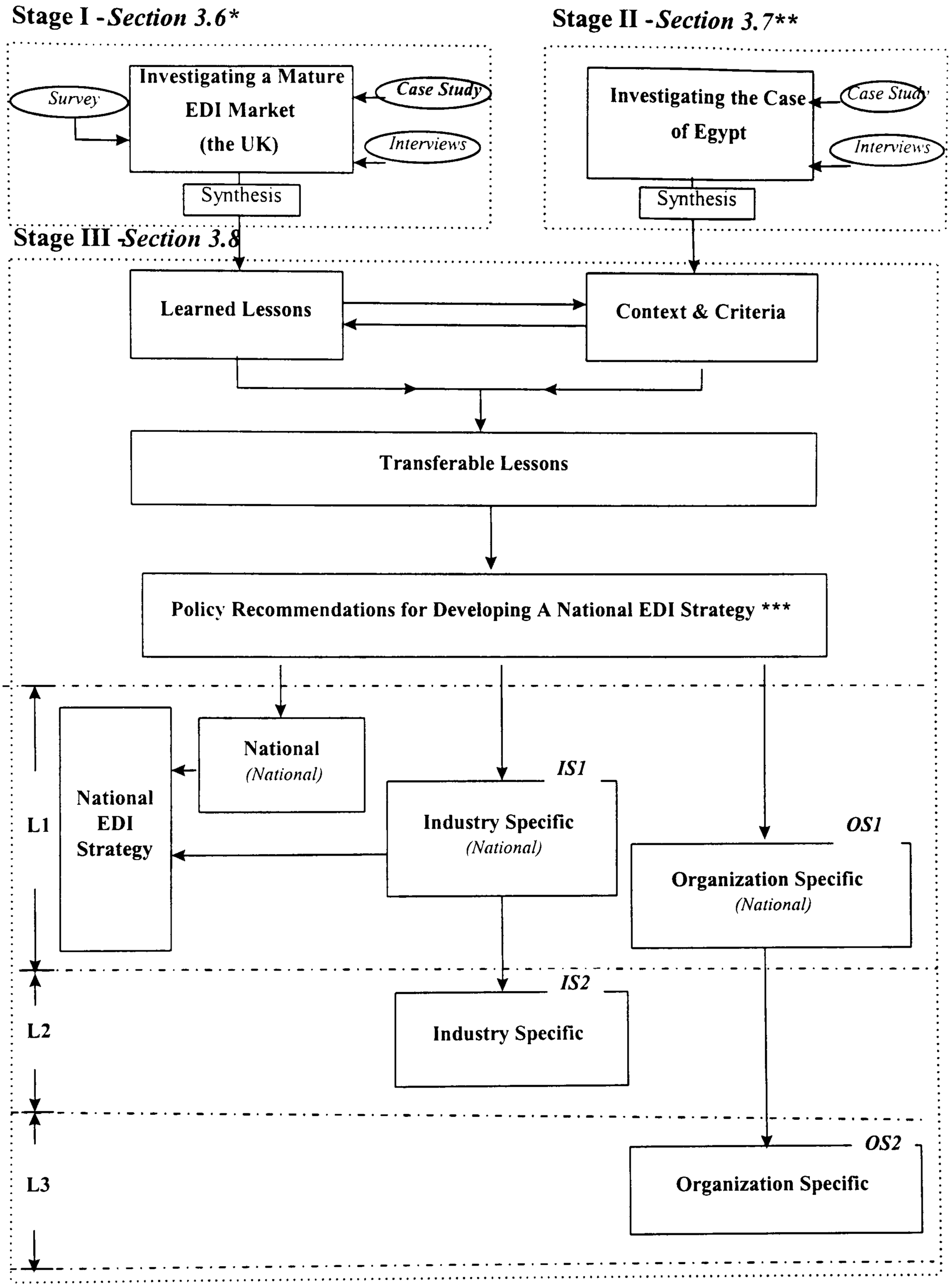
Furthermore, the pluralist approach and the three-tier analysis are very much appropriate in dealing with the nature of factors involved in EDI studies. These factors are, first of all numerous and difficult to assess. Secondly, not all of the variables can be precisely measured, particularly with respect to assessing EDI potential and impact. Thirdly, some other factors cannot be even subject to quantification techniques. Among those, for example, are the effects of EDI on systems integration, business process reengineering and EDI capacity to accommodate change. With a domain of such huge and diversified factors, it was necessary to adopt a methodology that employed both field surveys and case studies.

3.5.3 Analysis Procedure

Based on the above discussion, it is clear that the analysis procedure should be structured in order to enable a systematic logical sequence of analysis going from a general spectrum to a more specific disaggregated investigation of the issue. The developed analysis procedure consists of three stages, namely:

- Stage I - Investigating a mature EDI market, the UK study.
- Stage II - Investigating the case of Egypt.
- Stage III - Defining policy recommendations for developing a national EDI strategy for Egypt.

Figure 3.2 shows the flow chart of the analysis procedure which is outlined hereinafter.



* See Figure 4.1 for details of Stage I
** See Figure 5.1 for details of Stage II
*** See Figure 6.1 for details of the analysis procedure to derive policy recommendations

Figure 3.2. Simplified Flow Chart of the Analysis Procedure.

Stage-I, focuses on examining the UK EDI industry. It includes undertaking an analysis of the factors that influence and are influenced by EDI adoption at the *national*, *industry-sector* and *organization* levels. The aim is to conclude with a synthesis of the contextual and implementation factors that promote the development of an EDI industry in a mature market. The UK is selected to represent this market as it

is one of the leading countries in EDI development. The analysis involves:

- A comprehensive field survey (questionnaire) of seven British industries.
- A case study analysis of a public sector organization, which has been particularly successful in implementing EDI, namely, HMSO.
- A series of interviews with senior experts in the EDI profession, well-versed with respect to promoting the role of EDI coordinating bodies and service providers.

The synthesis of Stage I findings forms a significant input to Stage III.

Stage II, concentrates on investigating the case of Egypt. Egypt is selected to represent developing countries under increasing external and internal pressure to integrate in the global trading community. The aim is to examine the nation-specific pressures and constraints to developing a national EDI industry and study the potential EDI application at CEA. This analysis involves:

- Interviews with concerned politicians, business leaders and technical consultants.
- A case study of the CEA since it is a primary candidate to adopting EDI.

Research findings from Stage II are used as main inputs to Stage III.

Stage III of the analysis is concerned with developing a set of policy recommendations for establishing a national EDI industry in Egypt. It receives inputs from Stages I and II. From Stage I, the synthesis of the UK mature market analysis brings about a group of lessons learned for EDI adoption, whereas, Stage II research findings lead to identification of the needed prerequisites to establish an EDI industry in Egypt. The policy recommendations are specified at three levels, namely:

- *Level-1 (L1)*, national-specific.
- *Level-2 (L2)*, industry-specific.
- *Level-3 (L3)*, *organization* specific.

The industry-specific recommendations are sub-divided into two strata as follows:

- *Strata-1 (IS1)*, industry-specific recommendations with national level (L1) implications.
- *Strata-2 (IS2),* industry-specific success determinants promoting the use of EDI within particular sectors at the same L2 level.

Similarly, the organization-specific recommendations are sub-divided into two strata as follows:

- *Strata-1 (OS1),* organization-specific recommendations with national level (L1) implications.
- *Strata-2 (OS2),* organization-specific success determinants promoting the use of EDI with corporate boundaries at the same L3 level.

Accordingly, the national level policy recommendations are comprised of three subsets of recommendations as follows:

- *Subset-1,* national level recommendations (drawn from L1).
- *Subset-2,* industry-specific recommendations with national implications (drawn from L2-IS1).
- *Subset-3,* organization-specific recommendations with national implications (drawn from L3-OS1).

Details of the above mentioned stages of the analysis procedures are outlined in the remaining sections of this chapter, whereas the results of these tasks are given in Chapters 4, 5 and 6.

3.6 STAGE I - INVESTIGATING A MATURE EDI MARKET, THE UK STUDY

As mentioned earlier, the UK was chosen to represent a mature EDI market. This selection was driven by a variety of reasons. First, the UK EDI industry has assumed a leadership role since the inception of EDI in Europe. Second, given the level of the EDI industry diffusion and sophistication in the UK, it was possible to conduct a thorough investigation of the criteria critical to successful implementation. For example, the role played by EDI service providers such as International Network Services (INS) and coordinating bodies such as the Article Number Association (ANA) could be examined to extrapolate transferable lessons. Third, the UK led Europe in the development of EDI standards. The use, design and implementation of TRADACOMS in the UK has been instrumental in expediting the adoption of EDI at a national level. Fourth, the availability of a previous study (Reekers and Smithson, 1994) was used to compare research results and assess the extent of changes in the factors that influence EDI adoption.

3.6.1 Analysis Procedure for the Study of the UK EDI industry

The analysis procedure will be presented as follows: *Section 3.6.2,* National level analysis; *Section 3.6.3,* Industry-sector level analysis; *Section 3.6.3,* Organization level analysis.

3.6.2 National Level Analysis

National-level analysis of the UK market utilized the results of a questionnaire survey in order to assess benefits and drivers that influence EDI adoption in a national setting. The survey is discussed in detail in Section 3.6.3. Aggregate information was extracted from this survey to describe events at the national level (Section 4.3.1). Survey results were compared with previous research (Banerjee and Golhar, 1991; Reekers and Smithson 1994). Examining the results within a comparative framework and benchmarking survey results against previous research findings was critical to support and/or negate a number of issues frequently promoted in the EDI literature. It was also useful in terms of monitoring the impact of EDI. Furthermore, the aggregate results facilitated contrasting the state of EDI adoption at the national level with those of the USA and German EDI market studies (Banerjee and Golhar, 1991; Reekers and Smithson 1994). This comparative analysis helped in identifying the most important motivational drivers that influence EDI adoption in mature markets at the national level irrespective of cultural differences. From an implementation perspective, national-level analysis examined the technical barriers and difficulties in contrast to those reported in previous studies. Meanwhile, the role of EDI coordinating bodies and service providers was investigated building on the interpretive philosophy strand. A number of interviews were held with senior management to outline success determinants and ascertain lessons learned. These interviews were particularly useful in conveying to policymakers the importance of regulating and coordinating the establishment of the EDI industry.

3.6.3 Industry Level Analysis - EDI Survey of British Industries

The industry-sector analysis was primarily based on the field survey which was conducted in August 1993. The survey aimed at identifying the benefits and barriers and implementation challenges that influence/are influenced by EDI adoption in seven industries in the UK, namely, retail, manufacturing, distribution, government, services, pharmaceuticals and utilities. The method used was a postal questionnaire.

3.6.3.1 Postal questionnaire design and execution

The postal questionnaire was sent to 300 British organizations representative of a broad range of industries. Two senior EDI professionals, Managing Director – INS and EDI Director – British Gas, and an academic expert in the field, post-graduate fellow at the London School of Economics, were consulted during the questionnaire design phase and the first draft was pre-tested on five EDI users and EDI/ IT managers. The pilot questionnaire respondents typically represented the target survey sample in terms of experience with EDI adoption. They were asked to comment on the clarity, structure and completeness of the questionnaire. This exercise was very useful in indicating questions which were sensitive, meaningless or vague. It also ensured that the questionnaire is appropriate to examine EDI-specific influences. To identify barriers to implementation and assess the perceived potential and achieved benefits of EDI, both EDI users and non-users were included. The targeted organizations were randomly selected from the following sources:

- the UK EDI Association (EDIA),
- the International Network Services (INS), the leading UK EDI service provider, and
- the Top 1000 Times Organizations.

Selection of the factors included in the questionnaire was based on previous research in this area in order to ensure broad consistency with existing literature, and to provide a framework for comparison with previous work (Banerjee and Golhar, 1991; Reekers and Smithson 1994) complemented by questions of specific interest to the current research objectives. To assess industry differences, industry-specific questions were included. Factual and background information were solicited by direct questions asking for precise facts such as annual turnover, number of employees or number of trading partners. Where subjective opinions were sought, such as factors influencing the adoption of EDI, perceived implementation barriers, actual implementation difficulties and benefits achieved from EDI, a five point scale was adopted. Open-end questions were also included so that respondents could provide further details concerning critical issues in EDI implementation and operation, or with respect to recommendations to improve the use of EDI. In addition, respondents were given the opportunity to provide freeformat responses so that some of the richness of the phenomena addressed in the questionnaire could be investigated. The questionnaire can be referred to in Annex 1.

A response rate of 28% was achieved, comprising a total of 85 responses (75 users and 10 non-users). A further 50 responses were received indicating interest in results, but inability to complete the questionnaire because of organizational strategy or confidentiality concerns. The achieved response rate may be in part attributed to the letters sent from the executive management at EDIA and INS endorsing the research activity and urging their community members to complete the questionnaire.

3.6.3.2 Statistical analysis of questionnaire variables

The results of the questionnaire were subject to extensive statistical analysis. Several statistical measures were examined in order to reveal the characteristics of the results. Furthermore, a number of statistical tests were performed to examine the significance of the results. The computer software STATISTICA (Release 4.0, Statsoft, Inc. 1993) was used to perform the statistical analysis. MS Excel was also used to examine the survey results in matrix format in order to identify some pertinent issues of interest. A summary of the performed statistical analysis is given below. For further details, Alder and Roessler (1972) and Hamburg (1989) can be consulted.

a) Simple descriptive statistical measures were determined, namely, the mean (x) to reflect the central tendency feature and the standard deviation (s) to reflect the dispersion of the data around the mean. Also the frequency histograms were plotted for each variable in order to present the distributions of the answers of the respondents to the questions visually. This helped in getting acquainted with the nature of the answers relevant to each question. Both measures (x and s) were used in comparing the results across the investigated seven industry-sectors.

b) Since factors of high influence were of primary interest, a one-tailed test was performed with the null hypothesis representing the mean score of 3.0 on the rank scale ranging from 1 to 5. It is appreciated that certain assumptions inherent in the *t*-test (namely normality and randomness of the sample) are not matched by the survey procedure and results. In order to take this into account, only factors with a *p*-value <1% were considered statistically significant. Previous studies in the field used the same test (Banerjee and Golhar, 1991; Reekers and Smithson, 1994). Hence, the application of the *t*-test is further justified on the basis of the requirements for bench marking the survey results against previous research findings. This test is very useful for the analysis at the aggregate level in order to highlight national EDI industry trends and characteristics, and within a comparative framework to demonstrate the similarities and differences between industry-sectors.

c) Analysis of Variance (ANOVA) techniques were used to test whether more than two populations means may be considered equal (H_o: $\mu_I = \mu_{II} = \mu_{III} = \ldots \mu_n$). This analysis was used in examining similarities (and differences) across more than two industry-sectors.

d) The Correlation Coefficient was determined to explore the degree of association between the judgement of the respondents on a particular variable (factor) before and after implementation of EDI. This was very useful to verify mutually endorsing factors particularly when assessing drivers and perceived business benefits which are particularly attractive to policy makers.

e) Chi Square, Goodness of Fit Test was applied in order to test the significance of the similarity of the distributions of the variable concerned as ranked by the sample of respondents between the cases of before and after EDI implementation.

The choice of statistical techniques was particularly influenced by previous research. To overcome the static nature of cross sectional research, it is believed that conducting the analysis within a comparative framework would contribute to the research outcome. Hence, the choice of statistical tests, particularly the reliance on descriptive statistics and testing hypothesis, was inline with previous research analysis techniques in order to be able to compare the results. It is worth noting, however, that a number of other statistical tests beyond those typically applied in previous EDI field research, were applied in the current work in order to cater specifically for the thesis objectives described earlier. With such a wide scope of analysis, the task of detailing all the data testing results is formidable. Therefore, it was decided that only test results supporting the particular arguments advocated in this thesis are detailed.

The survey results were particularly useful in providing empirical evidence to support or challenge a number of key assumptions that appear in the EDI literature. They provide quantitative evidence from a large number of organizations across various industry-sectors and reflect on the phenomena from actual practice. Hence, the main advantage of this survey is that it provides a more precise measurement of the users perception of drivers and barriers to EDI adoption in the UK. In addition, through the survey results, and better assessment of the hypothesized comparative and relative advantage, benefits and difficulties associated with EDI implementation is achieved. The survey results are also used to clearly define EDI-specific industry-sector and organization characteristics and profiles. This proves particularly valuable in conducting comparative analysis across different countries and amongst various

industry-sectors within the UK. Furthermore, the industry analysis approach, based on a more homogeneous population, provides for better control over environmental influences and improves on replicability of findings as advocated by Yin (1994). The survey results and analysis are published (Cox and Ghoneim, 1996a) and later acknowledged by Massetti and Zmud (1996).

The survey results also identified areas for further research particularly with respect to the potential of EDI to provide strategic advantage and its role in business process re-design. In order to conduct this research, additional information was needed on the benefits achieved from EDI integration with core business activities in a non-retail organization. This is very important for developing countries where the industry-sector setup is often characterized by the lack of a strong retailing community irrespective of its massive size. This information was gathered by conducting a case study of HMSO.

3.6.4 Organization Level Analysis - The HMSO Case Study

As stated earlier, the case study in the form of interpretive inquiry was adopted for organization level analysis. The case chosen for investigation in the UK was that of HMSO. The reasons for selection of HMSO are given in section 3.6.4.1, followed by detailing the sources for information (Section 3.6.4.2) then an explanation of how the interview results were extracted (Section 3.6.4.3) concluding with a brief on how the findings were mapped against a theoretical framework (Section 3.6.4.4). Full details of the case study itself is given in Section 4.5.

3.6.4.1 Reasons for selection of HMSO

With a view to identify factors critical to successful EDI implementation at the organization level, that may be eventually transferred to Egypt, the HMSO experience was selected for investigation for the following reasons. First, HMSO offers a good exempler of how a government organization achieved strategic benefits through the use of EDI. Second, at the time of conducting the study, HMSO was one of the largest EDI users operating in a non-retail environment and leading EDI development amongst its trading community. Third, the technical implementation modality adopted is based on integrating EDI with core business processes, an area which required further investigation and in-depth analysis. Fourth, HMSO was one of the leading organizations to implement a Corporate EDI Gateway extending the role of EDI beyond the traditional inter-organizational use of the technology.

3.6.4.2 Sources of information

Conducting the case study relied on multiple sources of information: (i) documentation, (ii) questionnaire, and (iii) interviews with senior corporate staff, external technical and business consultants, and trading partners.

A. Examination of documentation

Detailed internal documentation and published references were examined. A continual review and analysis of EDI literature provided exposure to the academic development in appraising the changing role of EDI. In order to increase coherence of the information gathered in preparation for the case study and during the empirical investigation, multiple sources of evidence were used. A detailed corporate profile was developed using company reports and previous studies in addition to the information provided during the interviews. HMSO also completed a questionnaire form and provided the author with industry-specific statistics and reports. Due to the interpretive nature of the data obtained, the technique of triangulation was applied to verify the validity of data by applying two or more means of data collection to the same person.

B. Questionnaire

HMSO was included in the questionnaire survey undertaken to assess the extent of EDI adoption across different British industry-sectors as described earlier in Section 3.6.3.1. Completing the questionnaire form at the outset of conducting the case study provided useful essential corporate background information with respect to the nature of EDI operations at HMSO and assisted in determining the focus, content and points of interest to address during the interviews. The results documented in the questionnaire also provided means for checking and cross validation. The questionnaire served to familiarize the HMSO management with the nature of the research work, its objectives and with the overall data collection strategy.

C. The interviews with EDI professionals

Personal interviews with EDI professionals constituted an important and valuable source of information in conducting the case study. All interviews followed a systematic approach of introducing the interviewee to the general research topic and the specific case study objectives focusing investigating the corporate strategy and experience as to *why* and *how* EDI was implemented.

Objectives

The interview objectives were specifically defined as follows:

- Identifying the market forces leading to EDI adoption at HMSO
- Investigating the process of EDI implementation and development
- Examining the system functionality of the EDI Corporate Gateway
- Determining the benefits associated with EDI adoption
- Defining the critical success factors

Style

It was decided to adopt a style of semi-structured interviews in order to achieve complete understanding of how HMSO informants practiced EDI planning, implementation and continuous enhancement. Knowledge, perceptions and impressions differ from one informant to another based on his/her own experience and positions held within the HMSO rank and files. Understanding such impressions and knowledge necessitated, therefore, allowing each informant to state his/her own personal experience with complete freedom from being obliged (or directed) to answer specific questions. In the meantime it was also necessary to direct the discussion towards achieving the interview objectives through some types of questions that should be asked to each informant. Therefore, the only way to satisfy these requirements was to adopt a semi-structured interview. A minimum of well-formulated questions were raised and then complete freedom was given to the interviewee to get into any avenues and details as the discussion would entail. In other words the semi-structured interviews allowed a set of unstructured questions to allow participants/interviewees to express their own experience, impressions and interpretation of events, preceeded by structured ones to solicit input on specific issues. Obviously, if structured interviews were adopted, they would have masked alot of information that would have been otherwise released through the flexibility allowed by semi-structured interviews. Accordingly the outcome, though very difficult to analyse, yet it was very comprehensive and captured the richness of the HMSO experience. In order to integrate result, it was therefore necessary to hold review meetings as detailed in the following subsection.

The overall structure of the interview was briefly presented at the outset before attention was directed to each specific aspect of investigation. Wherever possible the interviewee was asked to provide supporting documents to the facts, figures or

processed discussed. These guidelines were strictly adhered to, in order to warrant a systematic approach to analysis.

The complexity of the implementation modality at HMSO required a selection of stakeholders with different expertise both from within and outside the organization and with different roles in the EDI adoption processes. Hence, interviews were sought from senior management at HMSO, a leading HMSO trading partner (Inland Revenue) and INS, the VANS offering EDI services to HMSO at the time the study was conducted. From within HMSO the managing director, the business process reengineering director, the IT director, the EDI project manager and two technical experts were interviewed. From INS, the managing director, the business consultant, the project manager and the technical support team were interviewed. Obviously, there exist possible differences in the viewpoints between informants of different hierarchical positions at HMSO. In order to ensure useful answers directly related to the interview objectives, all interviewees had to be chosen from senior management positions with considerable experience and first-hand involvement in EDI evolution planning and implementation.

Typically the interviews addressed the following.

Content

(i) Corporate background: soliciting information regarding corporate size of operations (turnover, staff, business units, customer base), nature of the organization, market dynamics, nature of the users environment, corporate setup before and after EDI implementation.

(ii) Corporate requirements: including examining the initial technical infrastructure (problems, advantages, disadvantages and limitations), drivers to EDI adoption (objectives from adopting EDI, identifying internal and external pressures, program objectives within the larger corporate strategy, EDI implementation program objectives, challenges, principles and scope of work.

(iii) Solution - project development details: including examining the process of formulating the project scope and EDI implementation strategy, defining project objectives, milestones, duration, leadership, implementation team, identification of key process areas, flow of information, business applications and user involvement. Investigating project development with respect to:

(a) Technical implementation process: infrastructure implementation stages, difficulties encountered, extent and form of trading partners involvement, implementation costs, staff training and retraining and managing change.

(b) Gateway functionality: including, internal/external document integration, internal/external applications integration, impact on traditional business processes and information flow, trading partners relationships.

(c) Post implementation assessment of the impact of EDI on: business operations, on trading partners relationships and corporate performance.

(iv) Reporting on achieved business benefits: cross-reference was made to the information reported in the questionnaire and further facts and figures were solicited to quantify and support proposed achievements whenever possible.

(v) Assessment of the overall strategy and achieved results: examining impact on organizational structure, role of EDI development team, potential EDI application and role in managing change.

(vi) Lessons learned: as to what makes the HMSO experience special, defining the criteria for success, investigation of what could have possibly been done differently and proposing implementation recommendations.

(vii) Conclusions: the broad conclusions were always summarized at the end of the interview and approved by the interviewee.

The above detailed outline was designed to address a comprehensive set of issues to investigate with HMSO internal staff. Interviews conducted with external business, technical consultants and HMSO trading partners addressed broadly all points of interest, but focused strongly on issues of relevance to their role in the implementation process. To ensure maximum cooperation, the service provider senior management endorsed the research effort to secure appropriate introduction to the various study informants. Hence, initial contacts with HMSO were established through the service provider senior management in August 1994.

Conduction of the Interviews

Before holding the interview meetings, informants were sent a copy of the interview guideline to allow them to prepare for the interview. A series of 19 in-depth interviews was conducted in the summer of 1994 with senior management from within and outside HMSO as previously mentioned. Interest in the study was strong and full cooperation was extended to carry out a series of interviews, each ranging from 60-90 minutes. Due to the nature of the phenomena studied and the semi-structured style

adopted in the investigation, it was often necessary to conduct more than one interview with the same informant to cover the set of issues investigated in sufficient depths.

In order to ensure reliability and internal consistency of data collection, all interviews followed the same protocol as specified earlier. During the interviews notes were taken and the discussions were tape recorded. A detailed transcription was prepared as soon as possible after the interview so as not to miss details. Unless otherwise stated, all findings are based on field data rather than on conjecture. However, to maintain a professional code of ethics, all interviewees remain anonymous in the findings with the exception of one primary informant. A number of review meetings were held with the interviewees to review and approve the research results findings during the preparation of the initial case study draft write-up as detailed below. The primary informant, H. Currie, BPR Director, HMSO undertook the responsibility for the disclosed information and validated the information upon case study write-up. The researcher returned to the primary informant periodically in order to monitor how the situation had altered. Three followup interviews were conducted with the primary informant over a two-year period to update and validate information for publication.

D. Review meetings and validation

To ensure the consistency and validity of the findings, it was decided to hold follow-up review meetings with the interviewee(s) and the primary informant. This was done through either revisiting the interviewee himself, or reviewing the results with the primary informant. In addition, two group meetings were held, one with the senior management team, and the other with the technical team.

In addition in order to ensure precision of the findings of the case study analysis, the final writeup was reviewed and validated by the primary informant and senior management. Furthermore, wherever possible the study was sent to the primary informant for updating and validation. This strategy was particularly important to overcome problems typically associated with cross-sectional research, adopting an ex-post position, where there is a risk that evidence may be distorted through double interpretation. Although this risk cannot be completely avoided due to the fact that it was not easy to observe the investigated phenomena directly, yet it was necessary to rely on the reviewing of top management to remove redundancies or misunderstood ideas and to ensure consistency. Preliminary findings were also sent for review and expert assessment of two EDI industry specialists who were involved in EDI

implementation at HMSO, namely, the Managing Director and a Senior Business Consultant at INS. Their comments were subsequently incorporated in the final version of the reports. Thus through the process of triangulation and cross-checking of evidence the validity of the case study was maintained which is crucial for presenting strong academic arguments as supported earlier (Eisenhardt, 1989).

E. Extraction and analysis of interview results

With the semi-structure interviews, extraction of the results was not a straight forward task. Detailed analysis was undertaken at two levels. First, vertical investigation of each interview was carried out identifying the key raised issues and organizing the various trends of thought discussed under headings and sub-headings to facilitate the cross referencing process carried out in the subsequent level of analysis. Second, horizontal analysis was carried out comparing the results of all the interviews, prioritizing similarities and differences. Then grouping of the ideas was based on logical inferences. The results were also utilized to develop and refine general concepts and frames of reference based on the plausibility of inductive reasoning.

3.6.4.3 Synthesis of information gathering

The case study analysis commences with a detailed description of both the context and process under investigation to unfold the interaction between the EDI *context* and *infrastructure* over time. This description itself is used to explain the origins and the outcomes of some of the phenomena under study. The case study findings are interpreted more generally by deriving broad lessons that may be meaningful beyond the confines of the particular research setting. Special attention was given to supporting key messages and research findings with facts and figures.

To document and examine changes in business processes and the critical aspects of systems implementations, flow charts and figures are used for illustration and analysis. Furthermore, information from the various sources were validated and synchronized, which required cross checking and formulating relationships between the various issues investigated to be presented in a novel format reflecting directly on the findings.

Table 3.1 maps the sources of information presented in this thesis with respect to interpreting and analysing the HMSO information. The *review* column refers to the actual analysis and interpretation of findings undertaken by the researcher which was subject to validation by both the interviewee and the primary informant.

With the wide range of investigated issues, ideas and phenomena, it is clear from Table 3.1, that the three sources of information were inevitably vital. They not only provided comprehensiveness and ensured precision, but also complemented each other to fill any gaps or misunderstandings. It is clear that each of the topics under consideration was covered from more than one source of information. Each source provided elements of its own with respect to the investigated topic. For instance, one source provided data (e.g. documentation), the other provided answers to specific questions (e.g. questionnaire), whereas the third (e.g. interviews) reflected on the interviewees ideas and experience. In certain situations and for certain issues and elements, some redundancies occurred. However, as stated earlier, these were eliminated during the process of reviewing and validation.

		Information Gathering Tools					
Section	**Topic**	**Doc.**	**Quest.**	**Interviews**			
				Internal	VAN	TP	Review
4.3.1	Background	✓	✓	✓			
4.5.3.1	Early implementation	✓		✓			
4.5.3.2	Analysing and extending the role of EDI	✓		✓			
4.5.3.3	Adding value to existing business strength			✓	✓		✓
4.5.3.4	Extending EDI functionality – Corporate Gateway			✓	✓		✓
4.5.3.5	Systems integration			✓			✓
4.5.3.6	Relationship with trading community & suppliers			✓		✓	✓
4.5.3.7	Strategic benefits	✓	✓	✓			✓
4.5.3.8	Technological benefits			✓			✓
4.5.3.9	Business re-engineering benefits	✓					✓
4.5.3.10	Managing problems	✓		✓	✓		✓
4.5.3.11	Critical success factors	✓		✓	✓	✓	✓

Table 3.1 Sources of Information for the HMSO Case Study.

In an attempt to relate the HMSO findings to the contextual school of thought the following section outlines the use of the relevant theoretical background.

3.6.4.4. Fitting the case of HMSO with a theoretical framework

The HMSO case results are mapped against the synthesized analytical framework on organizational change developed by Walsham (1993). This exercise had few main objectives. First, it enabled testing how comprehensive the HMSO case study is in view of the degree of its coverage of the various elements of the Walsham framework.

Second, the exercise allowed testing if the practical findings reached in the case study are supported by theoretical elements devised in Walsham (1993) and to what extent this occurred. Third, this matching exercise paved the way for drawing complementary recommended policy actions and conclusions that gave further insight results in the subject. Finally, comparing theory and practice results directed attention to certain topics that warrant further research that otherwise would have been overlooked. Full details of the exercise are given in Chapter 4.

3.6.5 Synthesis of the UK Study Findings

Various factors related to the context and implementation of EDI are identified at the three levels of analysis described earlier in Sections 3.6.2, 3.6.3 and 3.6.4. These factors range from the wider business and infrastructure considerations at the national level to industry-sector and organization specific drivers and barriers to EDI adoption. The synthesis is classified in terms of EDI factors related to EDI context, infrastructure for implementation and capacity to change denoted throughout this work as the CIC framework. The outcome of this stage of analysis provides input to Stage III in which lessons learned are defined.

3.7 STAGE II - INVESTIGATING THE CASE OF EGYPT

Stage II, of the research is particularly concerned with examining the potential EDI market in Egypt. This required in-depth investigation of the macro level context and the infrastructure-related variables that are expected to influence potential EDI adoption in a national setting.

3.7.1 Analysis Procedure of the Study of Egypt

The study design for Egypt focused on two aspects, namely, identifying the international and national factors driving EDI adoption in Egypt and investigating the potential for EDI implementation within the CEA. The study, therefore, involved the following. First, at the national level, desktop research was conducted to identify the country-specific pressures and constraints that promote and/or inhibit EDI adoption in Egypt. This effort was complemented by a number of interviews with policymakers and senior advisors from IDSC, Cabinet of Ministers and the Ministry of IT and Telecommunications in order to define the country-specific characteristics and requirements. Second, a case study approach was adopted to investigate the CEA.

3.7.2 Investigating the National Setting

Egypt is subject to a number of international and national pressures for adoption of electronic trading, in general, and EDI in particular. For systematic analysis and presentation, these pressures were best examined through the PEST (political, economic, social and technology) framework. At this level of analysis, the role of government was addressed and the existing technical setup investigated.

3.7.3 A Candidate Application - The CEA

The case chosen for investigation, in Egypt, was that of the CEA. It is a government authority, which represents a primary candidate for leading and promoting EDI adoption in the country, given the increased international pressure to streamline trading processes and its potential capacity to mandate preferred means of trading. Furthermore, the CEA enjoys government support stemming from the requirement to align customs procedures with international standards. The case is also representative of the potential challenges pertinent to developing countries and is used to illustrate the applicability of the research findings. The case study was carried out from 1996-1998.

The case study methodology was chosen to investigate the potential to introduce EDI at CEA based on the following grounds. Examined from an academic perspective the phenomenon under investigation is broad and complex, the existing body of knowledge is insufficient to permit posing the causal questions and the phenomenon studied cannot be studied outside its context (Bonoma, 1985). The potential to introduce EDI to Egypt meets all three conditions. First, EDI has the potential to alter many different aspects of organizations in Egypt. Second, the current body of EDI knowledge is based on Western experience and is anecdotal in nature. Causal research hypothesis could not be formulated and tested on the basis of such knowledge. Third, the ways in which EDI can alter organizations is believed to be closely associated with the business context. Given these considerations, the case research was deemed most appropriate to conduct research in Egypt.

The reasons for selection of CEA are given in Section 3.7.3.1, followed by detailing the sources for information in Section 3.7.3.2 and concluding with an explanation of how the interview results were extracted in Section 3.7.3.3. Full details of the case study itself is given in Chapter 5.

PAGINATION AS IN ORIGINAL

In light of the above, the study aimed specifically at examining and assessing the requirement for EDI implementation specific to CEA in order to propose a technical solution which would illustrate the strategic benefit associated with EDI adoption both at a corporate and at a national level.

3.7.3.2 Sources of Information

Conducting the case study relied on multiple sources of information: (a) examination of documentation, and (b) interviews with senior CEA management, and external technical and business consultants.

A. Examination of documentation

Detailed internal documentation was examined. All available corporate material was available in the Arabic language which often used terminology specific to the industry. It was therefore often necessary to ask for clarification from CEA technical staff or the primary informant. The internal documentation was often scarce and sketchy, mainly in the form of corporate publications and internal reports. It was, therefore, necessary to prepare a corporate profile at the research outset and to solicit validation from the primary informant throughtout the process of conducting the case study. As with HMSO, the technique of triangulation applying two or more means of data collection to the same person was applied to verify the validity of data reported.

B. Interviews with CEA Senior Management and Consultants

As with investigating the case of HMSO, personal interviews constituted an integral source of information in conducting the CEA case study. All the interviews followed a systematic approach to justify *why* and investigate *how* to introduce EDI at CEA.

<u>Objectives</u>

Interviews with CEA aimed to achieve three main objectives. First, assessing the requirement for EDI implementation at CEA. Second, examining the internal business processes. Third, subject to prevailing setup and constraints, investigating the viability of the proposed technical solution, prepared on the basis of the current work.

<u>Style</u>

Semi-structured interviews were adopted in investigating the potential to introduce EDI at CEA. The manner in which the interviews have been conducted follow on the same approach described earlier in Section 3.6.4.2, under the respective subsection.

Content

Series of inerviews were held at two distinct phases. The first phase focused on investigating existing processes whereas the second aimed at validating the credibility and practicality of implementing the solution put forward to CEA management on the basis of the current research work.

The first phase involved identifying the following:

(i) Corporate background: soliciting information regarding corporate history, mission, market place and role in international trade.

(ii) Organization setup and market challenges: including respective ministerial authorities, stakeholders and management structure.

(iii) Existing setup: investigating internal business processes with respect to export and import procedures, examining the flow of documentation, and assessing the prevailing drivers and barriers to change.

(iv) Perceived potential benefits, this involved assessing the extent existing knowledge of potential trading applications, tools to streamline business processes and the associated business benefits. Accordingly, information was solicited as to what are the major perceived business benefits that may potentially drive EDI implementation.

(v) Future outlook special attention was given to understanding the perspectives of CEA senior management as to assessing the future corporate vision in light of the emerging national and international trading pressures and opportunities.

The second phase focused on:

(i) Soliciting feedback to a number of proposed EDI solutions which have been prepared on the basis of the findings of the current research work.

(ii) Assessing the practicality and applicability of implementation of the chosen modality.

Conduction of the interviews

Along the same lines, previously outlined in section 3.6.4.2., collecting primary data was solicited via conducting semi-structured interviews. Senior CEA Executive

Management, CEA Efficiency Development Program Consultants and Project Advisors from IDSC were interviewed. Data collection required that a certain concord and confidence be built between the interviewer and the respondents. It was feared that without this trust, the required openness of the discussion would not be achieved. The research, therefore, required extensive fieldwork with regular contacts with respondents extending over a period of two years in order to extract the required information. The research site was revisited periodically to monitor how the situation had altered. The primary informant, H. Zorkani, Advisor IDSC and Consultant CEA Efficiency Development Porgramme, assumed responsibility for coordinating the review meetings and validating the conclusions documented in this research.

It is worth noting that the concerns raised by some IS methodologists regarding the use of case study techniques in IS research (Benbasat *et al.*, 1987; Eisenhardt, 1989; Lee, 1989; Miles and Hubernman, 1994; Yin, 1994) are accounted for in the research design adopted. This is reflected in following a step-by-step approach whereby in all interviews the same set of questions was asked by the same interviewer over the same time duration. Furthermore, the interviews were recorded, transcribed and the write-up revised by the primary informant.

C. Review Meetings and Validation

Review meetings were held regularly with the primary informant for verification and validation of the research findings. Three participatory review meetings were held with CEA management and advisory committees to discuss the research results and debate the applicability of the proposed technical solution. The review meetings were particularly valuable throughout the course of conducting the case study in continuously placing the proposed suggestions within a practical framework. By the way of illustration, the first proposed solution put forward to CEA management involved major changes to existing processes and was then deemed impractical. It was therefore necessary to investigate a staged approach to EDI implementation at CEA.

Unlike the HMSO case study which involved identifying the critical success factors in retrospect, the CEA study is used to illustrate the potential to introduce EDI in Egypt through an application at the CEA. The proposed solution was reviewed by an international expert, Principal–PKA to validate its applicability in comparison with similar initiatives in the region.

D. Extraction and analysis of interview results

The interpretation of the interview results followed the process described earlier with resepct to investigating the case of HMSO. It involved two distinct phases, namely: process documentation and solution articulation.

The documentation process of existing processes was particularly challenging and required a series of interviews in order to map the business processes and identify system flows. This process involved 4 different versions of depicting and documenting the existing business processes before the final version, included in this thesis, was approved by the primary informant for publication.

Proposing a potential implementation approach was even more challenging. Designing the solution was based in part on action research, which be definition involves the participation of the researcher in the activity whilst evaluating the results. This provides first hand understanding of the situation and a rich way of applying theory to practice in direct access to organizational reality (Galliers, 1992). The researcher's involvement with the primary informants and the advisory committee responsible for investigating CEA's need for streamlining processes provided a good opportunity to examine the processes in sufficient depth in order to be able to articulate a corporate vision and a potential reengineering solution.

3.7.3.3 Synthesis of information gathering

Sources of information for the CEA study can be mapped as follows:

Section	Topic	Doc.	Interviews			Review
			Policymaker	Internal	Advisor	
5.7	Introduction	✓			✓	✓
5.7.1	Background	✓	✓	✓	✓	
5.7.2	Flow of documentation	✓		✓		
5.7.2.1	Step 1- Receipt of goods			✓	✓	✓
5.7.2.2.	Step II – Clearing procedures			✓	✓	✓
5.7.2.3.	Step III – Release of goods			✓	✓	✓
5.7.3	Evaluation of procedures	✓	✓	✓	✓	✓
5.7.4	Proposed solution				✓	✓
5.7.4.1	Phase I – Introduction of EDI				✓	✓
5.7.4.2	Phase II–EDI community development				✓	✓
5.7.4.3	Phase III–Establishing an EDI Gateway				✓	✓

Table 3.2 Sources of Information for the CEA Case Study

As setout in Table 3.2, interviews with CEA management, external advisors and review meetings constituted the backbone of this case study investigation. The intervention of a senior policymaker, namely, the advisor to CEA, in studying and

evaluating the procedures as detailed in Section 5.7.3., was particularly useful in validating the inferences made on the basis of this research work. Given the complementarity inherent in interviewing various stakeholders, the review process proved to be of benefit in cross checking and validating the data gathered during the course of this study. The process to synthesize the information followed the same practice described in section 3.6.4.3.

3.7.4 Synthesis of the Findings of the Study of Egypt

The factors related to the context and implementation of EDI are identified both at the national and organizational level. These factors range from the wider issues relating to political, economic, social and technical issues at the national level to the CEA organization-specific drivers and barriers to EDI adoption. The outcome of this stage of analysis provides as input to Stage III in which transferable lessons are defined.

3.8 STAGE III - DEFINING POLICY RECOMMENDATIONS FOR DEVELOPING A NATIONAL EDI STRATEGY FOR EGYPT

In **Stage III,** research effort was directed towards extrapolating the lessons learned from the UK experience and identifying the transferable lessons applicable to Egypt. This in turn contributes to defining the policy recommendations for developing a national EDI strategy as setout below.

3.8.1 Learned and Transferable Lessons

First, the lessons learned are based on the literature review and the UK study findings. The lessons are drawn at the three levels. In other words, recording of the lessons related to EDI development at the national level will be distinguished from those relevant to industry-sectors and organizations. Chapter 6 gives full documentation and description of this effort and lists and discusses the lessons extracted. Second, to arrive to a set of transferable lessons that can be applied to Egypt, it was necessary to analyze all the lessons learned drawn from the literature and the UK experience and identify those transferable to Egypt. Non-transferable lessons were ruled out against certain criteria. Corrective measures to make non-transferable lessons transferable are prescribed. Details of this exercise are given in Chapter 6.

3.8.2 Policy Recommendations for Developing National EDI Strategy for Egypt

In order to cater for the research objectives, policy recommendations for developing a national EDI strategy in Egypt are setout. These recommendations are outlined at the three levels L1, L2, L3; national, industry-sector and organization levels, respectively, as detailed in Figure 3.2. It is clear from this figure and Section 3.6.2 that the national level (L1) recommendations are to be based on three inputs, namely, the national level analysis, industry specific elements of national implications, and organization specific elements of national implications. As described in the above-mentioned section, the proposed set of recommendations are further divided into two Strata S1 and S2, only at each of the industry-sector level (L2) and organization level (L3) as follows. At the industry-sector level, the Strata IS1 (which can be denoted by L2-IS1), provides input into the national strategy, by identifying for example, potentially leading industry-sectors and their characteristics. Meanwhile, the Strata IS2 (which can be denoted by L2-IS2) provides industry-sector specific recommendations to promote EDI diffusion within the boundaries of a particular industry-sector. Similarly, two Strata (OS1 and OS2) for driving the organization-specific level (L3) recommendations are presented. The first, OS1 (which can also be denoted by L3-OS1) is to be considered at the national planning level. The second, OS2 (which can also be denoted by L3-OS2), gives recommendations for corporate management initiating EDI use. The recommendations are hoped to provide practical benefits for policymakers, business people and practitioners involved in developing the EDI strategy and establishing the industry in Egypt. Accordingly, it is clear that the adopted analysis procedure arriving at the required set of recommendations is designed to achieve two criteria; comprehensiveness (at all levels and strata) and practicality (leading to applicable recommendations).

3.9 RESEARCH DESIGN IMPLICATIONS AND CHAPTER CONTRIBUTION

The research objective with respect to developing national EDI strategy recommendations, affected the study design in two ways. First, it required examining a mature EDI market in order to define factors critical to successful EDI adoption. Second, it necessitated testing their transferability to the Egyptian context. Consequently, it was necessary to examine the factors that govern national EDI adoption in the UK and then in Egypt. Given the complex nature of the subject matter and the diversity of the factors involved, a pluralist research approach was followed, building on the strengths of both the positivist and the interpretive research

methodologies. The pluralist approach was, then, applied via an analysis procedure which is especially designed to include four basic instrumental tools: a comprehensive questionnaire survey with EDI industry organizations in the UK; a case study in the UK (HMSO); a case study in Egypt (CEA), and a series of well-structured interviews with politicians, decision makers and technical consultants in both countries.

The procedure provides the desired in-depth analysis of the subject with different tools (as setout above) and with a variety of levels and strata of analysis (as shown in Figure 3.2). Hence, this offers a reasonably accurate way of investigating the contextual and implementation factors involved in EDI adoption at the national, industry-sector and organization levels. This is to pave the way for drawing a set of lessons that can be transferred to Egypt and eventually to drive a set of practical recommendations for developing a national EDI industry in the country.

The main contribution of this chapter has been, therefore, to present and justify the adopted research methodology and the developed analysis procedure. Research into guidelines for developing a national EDI industry has rarely addressed, in a systematic way, the crucial influence of the context on the process of EDI adoption. This study emphasizes the necessity to employ the appropriate methodology and procedures to carefully capture both the context and infrastructure-related factors that influence EDI implementation. It does not stop there, but extends to give practical application of the developed methodology and the analysis procedure.

CHAPTER 4

INVESTIGATING A MATURE EDI MARKET, THE UK STUDY

4.1 INTRODUCTION

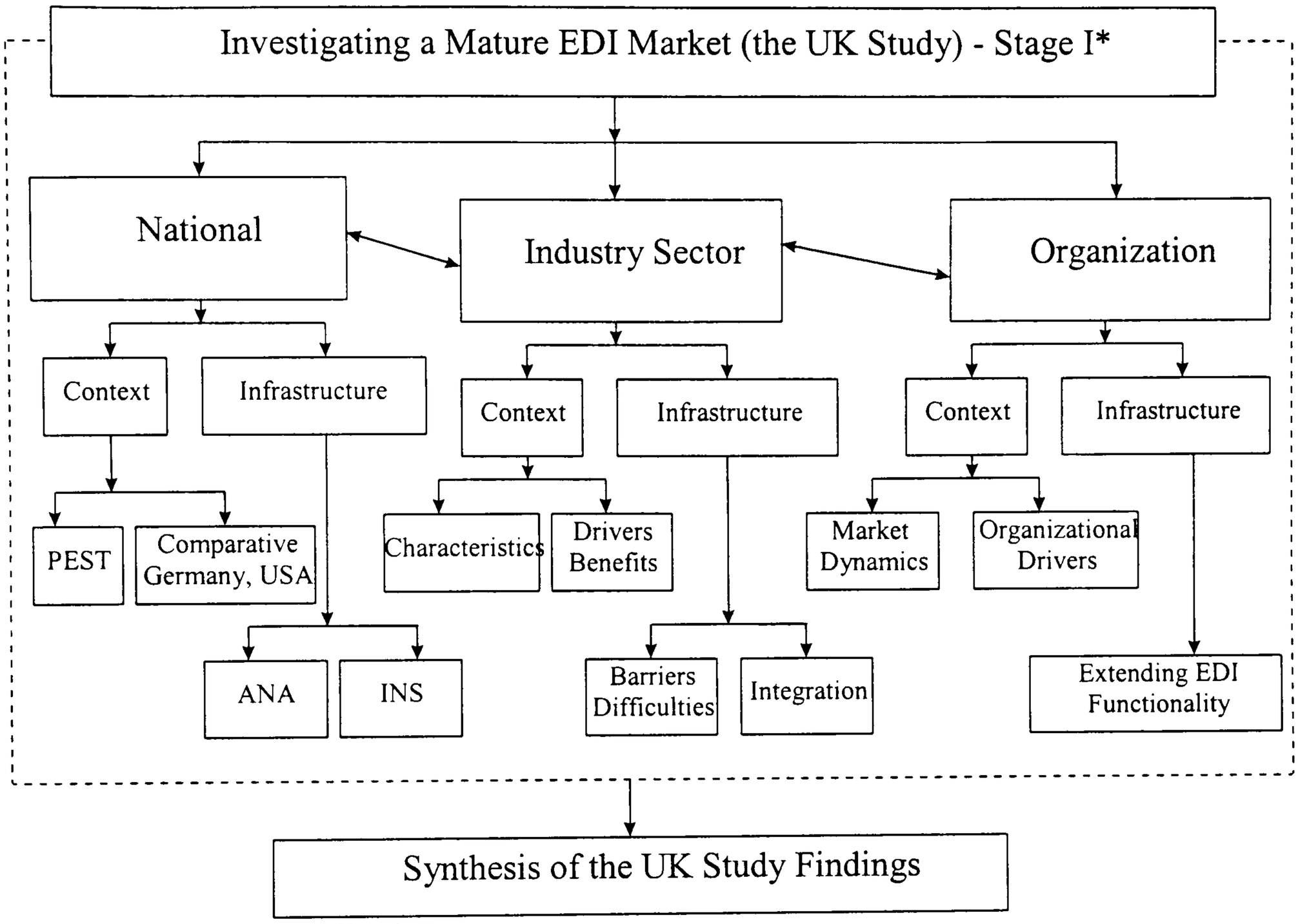
This chapter investigates the factors that contributed to the advanced state of EDI adoption in the UK. The investigation is conducted at the national, industry-sector and organization levels. At each level of analysis the pertinent EDI contextual and infrastructure-related aspects are examined. The analysis procedure for conducting the research work in the UK is given in Section 4.2. Section 4.3 details the national level analysis including a comparative study of EDI drivers and benefits, followed by investigating the role of government, EDI coordinating bodies and service providers in establishing the national EDI industry. Section 4.4 examines industry-sector specific EDI implementation drivers and benefits, the extent of EDI integration with internal business processes, and the industry-sector specific EDI implementation barriers and difficulties. Then in Section 4.5, the organization level analysis, including investigating the HMSO experience, EDI implementation and extending the role of EDI to achieve strategic, technical and business process reengineering gains is discussed. In Section 4.6, an implementation framework is prescribed, based on the questionnaire survey of the EDI industry, the HMSO case study and interviews with both EDI service providers and users. It provides a potential tool for practitioners covering important aspects of EDI implementation and integration. A synthesis of the UK study findings including a description of the CIC framework is given in Section 4.7. The CIC framework draws on the results derived from the study of the UK mature EDI industry investigated. The chapter contribution is given in Section 4.8.

4.2 A GENERAL OUTLOOK ON THE ANALYSIS PROCEDURE

Bearing in mind the thesis objectives, Figure 4.1 outlines the analysis procedure developed for the study of the EDI mature market, the UK.

It is worth reiterating that analysis focused on considering the context and infrastructure-related factors that influence EDI adoption at each of the three levels. To this end, at the national level, two modes of inquiry were employed. First, the contextual environment was considered within a PEST (political, economic, social and technical) framework of analysis. The results from the survey of British industries were examined at the aggregate level to identify the domestic EDI motivational

factors. Results are also examined within a comparative framework with previous studies conducted in the USA and Germany. Second, field study findings of the role of EDI coordinating bodies and service providers in establishing the EDI industry infrastructure are described.



* See Figure 3.2 for Stages II and III

Figure 4.1 Simplified Flow Chart of the Analysis Procedure for the Study of the EDI Mature Market (UK).

At the industry-sector level, seven industry-sectors (retail, manufacturing, distribution, utilities, pharmaceuticals, government and services) were surveyed to improve the understanding of the opportunities and problems particular to each sector.

Organization level inquiry is based on a case study of HMSO investigating the impact of full EDI integration with trading partners requirements' and core business processes in offering strategic benefits. The developed analysis procedure for the UK study is outlined in Figure 4.1.

4.3 NATIONAL LEVEL ANALYSIS

Farhoomand and Boyer (1994) suggest that legal, cultural, political and economic factors influence successful adoption and diffusion of EDI in a national setting. Two of these elements, namely the political and economic factors are of specific interest to this study as they are particularly applicable when EDI is driven by international pressures

to streamline trade processes (Schware and Kimberley, 1995a). However, it is also believed that EDI adoption may emanate in response to domestic intra- and inter-industry trading requirements as witnessed in the case of the USA, Germany and the UK (Banerjee and Golhar, 1991, Reekers, 1994; Reekers and Smithson, 1994). As such, it is necessary to incorporate the socio-economic element in the analysis to consider the critical impact of domestic trading players in promoting the use of EDI. It is also advocated that the revolutionary developments in the telecommunications and information technology industries will influence EDI adoption and as such must be accounted for in the analysis. Support for including the social factors are inherent in the contextualist approach as discussed earlier. Therefore, in principle, it is proposed that the analysis of factors that affect EDI adoption at the national level is scrutinized within the PEST framework. Those pertinent to the UK are discussed in this section, whereas those relevant to Egypt are given in Section 5.4. For illustration, Figure 4.2 depicts the variables to be considered at the national level.

It is believed that three major players contributed to the success of EDI adoption in the UK, mainly, the national trading community, the national EDI coordinating body and the VANS. With respect to the national trading community, it is clear that the UK EDI industry was primarily driven by the domestic industry trading requirements and the pressures exerted by the business community to establish standard trading practices. As both the American and German markets were subject to similar domestic pressures, the EDI-specific drivers and benefits are discussed within a comparative framework in Section 4.3.1 in order to provide further insight into the critical motivational factors that underline EDI implementation in the three countries.

Furthermore, it is believed that the UK is well-advanced in EDI compared to European countries as a result of the development of standards by the ANA and because of the VANS created in the wake of the telecommunications deregulation (Black,1991). Therefore, analysis pursued identifying the characteristics of both the national EDI coordinating body ANA and the International Network Services (INS) as the leading EDI service provider which enjoyed dominant market share at the time the study was conducted. It appears that since EDI was initiated for trade facilitation purposes in the early 1980s The British Simpler Trade Producers Board (SITPRO) and the ANA worked towards developing TRADACOMS (the British national trading standard) based on domestic business requirements. Those standards set the cornerstone for the

electronic trading foundation. The role of the ANA is investigated in Section 4.3.2. Similarly, INS has been instrumental in developing the UK electronic trading community. The role of INS is examined in Section 4.3.3. With respect to the political and technical factors that influence EDI adoption at large, a full discussion is detailed in Chapter 5. Finally, given the importance of the role of government in establishing the EDI industry and regulating electronic trading, Section 4.3.4 is dedicated to examining the relevant literature.

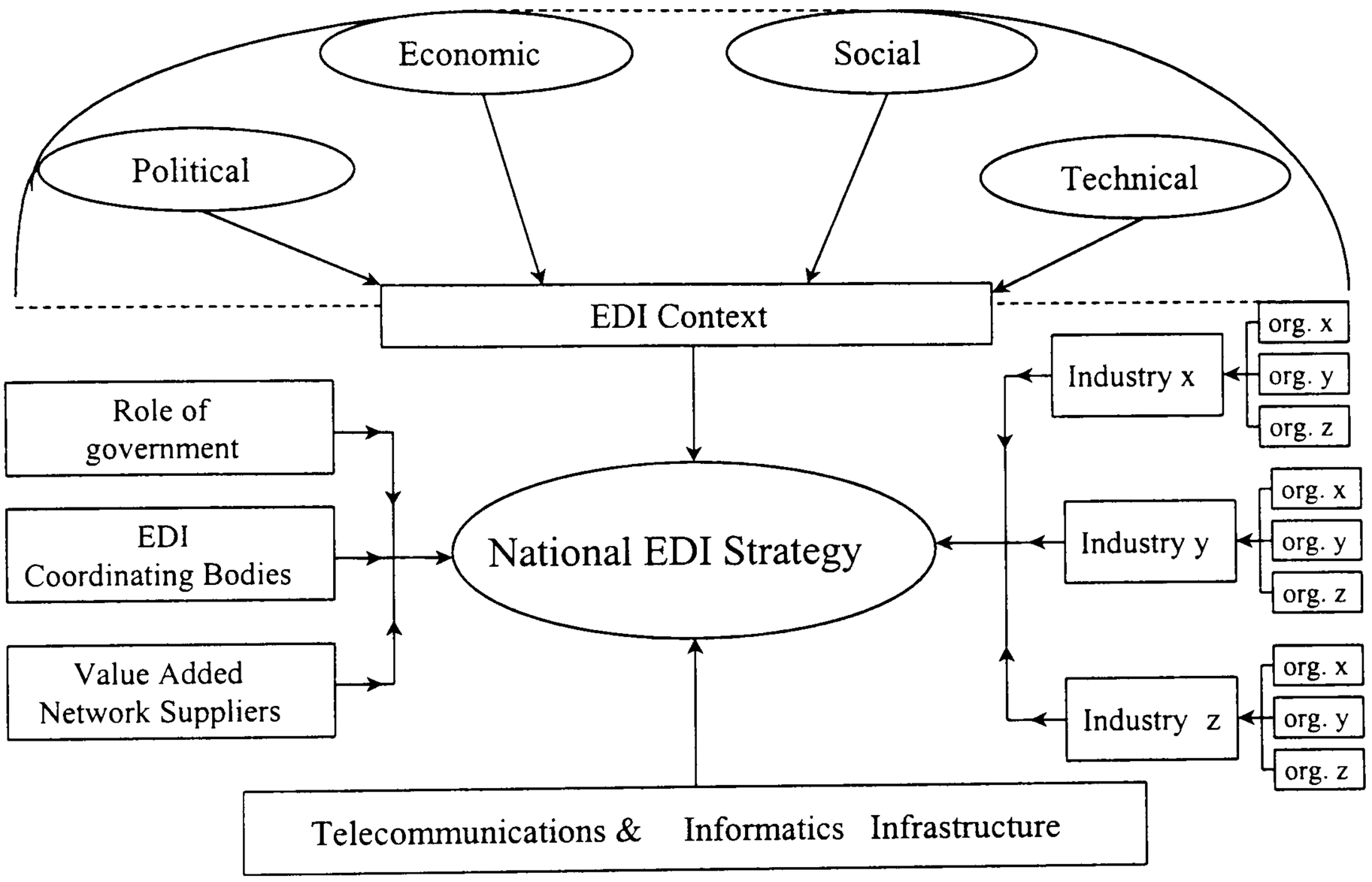


Figure 4.2 National Level Analysis

4.3.1 Comparative Study of EDI Drivers and Benefits

Through investigating the UK electronic trading requirements, it can be argued that the motivational factors and perceived benefits driving EDI adoption within a domestic market are fairly consistent in the USA, Germany and UK (see Tables 4.1. and 4.2). Before, examining these factors, it is worth noting that the purpose of the current section is to compare the results of the UK survey with previous research findings. In the three studies selected for comparison (Banerjee and Golhar, 1991; Reekers, 1994; Reekers and Smithson, 1994), the authors were keen to identify the factors of particular interest to organizations in the USA, Germany and the UK, respectively. It is acknowledged that these factors are not typically of a *macro* nature to be considered as a national influence, however, they reflect on the context-specific influences within the

social and economic components of the PEST framework. Furthermore, the results are of particular interest, from an application perspective, to policymakers involved in privatization initiatives and corporate restructuring efforts particularly in developing countries, where governments are under increasing pressures to adopt national IT-oriented efficiency programmes. Moreover, the results contribute towards better understanding of the domestic factors underlying the requirements for EDI which would assist policymakers in identifying those of relevance to their specific environment. Tables 4.1 and 4.2 setout the most prominent drivers and benefits to adopting EDI, the sample mean, standard deviation and the statistical level of significance associated with each factor for Germany, USA, UK (1992) and UK (1993). The results are summarized for reference purposes. This section will very briefly compare these factors in the three countries, considering only the statistically significant results. In other words highlighting particularly the most influential variables inducing EDI adoption within the domestic trading community. A full analysis of the specific EDI domestic trading characteristics in the UK is detailed on an industry-sector level in Section 4.4.

From the national perspective, suffice to mention that the five key motivational factors consistently driving EDI adoption in the USA, Germany and the UK are:

- better communication with trading partner,
- remaining competitive,
- increased accuracy of data,
- quick response and access to information, and
- better customer service.

It is clear that by definition these are factors critical to organizational competitiveness. Meeting industry standards was only prominent in USA, meanwhile improving delivery was of particular significance to Germany and the UK. The survey findings, in the case of the UK (1993) conducted as part of this research show that 12 of the examined 23 major motivational factors reported statistically significant results. Analysis of British corporate drivers specific to EDI adoption reveals that external pressures, in terms of inter-organizational collaboration and corporate competitiveness, and internal motivational drivers, in terms of enhanced business performance, administration effectiveness, process efficiency and improved customer service have been most influential.

It is worth noting that the 1993 questionnaire survey of British industries, envisaged a number of new factors. These factors were identified based on the literature review to address some specific research objectives pertinent to the current research. To illustrate, better trading partners cooperation and increasing efficiency were added to the set of factors investigated. Both variables reported statistically significant results.

In Table 4.1, better communications with trading partners, and remaining competitive reported statistically significant results, not only in the 1993 UK survey, but also in Germany (Reekers, 1994), USA (Banerjee and Golhar, 1991) and the previous UK 1992 study (Reekers and Smithson, 1994). In the case of the UK, improved trading partner cooperation and closer relationship were also reported. These findings support previous literature advocating the instrumental role of EDI in enhancing inter-organizational relations. It is worth observing that results relevant to fulfilling *trading partner requirement for further business* were not significant. This may be an indication that organizations are primarily motivated to adopt EDI by business initiatives based on a proactive corporate strategy to remain competitive. However, it should be noted that most respondents are typically large organizations. A survey of SMEs may produce different results possibly endorsing the mandated requirement to adopt EDI as a major adoption driver as mentioned by Iacovou *et al.* (1995).

FACTORS	GERMANY			US+	UK 1992			UK 1993		
	x	*s*	*p*	Sig.	*X*	*s*	*p*	*x*	*s*	*p*
Market or TP Driven										
Request of trading partner	3.07	1.31	0.3400	**	3.45	1.48	0.0089 *	2.89	1.35	0.7500
TP requirement for further Business								2.38	1.44	0.9999
Better communication with trading partners	3.94	0.90	0.0000 **	**	3.97	1.67	0.0000 **	3.49	0.87	0.0000 **
Better trading partners co-op, closer relationships]								3.66	0.82	0.0000 **
Remaining competitive	3.28	0.88	0.0000 **	**	4.05	1.79	0.0000 **	3.51	1.04	0.0000 **
Meeting industry standards	3.03	1.13	0.4000	*	2.85	1.37	0.8000	2.5	1.01	0.9999
Business Performance										
Organizational Strategy								3.47	0.93	0.0000 **
Reducing stock/ Inventory	2.87	1.25	0.7500		2.73	1.49	0.9100	2.53	1.17	0.9998
Improving ordering	3.55	1.00	0.0002 **		3.38	1.44	0.0230	3.34	1.14	0.0000 **
Improving delivery	3.02	1.19	0.4500		1.82	1.87	1.0000	3.29	1.13	0.0100 *
Implementing Just in Time								2.41	1.17	0.9999
Increasing sales/Turnover	2.21	0.98	1.0000		3.02	1.52	0.4600	2.37	1.02	0.9999
Reducing cost	3.70	0.92	0.0000 **		3.40	1.17	0.0051 *	3.03	1.08	0.4161
Reducing number of employees	2.82	1.14	0.8700		2.28	0.95	1.0000	2.36	1.10	0.9999
Increase Productivity								3.014	0.97	0.4531
Administrative Factors										
Increasing accuracy of data	3.84	0.87	0.0000 **		3.98	1.67	0.0000 **	3.75	0.82	0.0000 **
Quick response & access to information	4.19	0.66	0.0000 **	*	3.39	1.15	0.0051 *	3.26	1.09	0.0100 *
Reducing paperwork	3.28	0.94	0.0150	*	3.48	0.95	0.0001 **	3.54	0.97	0.0000 **
Increasing Efficiency								3.76	0.76	0.0000 **
Processes										
Improve Planning	2.53	1.14	1.0000		2.77	1.40	0.90	2.78	0.96	0.9788
Better Internal Processes								3.37	0.88	0.0000 **
Customer Service										
Better customer service	3.75	0.97	0.0000 **	**	4.13	1.92	0.0000 **	3.61	1.02	0.0000 **
Improving products/service quality	1.91	1.03	1.0000	**	3.74	1.25	0.0000 **	2.47	1.83	0.9999
	n=52			N=26				n=76		

One tailed t-test *=0.01 significance level; ** 0.001 significance level
Scale: 1=not at all, 2=minor, 3=moderate, 4=major, 5=extremely
+ The US study indicates levels of significance only; no values for x, s and p are given.

Table 4.1 Comparative Analysis of EDI Drivers (Germany, USA and the UK)

The statistically significant results also indicate that administration effectiveness, in terms of increasing the accuracy of data and quick response and access to information, as well as better customer service, are particularly influential. The reported results with respect to the above-mentioned administration factors significance are congruent with previous research findings. Furthermore, the results also distinguish EDI's role to streamline business processes as a significant driver to EDI adoption. Previous studies have not empirically examined this factor.

With respect to benefits associated with EDI adoption (Table 4.2), the results endorse the value of EDI with respect to reduced clerical error, improved speed of communications and improved cooperation with trading partners particularly in the UK. These are primarily the main three statistically significant benefits reported by the survey findings. It may be interesting to note that in the UK survey of 1992 (Reekers and Smithson, 1994), better customer service was reported as both a significant pre-implementation driver and a pertinent perceived post-implementation benefit. However, these results were not maintained in the survey of 1993 conducted within the scope of the current research. This may be interpreted in the light of the state of maturity of EDI trading which is tending towards the norm and is therefore no longer a differentiating factor. Such analysis, however, is best conducted at a more *micro* level within an organizational framework. To the *macro* end, Tables 4.1. and 4.2., are incorporated only to outline the pertinent significant variables in each of the three countries.

In order to address the implementation aspects at the national level, particularly in terms of EDI coordination and service provision infrastructure, Sections 4.3.2 and 4.3.3. are devoted to examining the role of EDI coordinating bodies and VANS in developing EDI in the UK.

FACTORS	GERMANY			US+	UK 1992			UK 1993		
	x	s	p	Sig.	x	s	p	x	s	p
Market or TP Driven										
Improved cooperation with TP								3.36	0.79	0.0000 **
Gained competitive advantage	3.22	1.08	0.0730		3.29	1.39	0.0340	2.67	1.10	0.9954
Business Performance										
Decreased inventory cost	2.35	1.08	1.0000		2.56	1.36	0.9900	2.39	1.03	1.0000
Increased sales	2.04	0.96	1.0000		2.30	1.09	1.000	2.60	1.14	0.9999
Decreased administrative cost	3.41	0.90	0.0010 **		3.00	0.01	0.5000	2.92	1.00	0.7500
Increased internal efficiency								3.12	0.78	0.0900
Administrative Factors										
Reduced clerical error	3.76	0.76	0.0000 **		3.71	1.20	0.0000 **	3.68	0.75	0.0000 **
Improved speed of communications	4.11	0.68	0.0000 **	**	3.89	1.50	0.0000 **	3.59	0.83	0.0000 **
Improved data sharing	2.73	1.17	0.9400		2.74	1.18	0.9500	2.56	0.84	1.0000
Improved control over data	2.95	1.04	0.6100		3.20	1.09	0.0800			
Processes										
Improved focus on core business								2.29	0.92	1.0000
Improved internal processes								3.11	0.83	0.1200
Customer Service										
Improved customer service	3.40	1.08	0.0054 *		3.68	1.24	0.0000 **	2.97	1.08	0.5900
Improved customer loyalty	2.67	1.23	0.9600		3.12	1.27	0.2400	2.58	1.16	0.9992
Improved vendor relationship	2.95	1.23	0.5900		3.11	1.53	0.30	2.85	1.04	0.8900
		n=52		n=26					n=75	

One tailed t-test *=0.01 significance level; ** 0.001 significance level
Scale: 1=not at all, 2=minor, 3=moderate, 4=major, 5=extremely

+ The US study indicates levels of significance only; no values for x, s and p are given

Table 4.2 Comparative Analysis of EDI Benefits (Germany, USA and the UK)

4.3.2 EDI Coordinating Body – The ANA

Coordinating activities among EDI industry players and its successful management are critical to EDI industry development. Therefore, EDI coordination bodies such as the EDIforum in the Netherlands, the EDIA (EDI Association) and the ANA in the UK play a critical role in establishing national EDI industries. Coordination as defined by Malone and Crowston (1994) and discussed by Saxena and Wagenaar (1995) refers to managing dependencies between activities namely, government regulations, standardization, liaison with potential users and suppliers of EDI services within and between various industry-sectors.

As mentioned earlier, in the UK, Black (1991) attributed the advanced state of EDI adoption to the role of the ANA and the development of standards. To this end, this section examines the characteristics of the ANA as the national coordinating body. It focuses on identifying factors underpinning its successful fulfillment of its coordination role based on a series of interviews conducted with senior ANA staff members (see Annex 2). The thoughts and ideas discussed in this section are based on the analysis of the interviews conducted as part of this research, unless otherwise indicated. Examining the main characteristics of the ANA, revealed that its success can be primarily attributed to its business orientation, its capacity to develop EDI trading standards, its ability to define EDI service specifications inline with user requirements, and it competence to maintain positive government liaison. The precise role of ANA in developing the British EDI industry is summarized below.

ANA was established in 1976 by a select group of retail and manufacturing industry pioneers to promote a standard system for identification of products, services and locations, and to develop the use of article numbers in business communications. Since its inception, ANA has been committed: '*to take the lead in developing, promoting and establishing a world-wide, multi-sector system for identification of goods, services, locations and for related communications, based on business-led standards agreed through the International Article Numbering Association (EAN). The objective is to improve inter-company logistics, increase the efficiency of trade and add value to the partners involved and to the customers*'. As such, the ANA provided a forum to collate and represent business requirements, particularly those of retail, manufacturing and trade industries, and to pursue an appropriate solution accordingly. This business alignment, as opposed to technical orientation, contributed towards the association's

appreciation of the national trading requirements and consequently effective coordination of objectives and activities.

It has been asserted in previous research that standards make a vital contribution to the EDI infrastructure (Saxena and Wagenaar, 1995). To illustrate, the case of the ANA provides empirical support based on the UK experience. ANA has been heavily involved in founding national trading standards for British industries in its capacity as the authority for article numbering since 1976. It established the international article numbering and bar coding systems, which has been used for the identification of any product or service. The standard was based upon the Universal Product Code (UPC) developed by the Uniform Code Council (UCC) in the US. Further, in response to the growing demand for improved methods of exchanging business data, ANA developed TRADACOMS, the UK standard for trading communications since 1982. These standard formats act as a common bridging language between computers for trading partners. TRADACOMS standards for EDI are based on the syntax rules developed by a government body called SITPRO. The standards stemmed from the retail industry requirements and were soon adopted by various industry-sectors. Having placed the required checks and ensured compatibility of business standards with business requirements, the next step was to attempt to capture the data electronically. An indication of the extent of TRADACOMS standards meeting business requirements was reported in the questionnaire survey undertaken in the current thesis. Wide use of the TRADACOMS standards (65% of respondents used TRADACOMS at the time of survey in 1993, compared to 53% reporting the use of EDIFACT). It is believed that this notable business orientation towards the development of standards facilitated the adoption and implementation of the TRADACOMS standards and contributed to the development of the EDI community in the UK.

With respect to coordinating trading activities, ANA maintained positive liaison with government to facilitate electronic trade regulation and institutionalization. Clarke *et al.* (1992) emphasized the importance of such coordination, especially that the regulatory structure imposed by government may represent a constraint to EDI implementation and may in some cases require change through changes to the law. It is, therefore, recommended that the coordination body maintains the appropriate liaison with government to be able to lobby in favour of its business constituency. For instance, in the case of the UK, when ANA and Her Majesty's Customs and Excise

recognized the need to make electronic invoicing acceptable in 1979, they successfully lobbied government, which amended the 1980 Finance Act.

With regard to setting up a national EDI service, the ANA assumed the responsibility for translating business requirements into technical specifications for setting up VANS. It skillfully played the intermediary role of translating its community business and industry requirements into technical specifications, which marked the birth of the TRADANET service operated by INS. Finally, ANA also played an important role in increasing community awareness and educating the market by organizing specialized industry workshops, holding technical implementation training seminars, and widely publishing case studies and implementation success stories.

In summary, with respect to developing a national EDI strategy, ANA experience in the UK outlines the role of a national body assuming the responsibility of coordinating EDI requirements and activities at a national level. These guidelines stress the association's business orientation, its capacity to convey business requirements to government and to translate business requirements into technical specifications. It also played a key role in increasing community awareness of the business benefits and potential of EDI. Therefore, it can be stressed that for developing countries, national trade chambers and industry federations are instrumental in the early stages of developing EDI policies and strategies. For example, in the case of Egypt, the Federation of Egyptian Industries (FEI) has the potential to play a critical role in developing the national EDI industry in Egypt.

The EDI success in the UK is believed to be strongly related to the advanced state of EDI standards, developed in response to business requirements. The simplicity, homogeneity and compatibility of these standards have been critical to rapid EDI diffusion in the UK. It should be emphasized at this stage, that integration into world economy requires homogeneity of standards and VANS inter-connectivity, as in the case of the Western European infrastructure at large. Contrary, it can be argued that despite of the advanced state of EDI diffusion in Japan and Korea, reliance on private-format EDI, almost no EDIFACT, and multiplicity of VANS connections (about 1000 VANs with limited inter-connectivity) have contributed to building electronic trade barriers instead of establishing an infrastructure to facilitate international trade. Japan and Korea acknowledge these system deficiencies and are working towards solution. For example, Korea has adopted a national initiative that is committed to EDIFACT

(Schware and Kimberley, 1995a). Related lessons learned will be assessed and the implications discussed in detail in Chapter 6.

4.3.3 Role of VANS – The INS

Black's (1991) assertion that VANS have been particularly instrumental in developing the UK EDI trading community, has been further supported by the survey results reported in this thesis, which indicate that 92% of respondents utilize the services of VANS, compared to 47% in Germany (Reekers and Smithson, 1993). This is a significant consideration in developing a national EDI strategy. For developing countries, in particular, there is the danger and temptation to seriously consider the Internet, for example, as a potential substitute to the proper foundation of a national EDI industry infrastructure. Although the Internet provides a potentially more cost effective technology alternative, there are a number of security and audit trail flows that can possibly hamper business performance. Suffice to mention, that most of the large international retailers and multinational manufacturers would not risk their business performance, nor expose their systems to the dangers inherent in the use of the Internet. It is believed that until the security risks associated with Internet use for electronic trading purposes are resolved, it does not provide a viable alternative to VANS. Specialized VANS offer inter-connectivity facilities amongst themselves and invest in enhancing security and audit trail services to ensure that traders business is not at risk. In contrast, it is believed that further research into the emerging Internet EDI facilities is required to consider its full potential and account for associated security implications. Although the Internet may cater for some forms of trading, particularly those involving the end customer directly, or serving as marketing channels, it may not necessarily provide an alternative to institutionalizing a national EDI industry. As such Internet-based electronic trading should be considered for future research within a different scope of study possibly focusing on SME's requirements.

Given the successful role of VANS in the UK, the role of INS in developing the UK EDI industry is investigated to extrapolate the key lessons learned. The investigation was conducted in 1994 when INS enjoyed market leadership in the country. Senior management interviewed include: four directors and six managers across different corporate functions as well as two international sales consultants specialized in institutionalizing new EDI implementations in a national setting. The interviews aimed at identifying the key service provider-specific factors that contributed to successful

diffusion of EDI in the UK (Annex 3). The discussion presented hereinafter is based on the above mentioned interviews, unless otherwise indicated.

Five specific success determinants for VANS were identified as listed below and discussed hereinafter.

- Corporate business orientation.
- Strategic alliance with major industry players.
- Supply of business driven technical solutions.
- Tenacity in community development.
- Capacity to change.

4.3.3.1 Corporate business orientation

INS has been committed to improving business efficiency and effectiveness by providing products and services which enable the electronic integration of the business networks of their customers. Based on INS experience, it has been recommended that EDI is perceived as a business tool that is likely to continue to influence business performance by pursuing innovative applications and implementations. For instance, EDI can extend the life of existing applications by providing the telecommunications base, or be used as a nucleus to alter inter-industry relations or reshape business networks and systems functions.

This implies considering the following in developing a national EDI strategy. Experts argue that the major challenges in establishing a national EDI industry are twofold: identifying potential high value markets and running an EDI service. They particularly affirm that technology transfer to nations in the early stages of developing an EDI industry must not be confined to the technology aspects, but must also be extended to the business know-how and the human resources skills aspects. Furthermore, key to successful establishment of a local EDI service provider is analyzing potential barriers to community development in the early planning stages and targeting high-value niche markets to ensure rapid electronic trading community development. Hence, the requirement for business orientation clearly necessitates *localization* to cater for local market requirements. It has been emphasized, that this orientation, provided for successful launch and diffusion of EDI in the UK. It is, therefore, believed that the service provider must be demand-driven to cater for national business requirements. Furthermore, technology transfer should not be confined to the technical aspects, but

must encompass the business and human resource know-how to ensure successful development of the EDI industry.

4.3.3.2 Strategic alliance with major industry players

The interviewed informants defined a number of strategic alliance initiatives that they believed are critical to INS success. They asserted that a fundamental cornerstone to successful EDI diffusion is strategic alliance with major industry players and EDI coordinating bodies, particularly in the early stages of national EDI development. Moreover, the following factors have been identified as instrumental in building corporate credibility and accordingly successfully promoting the use of EDI. First, is the sole endorsement of INS from the ANA. Second, is being first in the market. Third, is the strategic partnership between the two organizations and tenacity of the ANA, as well as strategic alliance with industry leaders, such as, Marks and Spencer. In fact, it is suggested that the endorsement of a single EDI service provider, is particularly recommended in the early stage of developing the EDI community to effectively promote community development. Although this conclusion should be revisited in terms of new technological developments and systems inter-connectivity, it is the author's contention that such endorsement is still applicable to ensure efficient technology diffusion. This recommendation is further supported by the results reported by South Africa and Brazil, where community development has been restrained due to multiple VANS representation (Schware and Kimberley, 1995a). For developing countries, it is believed that such endorsement prevails as a necessity.

4.3.3.3 Supply of business driven technical solutions

The development of technical solutions inline with the business requirements specified by ANA in the launch of EDI to the UK market is a key to INS success. Accordingly, the INS TRADANET service was developed in response to British industry trading requirements. The Ten Layer Model of INS EDI Service shown in Figure 4.3, delineates the focus on value added services. EDI service providers typically provide the technical services similar to those listed as Layers 1-5 (National and International Network, Protocol Conversion, EDI Envelope standards, EDI message standards and the Postbox/Mailbox facility) to cater primarily for the exchange of structured EDI messages. Meanwhile, the INS model offers an additional five layers. Layers 6-10 (user functionality, user enabling service, user consultancy, training and support, community marketing and support and service gateways), are INS-specific. They are

focused on enhancing the *value added* principal for the customer. For example, *user functionality* and *enabling services*, include audit, security, trading partners' authorization, international access, and business process re-design facilities. As such, they provide the user with control over managing the electronic trading relationship and utilizing the above-mentioned functionality towards corporate efficiency and performance requirements.

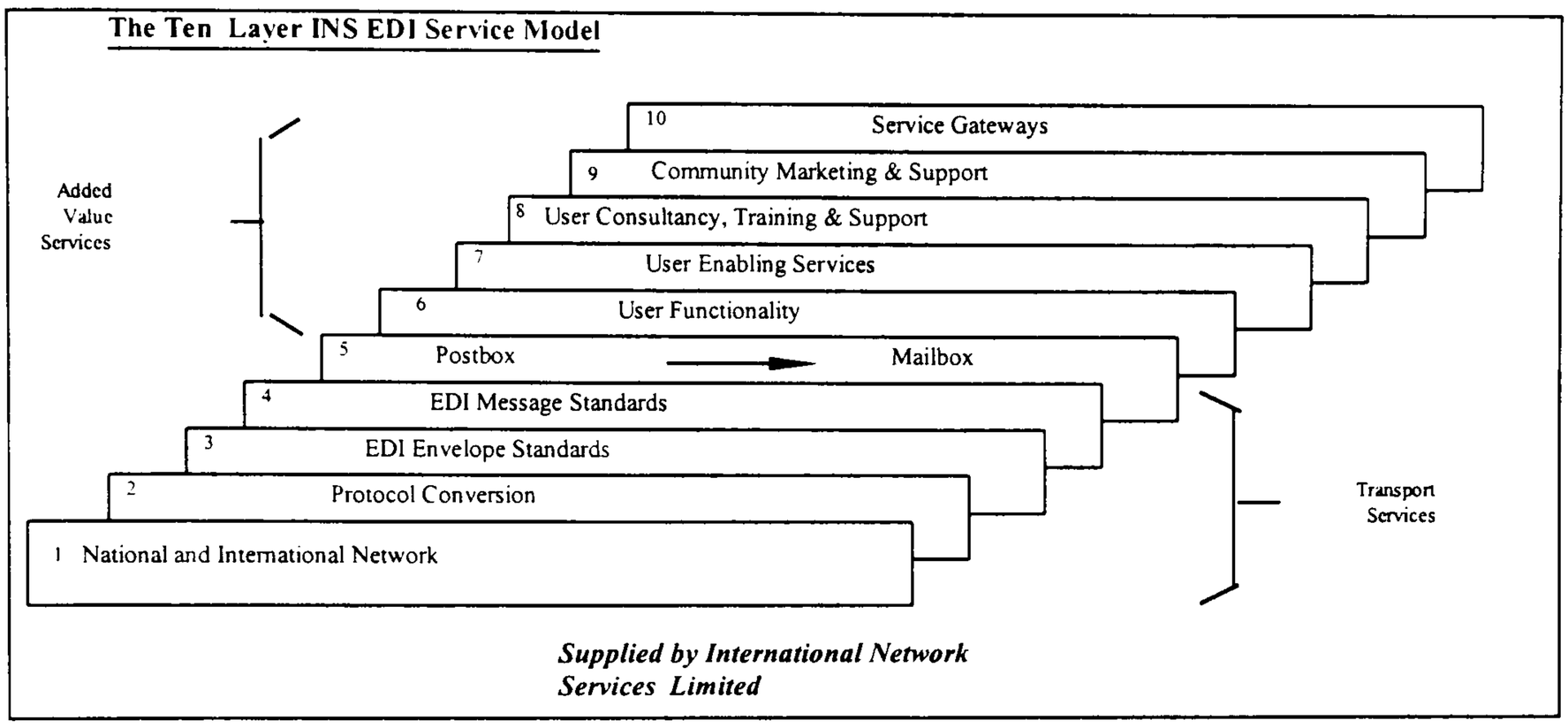


Figure 4.3 The Ten Layer INS EDI Service Model.

Furthermore, *consultancy services, training and support, community marketing support* and provision of *service gateways* are all value-added services that catered for expedient community development. These factors have been critical to successful development of the EDI industry in the UK, at the time the study was conducted. The main recommendation conveyed from all informants has repeatedly been along the message inherent in the above discussion. Namely, it is an endorsement that the services and products portfolio provided by the VANS should be demand-driven and based on the *value-added* principle. It is believed that responsiveness to market demand has been the catalyst to community development and the underlying success determinant for INS market leadership.

4.3.3.4 Tenacity in community development

In developing the EDI community in the UK, INS strategies focused on fulfilling customer requirements. This is reflected in the provision of help desk facilities, business consultancy services and special rollout programmes to enhance community development to address the requirements of its large customer base, different products were developed. For example, to specifically cater for SME's budgetary constraints, INS adopted an *unbundled approach* marketing strategy, which allowed for selling a

cut down version' of the EDI software product, yet allowing for potential upgrades subject to further requirements.

Within INS, the management emphasized the need for integrating *customer service* within the corporate policy of the EDI service provision. This would require recruiting specialized staff, training and retraining to acquire state of the art techniques, developing turnkey solutions and penetrating new industry markets to sustain market leadership, in order to cater for this *customer service* orientation.

4.3.3.5 Capacity to change

The capacity of the service provider to cater for changing business and technical requirements is critical to national development of the EDI industry. The development of the EDI industry in the UK has undergone a number of major changes since its introduction in the mid-1980s. Initially EDI was perceived as a means of eliminating paper, thus reducing clerical error. It has since been developed into an essential tool in IOS relations and finally to being an integral component of electronic trading, with significant potential to streamline internal business processes and to serve corporate objectives. Experts argue, therefore, that service providers should be able to respond efficiently and effectively to changing market requirements and, thus, develop the EDI community. To illustrate, the following example denotes the necessity of flexibility to cater for changing market requirements. INS, initially, adopted an aggressive marketing strategy focused on protecting its own customer base. Developments in technology allowing inter VANS connectivity forced INS to change its strategy. Placing the interests of customers first, INS led the change and adopted network inter-connectivity to cater for user requirements and ensure differentiated customer service. Senior management stressed that market penetration and sustained growth of market share mandated a responsive capacity to the changing market requirements. Therefore, focus on catering for changes in the business requirements, flexibility and speed in adopting the required solutions has been critical to INS success.

From the above, the INS experience draws attention to the importance of: corporate business orientation; strategic alliance with key industry players and EDI coordinating bodies; supply of business driven technical solutions; tenacity in community development; and corporate capacity to accommodate change. It is recommended that policymakers are aware of these crucial underlying success determinants in

establishing dedicated EDI service providers and VANS. The policy implications of the lessons learned are discussed in Chapter 6.

4.3.4 The Role of Government

Due attention has been given to investigating the role of government in founding and institutionalizing electronic commerce at large and EDI in particular (Clarke *et al.*, 1992; Damsgaard and Lyytinen 1994a and 1994b). The topic has been examined from different perspectives. Clarke *et al.* (1992), Damsgaard and Lyytinen (1994a) and Gotschlich (1992) suggest that government intervention in the diffusion of EDI may be influential, whereas Neo (1994) and Raman (1993) endorse government involvement in policy formulation. For example, Damsguaard and Lyytinen (1994a) examined how governments could promote the diffusion of EDI by modeling the process of diffusion by demand pull and supply push forces, both of which can be set in motion by government. Others suggest that government may set an example for the adoption of EDI in areas such as tendering and taxation returns (Clarke *et al.,* 1994). They argue that government can stimulate the development of infrastructure and culture necessary for EDI's widespread use. Gotschich (1992) states that EDI use in trading would not be very successful if government agencies, such as customs, did not start using it. Indeed, in a number of countries strategic government agencies have adopting the use of EDI, such as the HM Customs and Excise, and HMSO in the UK, have been influential in promoting electronic trading. Meanwhile, the requirement for government central direction and regulatory role is well-demonstrated in Brazil where the absence of regulations impeded EDI evolution. Despite the fact that the deregulated VANS market facilitated the creation of the basic infrastructure, the lack of central direction resulted in a multiplicity of initiatives which caused technological conflicts and hindered the development of EDI community (Schware and Kimberley, 1995a).

It is suggested, therefore, that government support and leadership is required for nations in the early stages of developing EDI. This argument is supported by various country experiences. To illustrate, in addition to the above-mentioned example, limited success has been reported with respect to trade facilitation initiatives in Latin America primarily due to the lack of serious government intervention (Schware and Kimberley, 1995a). As mentioned in Section 2.6.2, the extent of government intervention varies from total funding and management by government, to cooperative arrangement with the private sector, to complete lack of intervention. It is believed that the actual form of

government intervention will depend on the specific contextual environment of the nation, the role of the state at large and the existing institutional framework and EDI infrastructure. For illustration, the role of the GOE is discussed in Chapter 5.

4.3.5 Closure

The national level analysis described in this section contributes towards the research objectives in terms of identifying factors that influence EDI adoption in a national setting. The success determinants identified are based on the UK experience. Findings will be subject to further assessment in Chapter 6, to specify the lessons learned. It should be noted that the estimation of implementation costs, associated with establishing the national industry itself, including the setup costs of VANS and EDI coordinating bodies, is not included within the scope of the current thesis. Similarly precise changes in regulations are also excluded from the scope of work given the complexity inherent in the variation across the various legal systems and the requirement for specific legal expertise to examine the relevant issues and implications. Both perspectives are suggested for future research (see Chapter 7).

4.4 INDUSTRY LEVEL ANALYSIS

As nations vary in terms of their industry structure, the rationale for including an industry-sector analysis is verified in this respect by EDI industry specialists as a fundamental requirement for developing national EDI strategies. Furthermore, experiences with EDI vary from one industry-sector to another and from goods-related industries to service-related businesses, depending on the industry structure and the business network (Saxena and Wagenaar, 1995). Other reasons for the above mentioned variations are motivational drivers and perceived business benefit, implementation barriers and difficulties in addition to industry specific characteristics (Cox and Ghoneim, 1996). It is, therefore, important that the conventional and limited view of the implementation of EDI from a perspective of an individual organization be complemented by a broader and deeper appreciation of the relevant industry-sector/community view. This argument is also supported by Clarke (1992) and Lobet-Maris (1994).

A questionnaire survey of British industries was, therefore, conducted to compare the effects of EDI on UK industry. This section presents the results of the reported impact of EDI as given by the retail, manufacturing, distribution, government, utilities, services

and pharmaceuticals industry-sectors. Furthermore, the level of EDI integration with internal business processes and core business activity is investigated.

4.4.1 Need to Understand Industry-Specific Requirements

Previous research into EDI diffusion studies (Kremar *et al*, 1994; Mackay, 1993; Pfeiffer, 1992; Saunders and Clark, 1992; Thissen and Stam, 1992) either has not differentiated between organizations from different industry-sectors, or has focused only on one sector. Saxena and Wagenaar (1995) criticized the first approach for not considering industry-specific variables and the latter for lacking inter-industry comparisons leading to country-level generalizations. Clarke (1992) called for investigation into the impact of EDI on specific industry-sectors.

The research reported in this thesis is based on the hypothesis that different industry-sectors will have different experiences of EDI and that it is necessary to improve understanding of the problems and opportunities particular to each type of business sector. Motor manufacturers, for example, expressed a desire to know the experience of other motor manufacturers in the implementation of EDI. They indicated that the experience of the banking industry or the retail sector may be interesting, but still not necessarily relevant to them. This is particularly important in defining recommendations for developing a national EDI strategy as discussed in Chapter 6. To promote EDI development, it is necessary both to define leading industries and to identify the underlying factors that promote or hinder EDI development within particular industries.

4.4.2 Pertinent Sectoral Issues Investigated

This section investigates three pertinent aspects of EDI implementation at the industry level as they appeared from the questionnaire survey. First, the extent to which sectoral differences influence the perceived benefits of, and drivers to, the adoption of EDI. Secondly, the various barriers and difficulties of EDI implementation and the degree to which EDI has been integrated into the internal business processes of each sector. And finally, whether in each of the seven industry-sectors EDI delivers its maximum benefit when integrated with internal business processes or whether for maximum benefit to be obtained these processes must be representative of the core business activities of the organization. The questionnaire survey form and the industry-sector specific profiles are given in Annex 1. The results of the research affirm that industry differences do exist and that for maximum benefit to be derived from EDI technology it is essential that EDI

is both integrated into internal business processes and that these processes are representative of core business activities.

4.4.3 EDI Implementation across Various Industry-sectors

The majority of respondents were typically large organizations, both in terms of turnover and employment. The average turnover of these organizations was £1,877 million (maximum £30 billion, minimum £3 million) with average employment of 12,951. Only 7.8% of respondents reported an annual turnover of £10 million or less and only 9% employed fewer than 250 staff. The retail sector represented the largest user of EDI.

The sectoral results were analysed both within a comparative framework to demonstrate the similarities and differences between the various industry-sectors and on an industry-specific level to capture industry-specific dynamics and characteristics.

4.4.3.1 Industry-sector analysis of EDI implementation drivers

The survey responses supported the hypothesis that EDI implementation drivers vary across industry-sectors. Table 4.3 details the main salient features.

Whilst operational gain, remaining competitive, and improvement to inter-organizational relationships are the primary drivers to the trading community surveyed at large (i.e. all the respondents of the survey) as appeared from the results, their significance varies depending on the state of EDI adoption within the sector and on the requirements of the individual organization. For example, drivers for the government sector, which was at that time following a number of TQM programmes, were primarily those of improved customer service and increased effectiveness. Whereas the pharmaceuticals industry, which has been slow to adopt EDI, was mainly driven by the trading requirements of the retail industry. Retail, where EDI adoption was mature and most of the operational benefits had already been achieved, was seeking additional benefits in the form of reducing costs and facilitating the streamlining of the business processes.

The utilities industry was primarily driven by increased efficiency drivers whereas the service industry was mainly driven by increased productivity factors as well as achieving operational, efficiency and enhanced inter-organizational gains. The manufacturing and distribution sectors, where once again the state of EDI was relatively mature, aimed primarily at enhancing their inter-organization relations and

improving efficiency. The following analysis reveals how EDI drivers vary across different industry-sectors. Industry-sector specific profiles are summarized in Annex 1.

Factors	Retail	Manuf	Dist/n	Gov.	Utils	Service	Pharma	All
MARKET OR TP DRIVEN								
Request of trading partner	0.9999	0.0853	0.3050	0.5000	0.8238	0.3264	0.6026	0.7500
TP Requirement for further Business	1.0000	0.5517	0.6736	0.9798	0.9370	0.3974	0.9936	0.9999
Better communication with TP	0.0951	0.001 **	0.001 **	0.0307	0.3050	0.000 **	0.1587	0.000 **
Better TP co-op, closer relationships	0.0307	0.003 *	0.000 **	0.001 **	0.1867	0.001 **	0.001 **	0.000 **
Remaining competitive	0.0256	0.003 *	0.0668	0.0202	0.6103	0.0485	0.0233	0.000 **
Meeting industry standards	0.9999	0.9783	0.7291	0.2119	0.9999	06026	0.9082	0.9999
Business Performance								
Organizational Strategy	0.001 **	0.4166	0.0351	0.001 **	0.0749	0.000 **	0.5000	0.000 **
Reducing stock/ Inventory	0.5000	0.999	0.8531	0.9515	0.2148	0.9861	0.8133	0.9998
Improving ordering	0.0049 *	0.0367	0.5000	0.8413	0.0233	0.4052	0.001 **	0.000 **
Improving delivery	0.0537	0.3372	0.1056	0.001 **	0.3897	0.2546	0.8413	0.0100 *
Implementing JIT	0.6985	0.8997	0.8849	0.999	0.9938	0.999	0.9938	0.9999
Increasing sales/Turnover	0.9999	0.9999	0.7123	0.8770	0.9941	0.9370	0.8830	0.9999
Reducing cost	0.001 **	0.9778	0.591	0.004 *	0.2482	0.3594	0.9345	0.4161
Reducing number of employees	0.9515	0.9999	0.8413	0.9987	0.9890	0.7734	0.8413	0.9999
Increase Productivity	0.0409	0.8133	0.6664	0.6406	0.7518	0.0082 *	0.5000	0.4531
Administrative Factors								
Increasing accuracy of data	0.000 **	0.001 **	0.000 **	0.000 **	0.5000	0.000 **	0.002 *	0.000 **
Quick response and access to info	0.1736	0.2578	0.0526	0.0630	0.6368	0.001 **	0.791	0.010 *
Reducing paperwork	0.001 **	0.1230	0.0384	0.0307	0.0606	0.0300	0.0606	0.000 **
Increasing Efficiency	0.000 **	0.0078 *	0.000 **	0.001 **	0.001 **	0 000**	0.0606	0.000 **
Processes								
Improve Planning	0.9015	0.8925	0.5000	0.3594	0.9251	0.5000	0.9554	0.9788
Better Internal Processes	0.001 **	0.1977	0.0951	0.1587	0.1230	0.0764	0.0749	0.000 **
Customer Service								
Better customer service	0.010 *	0.0013 *	0.0071 *	0.001 **	0.209	0.1894	0.0170 *	0.000 **
Improving products/service quality	0.9951	0.9985	0.9871	0.1587	0.9999	0.1894	0.9999	0.9999

One tailed t-test *=0.01 significance level; ** 0.001 significance level
Scale: 1=not at all, 2=minor, 3=moderate, 4=major, 5=extremely

Table 4.3 Industry-specific Drivers, UK 1993

4.4.3.1.1 Market or trading partner driven

It is clear from Table 4.3, that contrary to the widely held views that EDI adoption is dictated by compelling external trading pressures, both the request of trading partner and trading partner requirement for further business variables were not significant in any of the sectors investigated. However, these results may be attributed to the size of organizations surveyed where large organizations typically lead rather than follow EDI implementation. The result may also be indicative of increased corporate awareness of

EDI potential business benefit and an increasing trend towards a proactive strategy to adopting EDI. To that effect, it can be argued that the previous academic views advocating the *bulldozer effect* mandating EDI implementation with the trading community lacked empirical evidence.

An important contribution of the survey findings is the extent to which EDI is perceived as an instrumental tool in enhancing inter-organizational relations. This is reflected in the positive response to the questions on better communications with trading partners and better trading partner cooperation. Both variables were statistically significant across the manufacturing, distribution and services industry-sectors. Whilst, better trading partner cooperation, was seen as a significant driver by the above three sectors, in addition to the government and pharmaceuticals industry-sectors. Responses from the retail and utilities sectors did not indicate that they were driven by any of the external factors mentioned in the questionnaire survey. It is worth noting, however, that although the retail industry did not setout to enhance its trading relationships as such, it was one of two industries that acknowledged improved cooperation with trading partner as an achieved business benefit (Table 4.4). Surprisingly, none of the industry-sectors surveyed reported statistically significant results with respect to meeting industry standards. Similar results were reported with respect to remaining competitive. The sole exception was the manufacturing industry which acknowledged the requirement for EDI to remaining competitive. This is believed to be a reflection on the exceedingly competitive nature of the manufacturing industry-sector.

4.4.3.1.2 Internal drivers to adopting EDI

Although in terms of enhancing business performance, both improved ordering and delivery were significant drivers in adopting EDI as reported by all the respondents, the drive to improve ordering was only significant in both the retail and the pharmaceuticals industries and improving delivery was only significant for government. It is also worth noting that the significance of the drive to reduce costs was confined to the retail and government sectors, whereas the drive to increase productivity was only highlighted by the services industry.

4.4.3.1.3 Administrative/operational drivers

Increasing the accuracy of data was significant across the four product oriented industries as well as the services and government industry-sectors. Furthermore, the services sector highlighted the requirement for quick response and access to information, whereas retail was primarily concerned with reducing paperwork. This is quite logical as it reflects the nature of the activities of both sectors. Increasing efficiency was a significant driver for all industry-sectors with the exception of that of pharmaceuticals, which can be generally perceived as a leader in applying efficiency measures. It can, therefore, be argued that the pharmaceuticals industry was driven to adopt EDI primarily in reaction to retail pressures as reflected in their responses.

4.4.3.1.4 Streamlining internal processes

Streamlining of internal processes was a priority in the retail industry. This finding is inline with the prevailing retail commitment to continuously streamline business processes to ensure efficiency and effectiveness. This particular driver assumes good knowledge of EDI impact based on an advanced state of EDI adoption. Such knowledge may not necessarily be available in all industry-sectors. Furthermore, it should be noted that the need for streamlining processes may not be necessarily a requirement across all the investigated industry-sectors.

4.4.3.1.5 Improving customer service

It can be considered from Table 4.3 that inline with previous research (see Table 4.1), seeking better customer service plays an influential role in the decision to adopt EDI. The survey results endorse this view as it was stressed in the responses of all respondents. In fact all the product-oriented industries in particular, as well as the government, given the launch of the TQM programmes, endorsed the importance of providing a *better customer service* as a major driver to adopting EDI. Yet, it is interesting to note that all industry-sectors did not perceive EDI as means for improving products or services quality. The empirical results suggests that EDI adoption is not perceived to influence the quality of product and services provided, but is only confined to the inter-organizational aspects of customer service.

4.4.3.2 Industry-sector analysis of the benefits of EDI

The above discussion illustrates how various industry-sectors are driven by different motivational factors to adopt EDI. The following section examines the extent to which these industries realized these anticipated benefits of adopting EDI (post implementation). Questionnaire respondents were asked to assess the extent of the achieved benefit. Hence, responses are based on the perception of the respondents of these achieved benefits and not necessarily on an actual precise measurement of benefit. Given the difficulty in assessing these benefits, Iavacou *et al.* (1995) used a more specific term *relative advantage* to refer to the perceived business benefit as a result of adopting EDI. For consistency and ease of reading the term *business benefit* or simply *benefit* will be always used to refer to the *perceived business benefit* or *relative advantage* reported by the survey respondents.

This research intended to identify whether the benefits reported in the survey vary between the various industry-sectors. The results support this view (Table 4.4).

FACTORS	Retail	Manuf	Dist	Gov.	Utils	Services	Pharma	All
MARKET OR TP DRIVEN								
Improved cooperation with TP	0.001 **	0.0200	0.0090 *	0.0600	0.001**	0.5000	0.670	0.000 **
Gained competitive advantage	0.8900	0.9700	0.3594	0.7500	0.9000	0.6800	0.850	0.9954
Business Performance								
Decreased inventory cost	0.9999	0.9999	0.9800	0.9400	0.7200	0.9999	0.999	1.0000
Increased sales	0.9999	0.8500	0.7000	0.8500	0.6300	0.8100	0.950	0.9999
Decreased administrative cost	0.0200	0.8400	0.7400	0.5000	0.5000	0.9200	0.850	0.7500
Increased internal efficiency	0.001 **	0.2600	0.7600	0.5000	0.1400	0.6300	0.500	0.0900
Administrative Factors								
Reduced clerical error	0.000**	0.000 **	0.001 **	0.00**	0.0400	0.2500	0.140	0.000**
Improved speed of communications	0.001 **	0.001 **	0.001 **	0.001 **	0.1400	0.0400	0.670	0.000 **
Improved data sharing	0.9400	0.9999	0.9999	0.9600	0.9500	0.6300	0.980	1.0000
Processes								
Improved focus on core business	0.9999	0.9999	0.9999	0.5000	0.9999	0.9800	0.999	1.0000
Improved internal processes	0.0200	0.010 *	0.7600	0.5000	0.8000	0.5000	0.500	0.1200
Customer Service								
Improved customer service	0.3600	0.9700	0.8000	0.2300	0.0500	0.3900	0.980	0.5900
Improved customer loyalty	0.9999	0.8400	0.6900	0.8400	0.6200	0.6000	0.390	0.9992
Improved vendor relationship	0.9600	0.1700	0.6100	0.6100	0.1900	0.6844	0.990	0.8900

One tailed t-test *=0.01 significance level; ** 0.001 significance level
Scale: 1=not at all, 2=minor, 3=moderate, 4=major, 5=extremely

Table 4.4 Industry-specific Benefits, UK 1993.

Somewhat predictably, benefit was most significant for the retail, manufacturing and distribution industries. This reflects the fact that the supply chain in these industries mandates a high level of efficiency in the transfer of invoices and orders, for which EDI provides an ideal tool. On the other hand, the analysis did not show the pharmaceuticals sector realizing significant benefit. In an attempt to explain this result, in-depth analysis of the level of EDI integration with core business applications and internal processes was undertaken in order to identify successful implementation criteria.

Cross-sector analysis supports previous findings where the primary benefits of EDI are operational. However, contrary to widely held views, the reduction of inventory costs was not significant. The result is congruent with previous research results in the USA, Germany and the UK (Banerjee and Golhar, 1991; Reekers, 1994; Reekers and Smithson, 1994). The primary benefits reported in support of previous EDI literature were confined to administrative/operational gains. This is in particular for those associated with increased speed of communications and reduced clerical error (Table 4.4). However, such impact should not be under-estimated. It is argued that EDI is one of the most reliable ways to cope with the requirement for faster response times and that new business opportunities, particularly from overseas partners, can occur simply because of EDI compliance. This is supported by Schware and Kimberley (1995a).

The suggestion by Holland *et al* (1992b) that EDI has the potential to transform relationships between trading partners by bringing them closer, is supported by the current research findings. Improved trading partner relationships appeared statistically significant in the retail, distribution and utilities industry-sectors. With respect to benefit gained from the *improved internal processes* the results suggest that this is only achieved in the manufacturing sector. Whereas benefits associated with increased internal efficiency are confined to the retail sector. These issues are discussed in detail below aiming to provide an assessment of industry-specific business benefits achieved across various industry-sectors as observed in the survey results.

4.4.3.2.1 Market and trading partner benefits

The retail, distribution and utilities industries reported improved cooperation with trading partner as a significant benefit. However, measurement of gaining competitive advantage proved to be an extremely challenging task. It is a good example of a factor where hard methodology, by means of statistical analysis, does not suffice and could be misleading.

Lack of statistical significance sets, therefore, the requirement for further in-depth case study analysis (see Section 4.5).

4.4.3.2.2 Enhanced business performance

It is difficult to assess actual benefits gained from the introduction of any particular technology. Furthermore, substantiating changes in business performance as a direct result of technology adoption is an even more complex task. This is reflected in the responses received with respect to questions attempting to determine whether benefits were realized in general. It may also be attributed to the reluctance of the EDI/IT management surveyed to respond to such key business issues. These arguments explain why none of the business performance variables, with the exception of increased internal efficiency which appeared in the retail industry responses, lead to statistically significant results. This is despite the large number of academic studies endorsing the attainment of these benefits as detailed in the literature review (Section 2.4).

4.4.3.2.3 Administrative/operational gains

The positive results given in Table 4.4, with respect to reduced clerical error and improved speed of communications, are further supported by previous research findings. These factors were particularly significant in the retail, manufacturing, distribution and government industry-sectors. At the other extreme, it is worth noting that none of the industry-sectors reported statistically significant results with respect to data sharing. This may be attributed to the limited use of planning and forecasting applications at the time the survey was conducted.

4.4.3.2.4 Streamlining internal processes

Only the manufacturing industry reported having achieved benefit from improved internal processes. It is suggested that the variables associated with these processes focusing on core business, require in-depth analysis at the corporate level. This is investigated in further detail in Sections 4.4.3.4 and 4.5. Furthermore, the pre- and post-technology implementation impact should be properly assessed in order to determine the effect of introducing the technology.

4.4.3.2.5 Improving customer service

Interestingly, none of the industries reported significant improvement in customer service neither with respect to improved customer service nor to loyalty. This may be attributed to the sophisticated level of EDI adoption in the UK industries where EDI is no longer viewed as a service differentiator but rather as a business necessity.

4.4.3.3 Benefit associated with integration of EDI with internal business processes

It is evident from the analysis presented above that EDI drivers and benefits vary across different industry-sectors. However, the EDI literature suggests a positive correlation between the benefits achieved and the extent of EDI integration (e.g. Swatman *et al.*, 1994). Meanwhile, compared to the large body of theory, there is little empirical research into the level of EDI integration in internal business processes (Bergeron and Raymond, 1992). Therefore, it was decided to further investigate this notion in an attempt to reveal the primary EDI-related factors responsible for reporting maximum business benefit.

The research explored the hypothesis that maximum benefit is achieved in industries where EDI is integrated into those processes which are representative of core business activity. Support was found for this assumption as well as for the hypothesis that difficulties in the EDI implementation process are more likely to be significant in those industries which have failed to integrate EDI into core business activity. This is particularly useful in developing the national EDI strategy as it identifies the underlying success element in EDI adoption that can be promoted across various industry-sectors to attain the maximum business benefit pursued. Furthermore, a finding of such generic nature can be replicated in developing countries.

Accordingly, the degree of integration of EDI applications with in-house applications, (i.e. the extent of automated processing and electronic transfer without human intervention), was incorporated in the questionnaire form to investigate the level of integration of EDI with internal business processes. Respondents were asked to select the statement most appropriate to their EDI practice from the following five alternatives.

a) EDI data is processed separately and re keying is the norm.

b) Incoming data is usually adjusted by employees, before further electronic processing takes place.

c) Outgoing data is processed on a different machine; the data generated requires adjustment before transmission.

d) Incoming data is transferred electronically without human intervention.

e) Outgoing data is transferred electronically without human intervention.

Industry	No	Processed Separately		Incoming Adjusted		Incoming Automated		Incoming NR		Outgoing Adjusted		Outgoing Automated		Outgoing NR	
		No	%	No	%	No	%	No	%	No	%	No	%	No	%
Retail	15	0	0	0	0	13	86.7	2	13.3	0	0	15	100.0	0	0
Manufacturing	21	0	0	6	28.6	13	61.9	2	9.5	0	0	21	100.0	0	0
Distribution	10	0	0	1	10.0	8	80.0	1	10.0	0	0	10	100.0	0	0
Utilities	7	2	28.6	0	0	2	28.6	3	42.8	1	14.3	3	42.8	1	14.3
Pharmaceutical	7	1	14.3	1	14.3	5	71.4	0	0	0	0	6	85.7	1	14.3
Government	8	0	0	1	12.5	3	37.5	4	50.0	1	12.5	5	62.5	2	25.0
Services	7	0	0	2	28.6	4	57.1	1	14.3	0	0	6	85.7	1	14.3

Table 4.5 Industry-specific Level of EDI Integration in Internal Business Processes.

The responses to these statements are classified by industry-sector in Table 4.5. Support for the above mentioned view that maximum benefit is achieved through the integration of EDI with internal business processes is observed in the replies from the retail, manufacturing and distribution sectors which show a correlation between benefit achieved and the level of EDI integration. Of interest, however, is the pharmaceuticals industry where despite the fairly high level of integration into internal processes, business benefits appeared non-significant. Whilst acknowledging that this is based on a small number of respondents, results would tend to challenge the assertion that directly attributes benefit achieved to the level of EDI integration into internal business processes irrespective of the nature of the EDI application. It is hypothesized here, that not only is benefit correlated with integration with internal processes, but is also dependent on the extent to which such processes are representative of the core business activities of the organization. This is illustrated in the following section.

4.4.3.4 Relationship between EDI applications and core business activities

To cater for this investigation, data was collected on the type of applications used in the various industry-sectors and the extent to which these were integrated with applications which might be considered core to the activities of the organization.

Based on the collected data, the following results were found.

- The EDI applications adopted by retail, manufacturing and distribution sectors, in which benefit is most significant, are primarily invoices and orders, which are representative of their core business activities in terms of procurement and sales.

- The government sector, where only operational benefits are significant, use of EDI applications is representative of its core activities. For example, educational boards use EDI to provide information for teachers, exam entries and results. However, whilst these applications are representative of the core business activity there is limited integration of EDI with the internal business processes. This may account for the limited success of this sector with EDI. Where government organizations successfully integrated EDI into core business activities, the results are very satisfactory as in the case study of HMSO described in detail in Section 4.5.

- The pharmaceuticals sector for which benefit is not significant in contrast with the government sector, has integrated EDI into business processes, but its use is primarily in the traditional context of EDI, i.e. exchanging procurement documents. In this case, EDI is integrated with internal processes, but these are not representative of core business activity such as research and development.

These findings, depicted in Figure 4.4, would tend to suggest that, for maximum benefit to be achieved, EDI must both be integrated into internal business processes and these must be representative of the core business activities of the organization.

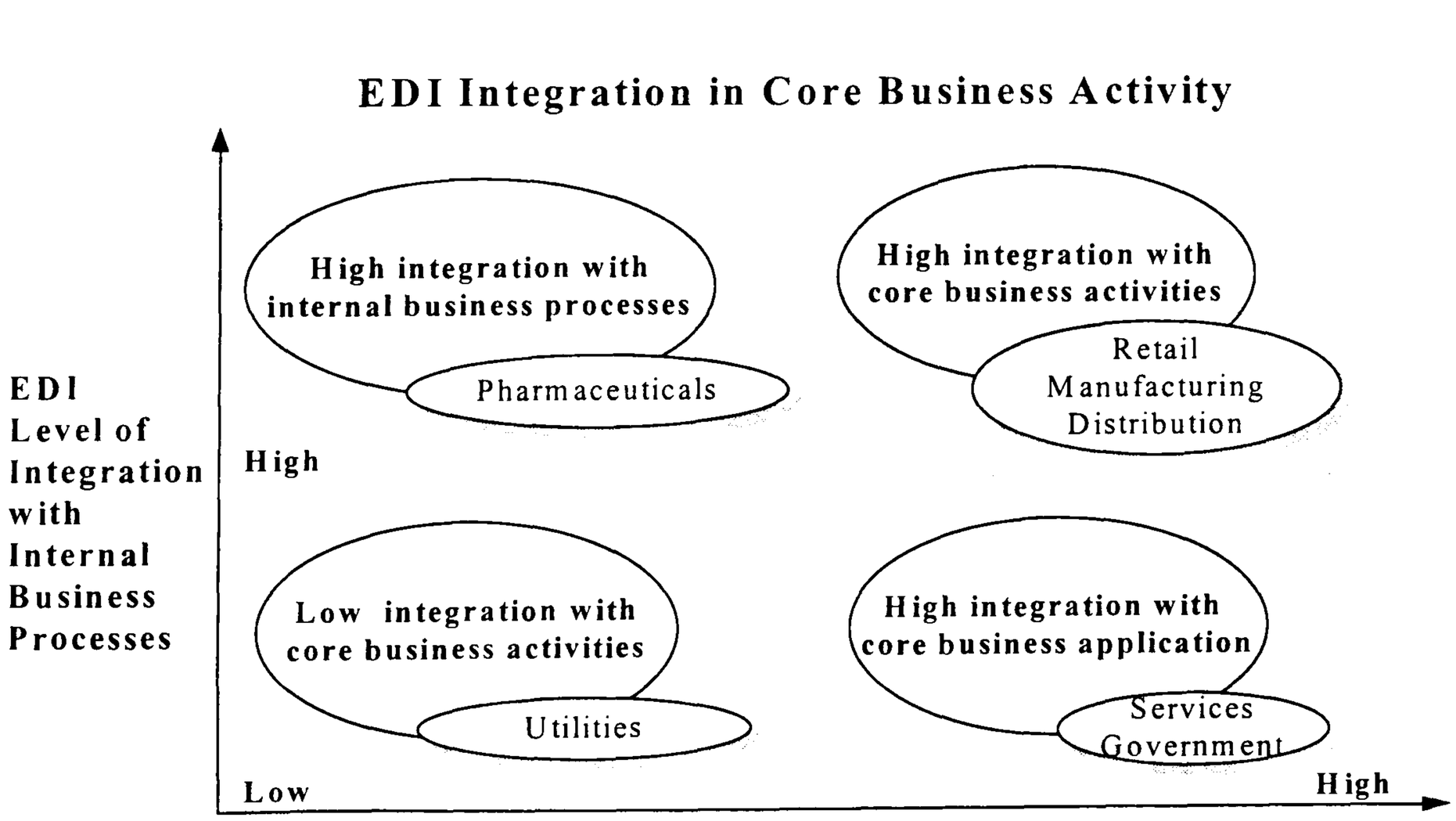


Figure 4.4 EDI Integration in Core Business Activity.

4.4.3.5 Barriers and implementation difficulties

This section provides a brief comparative analysis of the pre-implementation barriers and the difficulties encountered during EDI implementation across the seven surveyed

industry-sectors. An interesting outcome of the current research is the lack of correlation between what respondents initially perceived as potential barriers to the introduction of EDI and the actual difficulties subsequently experienced with the implementation process itself. In general, organizations did not perceive factors such as the adaptation of existing processes, cost or the introduction of trading partners as barriers prior to EDI implementation as given in Table 4.6. Yet, these factors were seen as difficulties during the implementation process as can be observed from Table 4.7. This highlights the importance of early comprehensive planning. Policymakers and practitioners need to be adequately briefed of the potential difficulties to account for them in developing the national EDI strategy.

It is important to bear in mind that survey participants completed the questionnaire after having implemented EDI. It would have been most interesting if it were possible to have conducted the survey in two phases, pre- and post-implementation. This might have been possible in an experimental environment, with a very limited number of organizations. However, the results would have been very limited and questionable. In addition, such approach would suffer from lack of comprehensiveness and the impossibility to draw comparisons with other factors across other industry-sectors. Therefore, it was decided, finally to attempt to capture the pre-implementation perception within a wider community of EDI adopters through flash back questions.

The results showed indications of under-estimation of the complexity involved in the implementation process as none of the 15 examined factors (Table 4.6) reported statistically significant results at the domestic trading community level. It was, therefore, important to capture these barriers in the research as they are representative of potential EDI users concerns. Although it is acknowledged that they may possibly vary in intensity from one country to another, yet policymakers still need to be made aware of them as potential inhibitors to EDI development.

Pre-implementation barriers reported, at an industry level, were fairly limited. As given in Table 4.6, statistically significant results were confined to the manufacturing and pharmaceuticals industry-sectors. The former sector respondents highlighted concerns regarding lack of EDI awareness and budget limitations. These concerns were further endorsed by the implementation difficulties they reported, where introducing EDI to new trading partners and cost justification aspects (Table 4.7) were defined as significant difficulties. Meanwhile, in the case of the pharmaceuticals

industry, concern was expressed regarding trading partners not using EDI as a potential implementation inhibitor.

FACTORS	Retail	Man	Dist	Gov	Utils	Ser	Pharm	All
MARKET OR TP DRIVEN								
TP not considered	0.9999	0.7019	0.8413	0.9999	0.7257	0.6217	0.500	0.91
TP do not use EDI	0.9222	0.4013	0.7939	0.9484	0.7734	0.2546	0.001 **	0.34
Competitors do not use EDI	1.0000	1.0000	0.9918	0.9999	1.0000	1.0000	0.9999	1.00
INTERNAL								
Organizational Issues								
Organization not considered	0.9999	0.9999	0.9943	0.9999	1.0000	1.0000	0.9999	1.00
EDI not related to core business	0.2005	0.9999	0.9332	0.6331	1.0000	1.0000	0.9429	1.00
Lack of awareness	0.2451	0.001 **	0.0505	0.8413	0.7088	0.3050	0.6368	0.26
Lack of management support	1.0000	0.3594	0.9115	0.7486	0.9830	0.9999	0.5000	1.00
Data/Information Exchange								
Concerns over legality	1.0000	1.0000	0.9943	0.9929	0.9554	0.9515	1.0000	1.00
Security of data	1.0000	1.0000	0.7088	0.8413	0.9830	0.9911	1.0000	1.00
Lack of signatures	0.9909	1.0000	0.9082	0.7823	0.9545	0.6554	1.0000	1.00
Technical Issues								
Technical difficulty	1.0000	1.0000	0.9918	0.9999	0.9999	1.0000	0.9981	1.00
Implementation complexity	1.0000	0.9429	0.8413	0.5000	0.9767	0.9066	0.9999	1.00
Cost/ Budget								
Budget limitations	0.9999	0.0116 *	0.5948	0.8413	0.9738	0.9732	0.6368	0.99
Not expected to be cost effective	0.9808	0.0655	0.5000	0.7019	0.7910	0.8264	0.8790	0.89
Business Processes								
Change of traditional business processes	0.9999	1.0000	0.4090	0.5000	0.6026	0.9066	0.8133	1.00

One tailed t-test *=0.01 significance level; ** 0.001 significance level
Scale: 1=not at all, 2=minor, 3=moderate, 4=major, 5=extremely

Table 4.6 Pre-Implementation Barriers, UK 1993.

It is interesting to note that those industries with the highest EDI usage (retail, manufacturing and distribution) experienced the least difficulty with implementation. Where implementation difficulties were significant in high usage sectors, such as manufacturing and distribution, those were primarily confined to the introduction of new trading partners. In the case of the manufacturing industry cost justification was also reported to be problematic. Surprisingly, however, no apparent implementation difficulties were cited by respondents from the government sector. This may reflect the relatively limited use of EDI by the government within a controlled environment.

4.4.3.6 Implementation difficulties

As given in Table 4.7, technical requirements in terms of selection of a communication method, VANS and standards did not present problems as given by the replies of all survey respondents. This would suggest that the problems of introducing EDI are

organizational rather than technical. The major implementation difficulties reported may be classified as follows.

4.4.3.6.1 Introduction of new trading partners

Based on Table 4.7, it seems that the introduction of new trading partners was perceived as a major impediment to EDI implementation. However, in the case of retail, government and utilities sectors, the above result does not hold and can possibly be attributable to the trading power and network structures in these sectors. Difficulties experienced by the manufacturing and distribution sectors where EDI is well-established and its usage widespread is somewhat surprising. A possible explanation of this result is that this is not a reflection of reluctance by trading partners to embrace EDI, but rather an indication of their caution in committing to inter-organization systems. The results are more easily explained in other sectors such as the pharmaceuticals industry, where the usage of EDI has not yet reached a critical mass and where the industry itself has only adopted EDI in response to retail requirements. The need to address the problem of how best to introduce trading partners was highlighted by the respondents throughout the open-end questionnaire questions. It is interesting to note that despite the common belief that awareness of EDI is widespread, 45% of respondents emphasized the need to increase community awareness of EDI business applications and benefits and in order to facilitate the introduction of new trading partners. Furthermore, 40% of respondents recommended that the business community should be better educated with regard to EDI, and promoting its benefits. In addition to establishing new trading partners, difficulty was also experienced in meeting the requirements of existing trading partners in the service sector. This may be related to the wide range of EDI applications used in this sector. This essentially calls for a need to incorporate trading partners requirements during the early stages of implementation to avoid further complications during the process itself.

4.4.3.6.2 Cost justification and legal requirements

As in the wider area of information systems, justification for investment in EDI is problematic as indicated in Table 4.7. Statistical significance was found for manufacturing, utilities, service and pharmaceuticals industry-sectors. Detailed EDI-specific cost justification techniques need to be developed in order to validate the associated benefits. What is required is evidence, not only of operational benefits, but also support for the claim for the wider benefits claimed from EDI implementation reflecting industry-specific gains.

Sorting out legal requirements was only significant in the Services sector. However, it should be acknowledged institutionalizing and legalizing the diversity of applications within the services industry is an extremely challenging task. Moreover, adoption of EDI in this sector had not been subject to supply chain pressures. It rather evolved on voluntary basis and was limited to major business partners.

FACTORS	Retail	Manuf.	Dist	Gov.	Utils.	Services	Pharma	All
MARKET OR TP DRIVEN								
Introducing EDI to new TP	0.19	0.003 *	0.008 *	0.72	0.50	0.003**	0.006**	0.001 **
Meeting TP requirements	0.70	0.048	0.50	0.72	0.01 *	0.01*	0.67	0.08
Planning implementation with TP	0.79	0.50	0.72	0.94	0.05	1.00	na	0.63
Technical Issues								
Selecting communications method	0.99	0.99	0.99	0.97	0.98	0.85	0.99	1.00
Selecting VAN	0.99	0.99	0.99	0.99	0.99	0.95	0.99	1.00
Selecting software	0.98	0.95	0.79	0.97	0.98	0.50	0.10	0.99
Selecting Standard	0.99	0.99	0.95	0.99	0.64	0.99	1.00	1.00
Access to technical support	0.35	0.97	0.06	0.93	0.95	0.35	0.98	0.96
Cost and Legal								
Cost justification	0.82	0.001 **	0.12	0.50	0.01 *	0.003**	0.006**	0.000**
Sorting out legal requirements	0.94	0.88	0.88	0.93	0.14	0.01*	0.14	0.92
Business Processes								
Integrating EDI with internal business processes	0.37	0.41	0.50	0.14	0.000**	0.07	0.10	0.01 *
Adapting traditional business processes	0.67	0.02	0.25	0.27	0.003*	0.03	0.05	0.000**

One tailed t-test *=0.01 significance level; ** 0.001 significance level
Scale: 1=not at all, 2=minor, 3=moderate, 4=major, 5=extremely

Table 4.7 Industry-specific Post Implementation Difficulties, UK 1993.

4.4.3.6.3 Adapting existing business processes and EDI software integration

Emphasis has been placed on EDI as a vehicle for BPR as reported by Swatman *et al.* (1994). In order to further investigate the relationship between BPR and the role of EDI, respondents were asked whether prior to implementing EDI they had considered adapting existing business processes to meet EDI requirements as a barrier to implementation. Obtained responses were not statistically significant, however. This implies that having to adapt existing business processes was not perceived as a barrier prior to EDI implementation (Table 4.6). However, responses from all respondents reported that post-implementation difficulties were experienced in adapting existing business processes and integrating EDI software with in-house applications (Table 4.7). This is particularly true in the case of the utilities sector.

The difficulties experienced focused on cost, meeting trading partners requirements, adapting existing business processes, and integration of EDI software. The utilities sector,

in particular, experienced significant problems in this regard. With respect to cost justification, significant levels were also found for the manufacturing, pharmaceuticals, utilities and services industries. This calls for the development of EDI-specific cost justification techniques, highlighting benefit and validated through empirical research. Furthermore, there is a fundamental requirement for evidence of strategic and industry-specific requirements beyond the operational benefits.

It is advocated that this contradiction between pre-planning expectations and post-implementation outcomes highlights the need for early awareness of the impact of EDI on internal applications and processes. Furthermore, there is a requirement to incorporate mechanisms to identify and implement potential subsequent changes.

4.4.3.7 Closure

The industry-sector analyses reported in this section contribute towards the research objectives in three ways. First, the results identify both the EDI contextual and infrastructure-related factors that influence EDI adoption across seven industry-sectors. The results indicate that EDI motivational drivers and benefits, and implementation barriers and difficulties vary across sectors. The variances are based on the industry structure, inter organizational relations, competitive pressures and business requirements. Such differences should be acknowledged and deployed to generate maximum business benefit as a result of EDI implementation. Second, it is revealed that integrating EDI with core business activity is a pre-requisite to achieving maximum industry-specific gains. Third, it clearly appears that in order to plan for successful implementation, it is necessary to examine the technical conditions and constraints particular to each industry-sector that influence the extent of implementation success.

4.5 ORGANIZATION LEVEL ANALYSIS

This section focuses on the organization level analysis. As previously stated, the rationale for including organization level analysis within the scope of this work is that no effective industry or national level strategies can succeed without the support and acknowledgment of the implementation agency, i.e. the individual organization. Therefore, the analysis in this section will focus on examining the strategic impact of EDI on the organizational performance.

4.5.1 The Need for Organization level Analysis

As the organization is the nucleus where the actual EDI implementation occurs, it is agreed that it is the entity that benefits most from exploiting and extending the role of EDI. For developing countries in particular, transferable lessons at the organization level are often easier to replicate. There are a number of international assistance programs and grants from international funding agencies, such as the World Bank and the EU to enhance the efficiency and effectiveness of large organizations. For example, the *mise-a-niveau programme* for the Middle East North Africa region sponsored by the EU as part of the Industrial Modernization Programme is likely to consider EDI adoption to streamline internal processes in large corporations.

Moreover, much of the corporate level analysis on EDI has focused on its strategic potential and its role as an enabler in BPR, which is particularly appealing to organizations in both developed and developing countries. Yet, despite the development of a number of EDI implementation frameworks, there remains a paucity of case studies and empirical research to support the validity of these frameworks. Detailed accounts of how successful implementation of EDI is achieved, particularly in organizations gaining large scale financial advantages from its introduction, are not widely documented. There is a requirement for empirical support and case studies, not only to verify EDI's capacity to generate strategic benefits, but also to document how these benefits could be achieved.

4.5.2 The Pertinent Organization Issues Investigated

The case of HMSO, described hereinafter, shows how this organization exploited its position within the public sector, taking advantage of the volatile British political environment as well as its reputation as a supplier to central government, to successfully grasp the opportunity to integrate disparate systems and achieve a strategic advantage through EDI implementation, as previously stated in Section 2.3. The study also illustrates how the traditional role of EDI as a document exchange platform has been extended to that of systems integration and corporate change agent to cater for changing business requirements and technological developments.

It is believed that EDI may provide strategic advantage to an organization, as discussed in Section 2.3.5, but this is dependent upon a number of corporate-specific factors that should be certainly studied, namely,

- The vision to incorporate business requirements and dynamics of the market place.
- The ability to integrate EDI with core business processes and to exploit the available technology innovatively.
- The capacity to accommodate the changing business and technical requirements, within the corporate EDI implementation strategy. Support for these arguments is provided by the present HMSO case study.

The above is particularly valuable to the wider research objectives of defining recommendations to developing a national EDI strategy as it illustrates how a public sector organization can pursue strategic benefits through EDI implementation. The following description documents the implementation modality and discusses the experienced benefits and challenges. The description of the process of implementation itself is a valuable contribution to the existing knowledge base as it stresses the factors critical to successful EDI implementation as detailed below. To conclude, the case study findings are mapped within the Walsham (1993) synthesized analytical framework on organizational change to systematically unveil a host of social issues which were critical to EDI success.

4.5.3 The HMSO Case Study

Until September 1996, HMSO was a British government organization with a turnover approaching £400 million per annum. It is a transaction-driven organization which sources and supplies stationery products, office supplies and equipment, printing and publishing facilities to the public sector as well as provides publishing services to the private sector. The public sector from 1786 till the early 1980s was dependent on HMSO for the sourcing and supply of office stationery. The commercial environment was one of a protected customer community bound by government commercial agreements. In 1980, the government changed purchasing policies, altering HMSO's status to that of *Trading Fund*, thus granting the customer base the freedom to choose suppliers on the basis of competitive price and quality. As a result, whereas previously HMSO operated in a protected customer environment, these policy changes forced it to move to a position of open competition. At the same time, large scale *value for money initiatives* introduced by the government meant that the public sector agencies, which constituted a major percentage of HMSO's customer base, gained greater control over their budgets. Consequently, HMSO faced the risk that its established and guaranteed customer base might move away from wholesale suppliers such as itself, to retail

suppliers already operating in the private sector. HMSO was confronted with a crisis situation in which it was in danger of losing its customer base.

In response to the changes stated above, in 1987 a review was undertaken at HMSO to improve performance, control costs and increase competitiveness. The review resulted in the implementation of a TQM programme and the adoption of supply chain management techniques (Sawhney and Williams, 1994). The programme was fully supported at the highest levels of decision making. In fact, senior management vision has been a primary driver directing HMSO at the time. The review particularly highlighted the need to increase efficiency and improve the quality of customer service. Accordingly, it was decided to implement EDI technology as the enabling mechanism to achieving these objectives. This strategy proved to be successful and in 1992, when senior management adopted a BPR strategy, the potential role of EDI in developing new markets and/or changing the nature of the business environment was assessed and the extension of HMSO's existing electronic trading endorsed. The history of EDI implementation at HMSO is described below.

4.5.3.1 Early implementation of EDI

Input for the description of the history of EDI implementation at HMSO is derived from examining existing literature, published and internal reports in addition to the results of the interviews carried out in this thesis. As detailed by Sawhney and Williams (1994), in 1987 the first implementation of an on-line order receipt system was developed to reflect the needs of commercial bookshops and accredited agents, and the implementation was restricted to this community. This improved ordering and delivery and provided uniqueness to both products and services, thus increasing the customers' cost of switching to alternative suppliers. This successful outcome indicated that electronic capture facility could provide significant benefit to HMSO and had a clear application to the Business Supplies Division where the goods supplied could be identified by discrete coded numbers and the exchange document information structured. At that time, HMSO was aware of the fact that the majority of their customers were not EDI capable, and, therefore, an on-line order entry system was implemented. This system, HMSO Enquiry Access and Rapid Trading (HEART), based on customer requirements, was developed in 1989 and provided online access to an electronic catalogue with a screen-based order creation and authorization

facilitation. In parallel, HMSO's EDI capable customers communicated their requirements through VANS providers.

4.5.3.2 Analysing and extending the role of EDI

By 1992, HMSO was conducting in excess of £30 million worth of electronic trading. However, arrangements were ad hoc and unfocused across the organization and did not provide the necessary security, data validation, audit and control required for the increasing amount of valuable information it was handling. As indicated during the interviews, communication links also were beginning to show signs of strain, with occasional slow downs (Currie, 1995). Investigations were undertaken to consider how electronic trading could deliver new business opportunities for HMSO and allow them to provide value to what was increasingly becoming a commodity market. The investigation focused on the trading and finance divisions within HMSO. An analysis of the *strengths, weaknesses, opportunities and threats* (SWOT) for each trading division was initiated, detailing the potential benefits of electronic trading to HMSO and its trading partners together with any dependencies. It was most useful examining the project document and the detailed SWOT analysis underlying HMSO's potential and the corporate capacity to achieve it. However, it is unfortunate that for confidentiality purposes it is not possible to include precise information from the document as to how the actual assessment process was undertaken. Suffice to mention, for research purposes, that consideration was given to whether electronic trading could enable the organization to develop new markets or to change the nature of the business, thus reducing its dependency on existing markets. It is also worth mentioning that HMSO examined a major private sector retail outlet to assess the trends and identify the challenges facing the private sector community.

4.5.3.3 Adding value to existing business strength through EDI

As emphasized by HMSO management during the interviews, amongst the more apparent strengths of HMSO was its position within government as well as its expertise both in central government issues and in electronic trading. From the point of view of customers, it was perceived as the supplier to central government and, therefore, was considered *safe*. However, this position needed to be consolidated and strengthened in the light of changing government policies. A unique service was required in order to protect its existing customer base from competition with the private sector and to attract new customers. Opportunities existed for a number of

options, such as the introduction of *one stop shopping* providing the customer with a single source for publications and printing materials. Other opportunities included the potential to provide a legislation database for solicitors and material for local authorities which provides information on the latest Acts which they could subsequently distribute to relevant parties.

A further opportunity existed for HMSO to provide consultancy and management services. It had acquired a great deal of know-how in the area of procurement in the public sector which could be exploited. It also had expertise in software development for specific information databases. In order to evaluate the range of opportunities available, HMSO assessed each one against a range of criteria. Included in these criteria were the associated costs and benefits, how speculative each option was, the ease of introduction, the extent to which the customers' requirements were known as well as the benefit to the customer, and the extent to which the process was core to the business. Finally, a technological opportunity existed to extend the existing HEART system as a base on which other facilities could be developed. The existing catalogue system could be extended to cover all the services provided by HMSO, thus supporting the above mentioned concept of *one stop shopping* for customers.

4.5.3.4 Extending EDI functionality, the EDI Corporate Gateway

It was decided that in order to meet the business objectives, the existing EDI implementation would be extended to logistics and supply activities and controlled centrally within HMSO through the implementation of an *EDI Corporate Gateway*. It was indicated during the interviews that the HMSO has initiated a new prototype of the role of VANS, but at the organization level. They, therefore, introduced the EDI Gateway at the inter-departmental to facilitate internal electronic interactions. Investigating the various descriptions of this system that appeared in the interviews, it was possible to schematically present the HMSO EDI Gateway as shown in Figure 4.5.

Depicting the EDI Corporate Gateway as shown below, reveals that the system design was a response to both the business requirements outlined earlier as well as to technical requirements to integrate disparate systems. It comprises a number of modules providing the management and control facilities for the exchange of information communications. Orders received (via HEART, value-added networks, telephone or post) are integrated by the on-line capture and placement systems which in turn interact with the warehouse system or raise a supplier order. Given that one of

the elements of interest of this thesis is to investigate the EDI intra-organizational potential, this section describes some appropriate technical aspects of EDI implementation to illustrate its potential as a systems integrator.

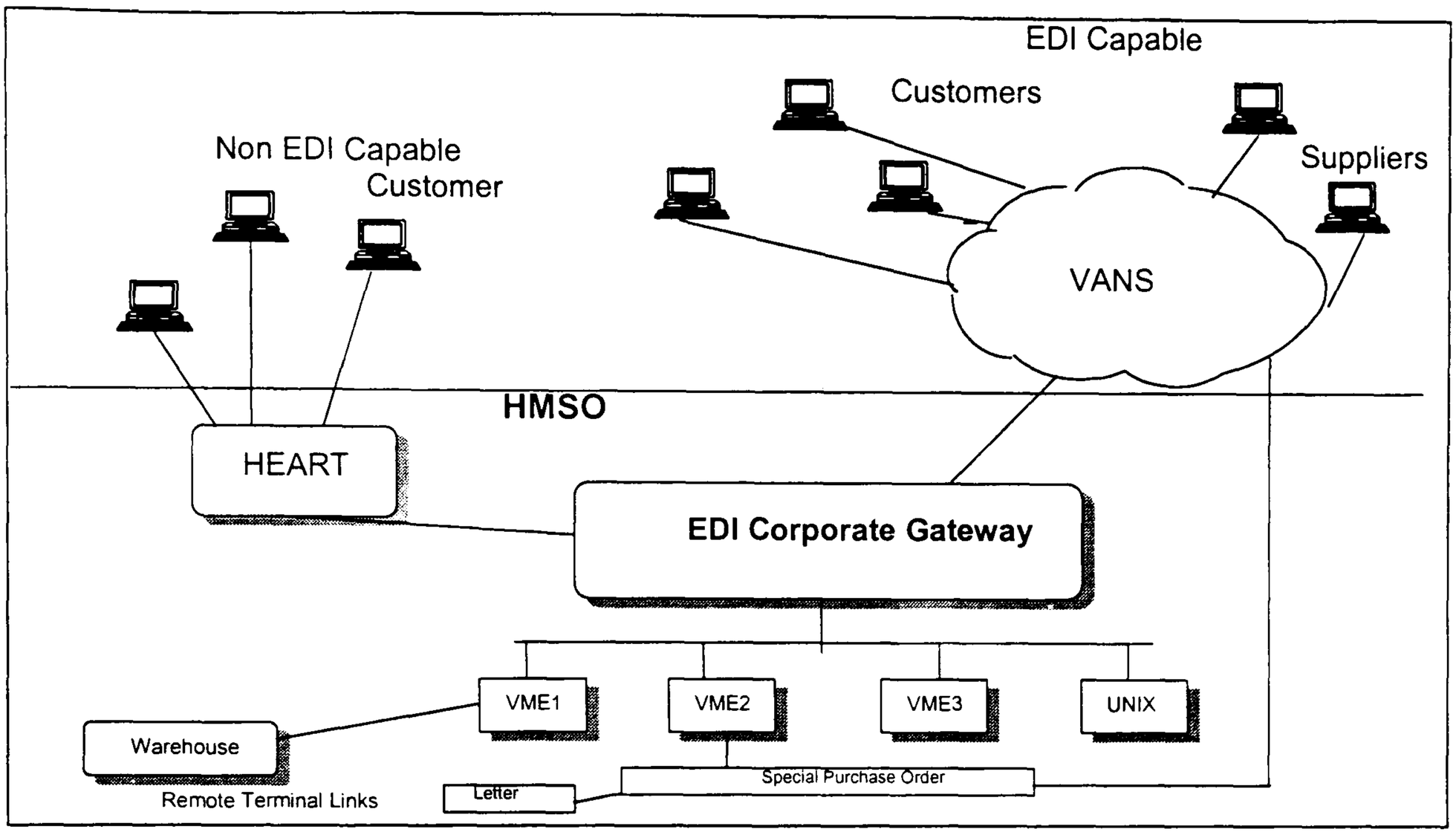


Figure 4.5 HMSO EDI Corporate Gateway.

Again it was frequently emphasized during the interviews that the HMSO EDI Gateway has many benefits and features. It was possible after thorough examination of the interview results and in light of the revisions with the interviewees and the primary informant to summarize the key features of this Gateway in the following points.

- Single access capacity: based on a single trading interface to connect HMSO internally and externally to all trading partners both within and outside the UK. The gateway includes a built in translator to convert data from in-house applications into EDI format (such as TRADACOMS, EDIFACT or ANSI X12) and vice versa. The translator uses data conversion tables to define EDI format and in-house format, and thus by adding tables, you can handle as many different documents types as necessary both for EDIFACT and TRADACOMS.

- A comprehensive and flexible technical platform. In order to cater for the varying trading community technical setups, it was necessary to provide open systems communications and multi-network connect facilities to access the various VANS. The Corporate Gateway is based on open systems technology to ensure maximum integration into existing business applications, ensuring that existing investments are maintained. The Corporate Gateway provides a powerful facility to manage its

communications with other network services. It is also necessary to ensure system resilience, security and reliability. When purchase orders are delivered to HMSO, the gateway information flow control system invokes HMSO-specific routines to carry out data integrity checking to ensure the correctness and validity of the messages exchanged. The Gateway also manages trading partners profiles and the relevant HMSO relationships.

- Enhanced administrative functions are required to maintain the information needed for business and legal purposes as well as management and billing information in a single auditable repository. This information details trading profiles and statistics. In addition, a number of audit and status reports are generated to track details of a document's delivery and receipt.

- Agent Tasks: the functionality of the construction and translation agents was technically adapted and extended to co-ordinate the exchange of internal as well as external business applications by establishing a standard means of business communication. This central facility referred to as *agent tasks* minimized the requirement to change existing systems. These *agent tasks* referred to in programming terms as *user hooks* are built into the trading relationships and allow for assigned tasks to be implemented whenever the relationship is invoked. These are basically UNIX shell scripts or other user-written programs which are invoked whenever the trading relationship is checked. As a result, the trading relationships are no longer passive, but rather active. It is believed that this functionality allows for greater flexibility, power and accountability because the scope of the agent tasks is limited only by the scope of the programming script created by the user. Tasks can thus be defined to validate internal or external trading relationships, conduct security checks, add or extract data from a database, trigger routines in a different system, route message destination, setup audit information, or archive pre-specified messages, thus building in intelligent information management as well as applications and systems integration. Further, *agent tasks* provide a central capacity to accommodate future change by simply adding or modifying existing script files. Although, this study does not adopt a technical framework to accommodate such level of technical detail, it is believed that such features cater directly towards the current research objectives in terms of enhancing the understanding of the issues involved in EDI adoption.

- The Corporate Gateway incorporates Help Desk facilities, EDI construction and translation, audit trail and data tracking, sending EDI formatted and unformatted data, security management, trading relationships definitions, management tools and reports

with very flexible methods of connection including X.400 technology. The Gateway as such acts as an intelligent information manager, offering sophisticated facilities for control of business information flows.

4.5.3.5 Innovative use of EDI technology - systems integration

It is clear from Section 4.5.3.4 that the HMSO EDI Corporate Gateway has many features, on top of which are integrating disparate systems applications and defining trading relationships. It was at this stage very important to start a discussion during the semi-structured interviews about the implications of flexibility that resulted from the above-mentioned features of the Gateway. Analysing the answers and various points raised, it was possible to infer the implications as setout below.

The HMSO EDI Corporate Gateway served to achieve the following tasks:

- Minimize the requirement to change internal existing systems. Whenever change is needed, it is centrally absorbed through the use of the Gateway using agent tasks functionally capable of invoking the specific pre-defined routines and macros associated with a particular application, system or trading partner.
- Automatically validate and route documents to one of the four internal operating systems (Figures 4.5), covering printed goods, publications, office supplies and financial systems, or to an external supplier according to the pre-defined parameters in their respective trading relationships. As a result the corporate gateway automated the entire process of creation and dispatch of HMSO's orders to suppliers originating either from customers orders or to replace warehouse stock.
- Position the gateway as the central backbone for corporate systems serving as a change agent, enabling and managing potential future corporate systems and/or applications change requirements. By absorbing any potential change requirements centrally, i.e. ensuring data coming into or moving across HMSO is dealt with in a standard format, costly and complex conversion code is eliminated and may be re-used across the organization.

4.5.3.6 Relationship with the trading community and suppliers

A primary objective throughout the implementation of this project was to enhance cooperation with trading partners and establish closer trading relationships within the relevant business community. The initiation of the electronic trading strategy provided an opportunity to understand requirements of trading partners, re-negotiate terms in the

light of exploiting the technology and communications capacity, and further enforce collaborative efforts. It was inferred from the interviews, that for customers, HMSO incorporated the use of EDI in bid offerings as a positive business differentiator. This provided the opportunity to work more closely from the beginning with the trading partners to understand their corporate needs and EDI requirements. It also offered the opportunity to support non-EDI users and assist them in adopting and implementing EDI. In order to address the needs of suppliers, HMSO adopted a formal roll-out programme in partnership/collaboration with a VANS. Senior staff members addressed suppliers at seminars especially organized to introduce the benefits of EDI implementation. The implementation itself was undertaken with a number of key suppliers so that the objectives of both parties could be understood and achieved.

The HMSO study also investigated EDI impact on business performance and processes. A number of strategic, technological and business process reengineering benefits were identified as outlined hereinafter.

4.5.3.7 Main benefits of the system

The interviews with HMSO management revealed that organization-wide technical, operational and strategic benefits were achieved. Furthermore, based on the questionnaire results, the specific operational and efficiency benefits reported to have been achieved focused on *improved customer service*, *improved cash flow* and *reduced clerical error*. HMSO states that EDI transactions are 10 times less likely to contain an error than traditional document processing and exchange methods. However, it is the strategic benefits identified during the interviews that are more enticing. For example, it was emphasized during the interviews with the BPR Director in August 1994 that through the use of EDI as a backbone to its TQM and BPR strategy, in an extremely competitive field, HMSO has been able to retain and expand its customer base (Currie, 1994). As a result, financial gains, including the value of business won and cost efficiencies resulting from the introduction of EDI, were estimated to range between £5-10 million per annum. During the follow-up interviews held in 1996, the above mentioned results were further re-enforced. HMSO management indicated during the interviews then that *'in 1993 the annual value of HMSO's business leaped to Sterling £45 million, a tenfold increase on 1991. Customer benefits comprise faster and more accurate ordering, reduced costs, greater control over cash flow and improved management information'* (Currie, 1996). Moreover it was indicated that, in 1995 a

major tender with Inland Revenue worth in the area of £4 million would not have been awarded if HMSO had not been EDI capable.

In addition, technological benefits were also reported in the interviews. For example, HMSO connected three mainframe computers and one UNIX operating system to the EDI corporate system utilizing the EDI technology as a systems integrator. As indicated in the interviews, the introduction of the EDI Corporate Gateway facilitated the transfer of structured data internally within the organization and externally amongst HMSO suppliers and customers. It also provided an integration enabler for in-house applications, integrating various organization applications, whether ordering, accounting or other, as well as integrating corporate systems, connecting diverse IT platforms. Although EDI has been traditionally perceived as an inter-organization means of exchanging structured data, at HMSO, the same functionality was applied to the individual, fragmented intra-organization systems. It was indicated during the interviews that this implementation scenario was designed to encourage continuous modification and enhancement at minimum cost. However, it is believed that such implementation modality accentuated EDI competence as a central corporate change agent for managing future business and technical change requirements. On the basis of the flexibility of the system, HMSO are expanding their use of electronic trading to include invoicing, order acknowledgment, dispatch advice, self billing and forecasting and are planning to pilot the use of electronic funds transfer and generic credit cards with central government authorities. A further HMSO initiative introduced in 1994 utilizes voice response technology to allow customers to generate electronic orders using touch-tone telephones.

This flexibility to accommodate change was also evident in corporate restructuring. Based on input from senior HMSO management, HMSO was originally organized on the basis of four divisions. In 1996, it comprised of 15 fragmented businesses with EDI functionality serving as a central corporate gateway accommodating the requirements of individual units and enforcing a central corporate standard for conducting business. With respect to business process reengineering, additional benefits were reported during the interviews. It was found during the analysis of those benefits, that the process of EDI evolution within HSMO, is representative of the IT-enabled business transformation model developed by Venkatraman (1994). By the way of illustration of those benefits, it was found that, the initial implementation of EDI at HMSO enabled re-configuration of the business using IT as the central lever. Then, the introduction of

EDI within the Publication Division and its initial restriction to trading partners within this community marked the initiation of the business process re-design stage which allowed transforming the traditional means of conducting business within that particular community of customers. Such initial process re-design was then extended to reconfigure the scope and tasks of the business network involved in the creation and delivery of products and services. Similarly, the extension of the use of EDI to the Business Supplies Division and the implementation of a Corporate EDI Gateway to maximize the benefit of the existing investment in EDI and to enable links to be developed with the wider trading community resulted in a *virtual business network.* The initiatives were to include non-competing products, such as orders relating to the supply of industrial uniforms and clothing, on HEART and to provide EDI consultancy often as a free service to enhance transfer bids, differentiate HMSO's service, generate new sources of income and enhance customer service profiles. This resulted in an extension of the business mission and the scope of the organization. Furthermore, parallels can be drawn with the EDI team whose role developed from one of support and coordination to one of adding value, service and products.

4.5.3.8 Managing problems

Bearing in mind the research objectives, it was imperative to examine the implementation difficulties encountered by HMSO.

As may be expected, HMSO experienced a number of organizational and technical problems in implementing the system, as well as a number of difficulties associated with introducing EDI to their trading community (Sawhney and Williams, 1994). These are organizational and technical specific. Organizational problems included constraints on staff reduction, limited capital resources, fear of the unknown, and the complexity of changing traditional business processes. Technical problems focused on the integration of EDI with internal and external systems. There were also problems associated with giving adequate weight to the needs of the different departments and the limited state of EDI adoption within HMSO's trading community. In order to address these problems HMSO took the following steps.

- An Electronic Trading Unit that provided technical assistance, training and support to the various internal trading divisions was established. The unit was also responsible for providing regular updates on the strategy and achievements. This served to alleviate

anxieties, keep staff informed and promote the *Electronic Trading Culture* within the organization.

- A TQM strategy was adopted to highlight the achievement of specified objectives and milestones.
- Detailed analysis of internal processes was conducted and the planning and management of systems modifications were carried out inline with corporate requirements.
- Training and awareness sessions were held to promote EDI use with trading community.

It is also worth noting that, a major factor in the success of the implementation was the alliance between HMSO and a major EDI service provider who was able to tailor the EDI gateway platform to meet corporate requirements.

4.5.3.9 Critical success factors

It is believed that the HMSO experience is a good example of a business proacting to the opportunities afforded by technology to meet the requirements of customers, competition and the changing environment. The introduction of EDI at HMSO was not a reaction to trading partner requirements, but was perceived as a mechanism for obtaining competitive advantage in response to a crisis situation to adapt to the changing business environment. However, the EDI strategy closely reflected the needs of the trading partners. The business activities of the organization were re-organized to maintain consistency with organizational strategy and customer expectations and to maximize the productivity of organizational resources through the use of EDI. HMSO established the business vision and objectives for enhancing and differentiating their customer service, and by clearly identifying and focusing on the core business processes and supporting them through EDI implementation. Thus, EDI was viewed not only as an automating or mechanizing force, but also as a tool serving corporate objectives and enabling the integration of various functional systems as clearly appeared from the interviews. The entire strategy for implementation of EDI at HMSO thus, demonstrates the importance of reflecting market dynamics, organizational position and strengths, and innovative use of technology. Further, it provided the technical capacity to develop new products, services and markets.

Considerable time was devoted to discussing the main reasons behind the success of EDI and HMSO pioneer experience, both with senior informants from within and

outside HMSO. It was not always a direct way to receive direct answers. However, after thorough analysis of the recorded discussion, integration of the mentioned views, elimination of redundancies and logical inference of the responses, it was possible to arrive at the critical success factors. These are summarized below.

- A corporate-wide, coherent and integrated, both upstream and downstream electronic trading strategy, reflecting the industry structure, vigorously supported by senior management and pioneered by dedicated leadership. This is supported by previous research findings where Szal and Escue (1992) call for positioning the EDI strategy as a business case, setting a high level direction, and expressing the reasons why only EDI is best for the organization. The results are also in-line with identification of the need for a wide base of support within the organization as a requirement for EDI success (Emmelhainz, 1993).
- An EDI strategy focused on customer requirements and the organizational business processes, aimed at adding value to core business (buying-distribution-logistics), eliminating time, cost and error from HMSO's internal processes, and maximizing benefit to HMSO and trading communities. This is further endorsed by Holland *et al.* (1992b) and Kremar *et al.* (1994) who stated that a common element in strategic application of EDI is the reengineering of business processes. Furthermore, Holland *et al.* (1992b) called for the strategic use of EDI through its adding value to products by increasing their information content. This was empirically demonstrated by HMSO.
- Awareness of the industry-specific requirements. The articulation of a business vision gives the EDI implementation programme a broad goal such as gaining a sustainable competitive advantage by reaching customers or suppliers electronically, or simply maintaining a position within the sector/community was also called for by Leyland (1993), Saxena and Wagenaar (1995) and Szal and Escue (1992).
- A sound technological infrastructure. This includes a comprehensive review and assessment of processes to provide for further exploitation of EDI both as an integration enabler and a corporate change agent within the business context of increasing customer satisfaction and, hence, profitability. It is therefore argued that as an organization changes its strategy, it must keep evaluating its own EDI applications to decide when it should adapt and/or launch new ones.

In order to specifically summarize the pertinent social context and process elements, the following section undertakes interpreting the HMSO case study findings within the Walsham (1993) theoretical framework.

4.5.4 Interpreting HSMO within the Walsham Theoretical Framework

4.5.4.1 Theoretical background

As previously mentioned in the literature review and the methodology design, Sections 2.8 and 3.4, respectively, Walsham's (1993) interpretation of IS in organizations was particularly valuable in defining the underlying principles guiding this research. Walsham integrates a number of theoretical approaches in social theory and contextualism into a broad framework for analysis. These include the works of Pettigrew (1985, 1987, 1990) on the context and process of organizational change, Kling and Scacchi (1982) and Kling (1987) web models and Giddens (1979, 1984) structuration theory. The synthesized framework contributes so much to understanding of organizational change associated with EDI as a subset of IS as shown in this section.

The key components of the framework and associated conceptual elements are shown in Table. 4.8, followed by a brief summary of each of the components.

Organizational change and IS: synthesized analytical framework

Key Components of the framework	Associated Conceptual Elements
Content	Organization – products/ processes/systems IS – hardware/ software/ systems
Social Context	Web models – social relations/ infrastructure/ history Multi-level contexts
Social Process	Culture – subcultures/ multiple meanings Politics – control and autonomy/ morality
Context/ Process Linkage	Structuration Theory – action and structure duality IS and modalities – embody interpretive schemes - Provide co-ordination and control facilities - Encapsulate norms

Reproduced from Walsham (1993).

Table 4.8 - Organizational Change and I.S: Synthesized Analytical Framework

Walsham commences with emphasizing the importance of the *content* of any organizational change programme. With respect to the organization, he involves products, processes and systems as well as associated changes in IS including hardware, software, operating systems and related technologies.

The second component of the analytical framework is the *social context*. This component is based on the concepts of web models as a way of identifying and tracing that social context. Elements of the approach include the social relations between participants concerned with the information system, the social infrastructure available (or necessary) for its support and the history of previous commitments in connection with computer based systems. In addition to the web models, Walsham stressed the necessity to include the broader social contexts in the analysis. He acknowledged that although it is impossible to include all such contexts in the social analysis of a particular situation, it is desirable to try to incorporate elements of these broader contexts where feasible so as to contribute to a richer social analysis.

The third component of the framework is concerned with *social process*. It involves taking both a cultural and a political perspective on the organizational changes associated with an information system. The cultural perspective stresses the relation between corporate culture and subcultures maintenance and change, and IS. Meanwhile, the political perspective emphasizes the information system as involved in the process of control and domination, and having a part to play in the dynamics of autonomy and control management.

The final component in the analytical framework concerns the linkage between *social context and social process*. Walsham employs Giddens (1979, 1984) structuration theory to address the duality of structure whereby agents and structures are not two independent sets of phenomenon, but represent a duality whereby structure is drawn on in human interaction, but in so doing, social structures are produced and reproduced. The structuration theory provides a clear definition of the mechanisms 'modalities' of linkage between context and process. Three modalities are used to conceptualise the linkages between context and process: interpretive schemes, facilities or resources, and normative sanctions. Firstly, human communication involves the use of interpretive schemes which actors draw on to make sense of their own and others actions. They thereby produce and reproduce structures of meaning termed 'signification'. Secondly, human agents utilize power in interaction by drawing on facilities and resources. In doing so, they create and recreate structures of 'domination'. Thirdly, human agents sanction their actions by drawing on norms of morality. Thus, social structures of 'legitimation' are maintained or modified. Walsham argues that IS are deeply involved in the above mentioned modalities which link social context and social process in contemporary organizations. In other words, computer-based IS embody interpretive

schemes, provide coordination and control facilities and encapsulate norms. As such the structuration theory offers a detailed view of the constitution of social life. The above description of the modalities implies that social action can not reproduce existing social structure, but also produce new structure.

4.5.4.2 Applying the Walsham analytical framework to the HMSO case

4.5.4.2.1 Social context

The findings reveal that the success of EDI to cater for enhanced customer service at the early stages of the technology implementation at HMSO served to pave the way for further expansion across various corporate departments. The main catalyst for change has been the senior management ability to direct the technology towards meeting corporate requirements. The key elements of the social context at HMSO are summarized in Table 4.9 under the headings of history, social relations and infrastructure (see Section 4.5.3 for further details).

HMSO: some elements of social context
Historical Context
• Changing market conditions from a protected customer base to open competition. • Crisis situation evolving under open competition. • Senior management was in a good position to introduce change. Staff responded because they realize it is needed. • Corporate vision for change focused on customer service and supportive climate can be regarded as favorable starting points. • Phased implementation across departments. • Phased technology adoption towards the development of a corporate EDI gateway.
Social Relations
• Senior management commitment. • Participatory reviews including both business and technical staff. • Forming a strategic alliance with the leading EDI VANS. • Incorporating trading partners requirements, based on a clear understanding of requirements and constraints.
Infrastructure
• Senior management commitment supported by senior staff diligence. • Senior management vision and alliance with the leading EDI service provider. • Dedicated skilled business and technical consultants and staff. • Participation of key trading partners.

Table 4.9 Some elements of social context at HMSO.

4.5.4.2.2 Social process

This section gives an analytic glance of the key elements of the social process at HMSO. These elements are organized under the headings of cultural and political perspectives (Table 4.10). The full case study description is given in Section 4.5.3.

It is worth noting that it would have been interesting to include elements of EDI impact on maintenance and change of subcultures. However, at the time the study was conducted, emphasis was placed on examining the internal and external corporate context-related drivers to EDI adoption. Less emphasis was placed on investigating the interaction between the various subcultures within HMSO and the multiple meanings ascribed by the different subcultures to the same events and actions. This is, therefore, a topic suggested for further research. Similarly, the balance between autonomy and control could be another subject for further analysis.

HMSO: some elements of social process
Cultural Perspective
• Adopting a TQM Programme including staff training. • Senior management awareness of the need for cultural change. Dedicating necessary resources through the Central Electronic Trading Unit to conduct training and ensure transparent change management. • Symbolic commitment through direct involvement of senior management. • Customer service oriented strategic direction involving relevant staff training. • Senior management involvement in internal and external seminars to promote new cultural norms and structures within HMSO and its trading community.
Political Perspective
• Senior management sensitive handling of the critical balance between autonomy and control using EDI to cater for necessary corporate change. • Empowerment of senior staff members. • Technical staff perceived an enhancement in their roles and responsibilities through extending support to key elements in corporate strategy. • Affirmative ownership of trading partners community through offering value added services 'one stop shop' and differentiated trading terms.

Table 4.10 Some Elements of Social Process at HMSO.

4.5.4.2.3 Context/ Process Linkage

In this section, the formal model of structuration theory, as discussed in Section 4.5.4.1 is used to describe the way in which context and process are inextricably inter-linked. It provides an impression of the structuring processes at HMSO in which social action, influenced by the social structure, reinforced or modified the existing structures. The selected elements, included in Table 4.11, draw on the detailed analysis of context and processes presented earlier in Section 4.5.3. and highlighted above. These elements should be regarded as complementary to the above analysis, rather than a replacement.

HMSO: some elements of Context/ Process Linkage
• Senior management initiated and legitimated change through appeals to desirable norms of better customer services, new business opportunities and improved financial performance. • Senior management used of SWOT analysis and evaluation reviews as interpretive modalities to alter existing signification structures towards corporate objectives. • The above two points reproduced new structures of signification and legitimation. • EDI success in particular departments stimulated expansion across others. • Management continuously intervening to endorse shared vision.

Table 4.11 Some elements of Context/ Process Linkage at HMSO.

It should be noted that although the structuration theory offers a detailed view of the of the constitution of the social life, the analytic dimensions of the duality of structure and its associated modalities are considered as too detailed and complex for empirical analysis in some instances. This sentiment was also supported by Walsham (1993).

4.5.4.3 Conclusions

This section draws some conclusions from the HMSO case study with respect to interdependent issues of IS strategy, evaluation, design and development, and implementation as recommended by Walsham (1993). It should be noted that these issues as presented in Table 4.12 are interdependent, but are presented under separate headings for convenience.

Strategy
• Sensible, broad focus on corporate performance creating common goal. • Senior management commitment towards a clear strategic focus. • Senior management adopted a strategic view with respect to cultural change and encouraged extensive dialogue between interested parties, trading partners and customers. • CEO vision and strategic alliance with VANS.
Evaluation
• Adopting a continuous evaluation process. • Evaluation process involved systematic methodologies, SWOT analysis and periodic reviews to assess how the technology can deliver new business and technical opportunities. • Management review included assessment of the private sector experience. • Detailed analysis of the processes initiated at the outset of design and development. • Successful implementation led to evaluation for expansion across various departments. • Informal staff evaluations were positive towards EDI based on better customer services.
Design and Development
• Oriented towards enhanced customer service. • User driven design methodology. • Committing to deploying the state of the art technologies in electronic trading. • Enhanced prototype of VANS to cater for corporate requirements. • Innovative approach towards EDI implementation. • Utilization of EDI capacity to change.
Implementation
• Shared business and technical commitment to clearly conceptualised corporate objectives. • Senior management commitment to skilled resources availability. • Systematic training and capacity building. • The implementation team was particularly motivated by senior management support and project endorsement at the highest levels. • Leadership mastering the delicate balance between direction and participation. • Project management leadership endorsement by senior management secured autonomy and control to efficiently orchestrate project resources and activities. • EDI implementation assessment under several criteria (financial performance, developing new markets and reducing dependence on existing markets) ascertained project success.

Table 4.12 A Synthesized Perspective on Strategy, Evaluation, Design and Development, and Implementation at HMSO

Furthermore, the following general conclusions were drawn. First, the case of HMSO has shown that *context* plays a critical role in effective usage of EDI to meet corporate objectives. It offers an example where the investigated elements of content, social context, social process and the social context/ process linkage proved to contribute positively towards the success of implementing EDI at HMSO. Second, synthesizing the information within the Walsham (1993) framework demonstrates once more the need for considering the social context and process in examining the process of EDI implementation. Third, a clear strategic vision filtered through corporate culture is necessary in setting a positive corporate mindset and stamina. Fourth, successful EDI practice entails continuous comprehensive evaluation. Fifth, HMSO experience demonstrated how old management styles can evolve from traditional public sector secure market orientation to a totally unprotected competitive private sector orientation. Sixth, the success of such experience represents an incentive for similar organizations to follow suit. Seventh, the use of the Walsham analytical framework unveiled the intricacies of the social context/ process interaction in setting the strategic direction and guidance for others to learn from. Finally, the mapping process of HMSO against the theoretical framework highlighted the richness of the case study material and identified the areas for further research. For example, it should be noted that the use of the framework reflected little explicit opportunity to include economic aspects and how they interact with the process of implementation. Further theory relevant issues are discussed in detail in Section 7.4.

4.5.5 Closure

The case study described in this section documents the adoption of EDI in the UK public sector by HMSO to gain strategic advantage. The study reveals close integration between business planning and EDI implementation and the role of EDI as an application and systems integrator, allowing for future independent systems and applications enhancement with minimum impact on existing IT platforms and applications. It is stressed that, this use of EDI as a systems integration enabler extends the role of EDI beyond business process support to one of coordination and control. It provides the technological flexibility for business decisions, dependent on technological solutions to be made thus providing the basis for EDI functionality as a corporate change agent.

In September 1996 the British Government announced the sale of HMSO to Electra (The Economist, 1996). It is believed that EDI improved the organization's position as it moved from the public to the private sector. With respect to EDI technical capacity and implementation strategy, EDI provided HMSO with a solid IT foundation for managing changing market and business requirements and gained them strategic advantage. Further, it provided the technical capacity to develop new products, services and markets. In the process of conducting the interviews for the case study described in this Chapter, it was clearly stated that efficiencies and commercial gains afforded by the exploitation of EDI stood HMSO in good stead as it moved into uncharted private waters (Currie, 1996).

From the above, the HMSO case study catered towards the research objectives in three ways. It supplies material illustrative of the achievement of strategic benefits through the judicious use of EDI. It provides support for previous literature illustrating the use of technology in achieving business transformation in the private sector (Swatman, 1994; Swatman *et al.*, 1994), by illustrating this effect in the public sector. As such the HMSO experience demonstrates the use of EDI as a systems integrator and as a corporate change agent. This is most useful in identifying the candidate organization in Egypt to which the findings and drawn lessons from the EDI experience of HMSO may be applicable.

The above research findings are synchronized from a practical perspective in the implementation framework described below.

4.6 THE PROJECT IMPLEMENTATION PLANNING (PIP) FRAMEWORK

Responses from the questionnaire survey and the HMSO case study stress the need for early planning in the EDI implementation process. There is limited research into the development of frameworks which provide for the diversity of organizational structures and requirements involved in EDI implementation. This notion is further supported by (Blacker, 1988; Finnegan and Gorden, 1996; Holland *et al*, 1992b; Holland and Lockett, 1990; Sokol, 1989) who illustrate the limited nature of planning guidelines for EDI. Therefore, Holland *et al.* (1992b), for example, suggested a strategic implementation model which incorporates the nature of the markets and distribution channels, organizational structures and processes, and the buyer power influence. The PIP (Processes, Infrastructure and Partners requirements) framework described hereinafter attempts to cover some of the broader crucial planning issues involved in the

implementation, planning and control of EDI based on the research results discussed in this chapter (Figure 4.6).

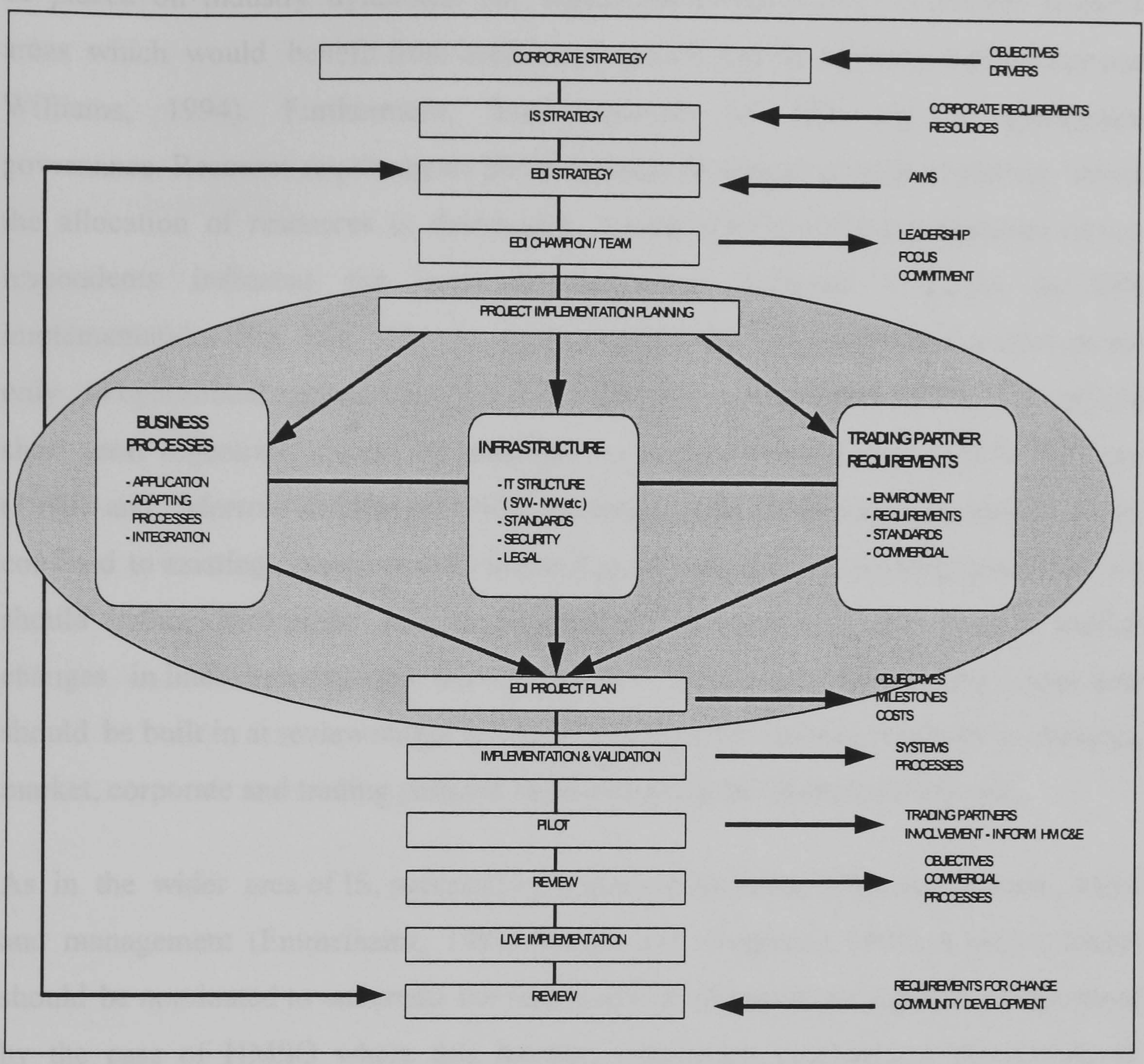


Figure 4.6 EDI Project Implementation Planning (PIP) Framework.

It calls for the early assessment of EDI benefits, its potential impact on the infrastructure, business processes and core business activities and understanding the trading partner requirements. It also focuses on the need for a dynamic assessment of the implementation process to absorb future business and technical changes. Strategic implementation and control planning stages are covered.

4.6.1 Strategic Planning

As illustrated by HMSO, planning for EDI implementation should be integrated with both corporate strategy and IS strategy. EDI must be seen as a business solution, to corporate requirements, rather than merely a technical one. As in other areas of IS planning, the importance of incorporating the EDI strategy with corporate strategy is

emphasized (Cox and Ghoneim, 1995b; Currie, 1994; Holland *et al.*, 1992b). Comprehensive evaluation of costs and benefits is required with particular emphasis to be placed on industry dynamics. An organization wide strategy to identify potential areas which would benefit from implementing EDI may be carried out (Sawhney and Williams, 1994). Furthermore, implementation of EDI requires appropriate governance. Resource requirements planning must be integrated with IS strategy where the allocation of resources is determined. A total of 63% of the questionnaire survey respondents indicated the need for permanent dedicated resources for EDI implementation. The EDI strategy itself should identify EDI applications relevant not only to operational improvement but also aligned to core business activities. Long and short term objectives should be detailed. As argued Galliers *et al.* (1995), Hammer (1990) and Morrow and Hazel (1992), utilization of IT for strategic use should not be confined to existing objectives or to improving the efficiency of existing processes, but should rather incorporate radical, innovative thinking which may lead to radical changes in inter-organizational trading relations. Thus, a dynamic tracking component should be built in at review stages to ensure that the EDI strategy responds to changing market, corporate and trading partners requirements in the short and long- run.

As in the wider area of IS, successful projects require leadership, commitment, focus and management (Emmelhainz, 1993; Saxena and Wagenaar, 1995). A project leader should be nominated to undertake the responsibility of implementing EDI as illustrated by the case of HMSO where this has been particularly emphasized. The position of EDI champion within the organization is crucial to the implementation of success (Currie, 1994). The EDI champion must be able to control implementation and strategy inputs and have access to, and support from, top management.

4.6.2 Project Implementation Planning

The EDI project implementation planning stage is crucial as endorsed by previous research findings (Holland *et al.*, 1992b). Based on the current work, the three critical areas which require attention are: business processes, infrastructure and trading partner requirements.

4.6.2.1 Business processes

It can be concluded from the current work that improvement to internal business processes is a major driver to implementing EDI. Yet, adapting existing business

processes and integrating EDI software within in-house systems of the organization were reported as major implementation difficulties. A lesson to be drawn from this is that identifying the EDI application, investigating its potential impact on traditional processes and specifying the EDI software integration requirements should be carried out early in the planning stages.

4.6.2.2 Infrastructure

The selection of communications technology is not problematic. However, difficulties are experienced in integrating the EDI software with internal applications and the implementation of standards which indicates the need for infrastructure planning. These findings are further supported by Holland *et al.* (1992b) who assert that companies without an effective infrastructure for IS are unable to develop EDI on a company-wide scale. The building of the EDI infrastructure should not, therefore, determine the EDI platform in terms of software, hardware, VANS and standards in isolation, but should rather closely investigate the business processes and trading partner requirements to be affected. It is emphasized that the organization needs to accommodate the trading partner requirement for implementing a particular standard which will subsequently need to be reflected in its internal business processes and integrated in internal systems. Security and legal issues should also be investigated at this stage to allow for the required commercial adjustments. It is also advised to make allowance for the social infrastructure as advocated by Walsham (1993) ensuring availability of technical skills and expertise with respect to human resources and systems documentation.

4.6.2.3 Trading partner requirements

Better communications and cooperation with trading partners are significant drivers to EDI implementation. Yet the introduction of EDI to trading partners is difficult. This reflects the need to understand the trading partner environment, the commercial setup, requirements and drivers to EDI adoption in the early stages of planning in order to enable the implementation of a mutually beneficial project.

4.6.3 Implementation and validation

As in the wider field of IS management, the project plan should include detailed objectives, milestones, time-scales, cost details and contingency plans. In particular, close attention should be paid to the impact of the introduction of EDI on internal systems, information flows and business processes. Procedures concerned with EDI

implementation such as transmission schedules, commercial obligations, handling errors and regulatory requirements must be tested and validated. Contingency studies should be undertaken to address possible future changes. A pilot phase is recommended to test the EDI system with trading partners in order to validate implementation and ensure completeness of the commercial aspects.

4.6.4 Reviews I and II

Results of the interviews emphasize the importance of building a dynamic tracking component to monitor and review the development and implementation of the EDI project. This is represented in the PIP framework by the *review components I and II.* Review I, monitors and assesses the pilot stage results. At this stage any changes to commercial arrangements need to be made and re-assessment of the project feasibility and costs carried out.

Building the second dynamic Review II tracking component is aimed at the identification of future requirements for change, exploration and adaptation to new EDI applications and the development of the electronic trading community. The requirements identified should be incorporated into the EDI strategy for future implementation.

4.6.5 Implementation Execution

A phased or pilot approach is recommended for launching EDI. An initial community of well-established trading partners maybe setup to test the systems and assess the impact on business processes. This stage involves contracting with the EDI service provider, EDI software installation, integration with existing applications where applicable and exchanging of test messages. As the pilot project develops, it is possible for partners to begin to trade electronically and to gradually remove the paper systems which EDI was designed to replace, subject to legislative requirements. It is then recommended to extend the use of EDI to the widest range of trading partners to yield desired results. Techniques used to enlarge the user community and to encourage participation may vary from mandating compliance at one extreme to a range of financial and business inducements at the other (Schware and Kimberley, 1995a).

4.6.6 Closure

As shown above, the PIP framework provides a practical utility for practitioners. It endorses a business strategy-based approach to implementing EDI, based on

incorporating trading partners requirements and local market conditions, integrating EDI in core business processes, and building a two-tier tracking component to monitor corporate and technology changes. A staged systematic approach to the launching of EDI, is recommended. Finally, it illustrates the need for a top-down strategic planning process within which the business re-engineering may be considered. From a practical utility perspective, it is valid and applicable in both the initial *green field-type* projects and the advanced stages of EDI implementation projects, which require fundamental changes in procedures and processes. As such, it is applicable to both developed and developing countries.

4.7 SYNTHESIS OF THE UK STUDY FINDINGS

In investigating the EDI industry in the UK and describing the case study of HMSO, it has been endeavored to set the topic in the context of existing research into EDI. In reviewing the literature, it was found that the research focused on a number of perspectives, each of which is typically addressed independently of the others. Details of these perspectives are discussed in Chapter 2. It can be concluded from the questionnaire survey results and the case of HMSO, that there is a need for a more theoretically integrative approach to the study of EDI in order to convey, more realistically, the true complexity of the subject area. Defining potential benefit from EDI cannot be viewed independently from the context within which such benefit derives, be that as a result of its impact on inter-organization structures or from its role as a facilitator of process re-engineering. Likewise, the implementation process cannot be viewed independently from either the surrounding context or the technology. Furthermore, both the context and the infrastructure are subject to dynamic business change and technological developments. Therefore, there is a requirement to consider the Context, Infrastructure for implementation and Capacity to change in developing the EDI strategy. These elements are integrated in the CIC framework (Figure 4.7).

4.7.1 The CIC Framework

The need for an EDI conceptual framework to guide developing an EDI strategy has been widely cited in the literature. For instance, Reekers (1995) emphasized the lack of a comprehensive framework to assess the causes and consequences of EDI is a primary obstacle to adequately evaluating the effects of EDI within and among organizations (Section 2.7). Furthermore, no single framework is sufficiently developed to address the complexity of developing a national EDI strategy. Difficulty of establishing a

single EDI adoption and implementation framework stems from the diversity of EDI applications across various business domains, EDI's inter-relatedness with inter and intra organization business requirements, and its impact on inter organization systems and internal business processes. The lack of guidance is a major impediment facing nations, industry-sectors and organizations in the early stages of adopting EDI. This situation is the result of the limited research into EDI specific technology transfer issues (at the organization, industry-sector and national level) and the limited effort into developing generic EDI adoption frameworks or implementation guidelines to identify transferable organizational, sectoral and national lessons from sophisticated and mature EDI markets.

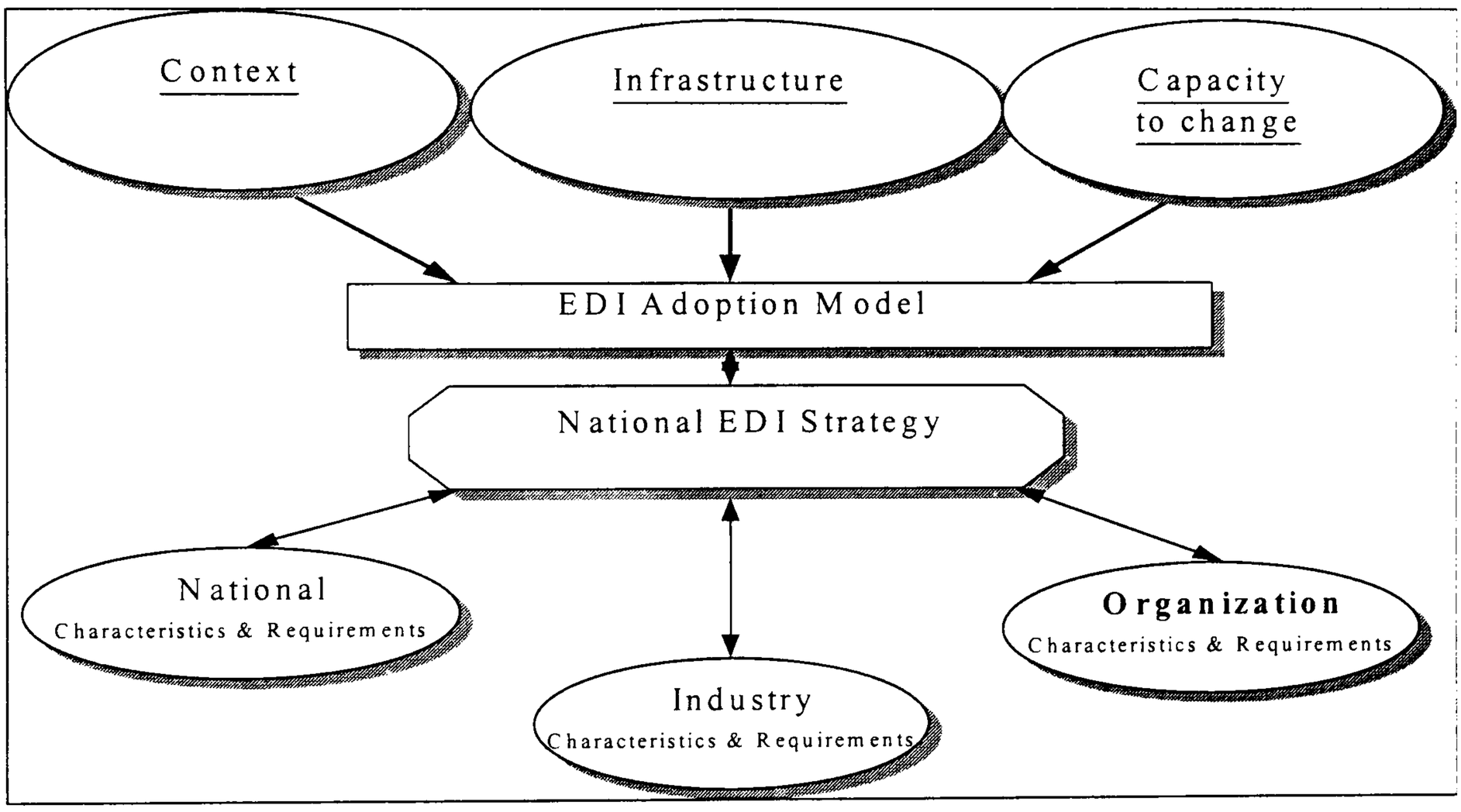


Figure 4.7 The CIC Framework.

Whilst this thesis does not purport to present such a framework, it attempts to develop a set of independent principles for analyzing EDI, which could serve as a framework for undertaking an in-depth analysis of factors that influence/are influenced by its adoption in a national setting. The research findings indicate that a successful EDI strategy must grow out of a sophisticated understanding of the surrounding business and technical requirements and structure and how they are changing. The framework is applied to the UK with a view to provide insight into potential application to Egypt.

4.7.1.1 Synthesis of the context-related factors

Context is an integral CIC framework component. The value of this proposition is supported by previous research in the wider area of IS research as previously discussed in Chapter 2. Avgerou and Doukidis (1993) specifically recommend accounting for the

broad national and international context, as well as the characteristics of the local markets and cultural aspects in conducting IS research. Similarly, Reekers (1995) and Farhoomand and Tuunainen (1996) suggest incorporating the broader context within which EDI implementations are proposed at the organization, industry-sector and national levels.

The *contextual influences* will not only vary from one nation to another, but also according to specific industry requirements, differences in corporate objectives and the role of government in the economy. Accordingly, business requirements on the national, industry and corporate level have been particularly important in successful EDI adoption. Based on the research findings, it is concluded that at each of the three levels investigated, analysis should consider the following:

- at the national level: the political, economic and social factors,
- at the industry-sector level: the industry characteristics, inter-organizational relations, socio-economic factors reflected in industry-specific drivers and perceived benefits,
- at the organization level: external market dynamics, corporate culture and objectives, and trading partners requirements.

For instance at the industry-sector level, results from the questionnaire survey indicate that drivers and benefits vary across industry-sectors. Therefore, awareness of industry differences in developing the national EDI strategy and planning for the differentiated extent of diffusion and benefit across the various sectors are of vital importance. In the UK, the retail, manufacturing and distribution sectors reported maximum benefits. Those industries enjoy strong supply chain management techniques and are typically bound by a hub-spoke network structure, which facilitates the extent of EDI use and development. Although the retail and distribution industry-sectors are not particularly mature in developing countries, manufacturing and public sector institutes enjoy similar network structures. As such, industries with similar structures are primary candidates for leading EDI diffusion and community development. This is particularly valid in industries that are specifically promoted through national strategies in developing countries like the motor manufacturing in countries like Egypt. The UK experience also illustrates potential benefits associated with EDI adoption and provides empirical evidence of such gains which act as incentives to policymakers in the region. Details of industry-specific factors are given in Section 4.4.3.

In principle, at the organization level, the most puissant drivers identified are typically those associated with strategic advantage, increased efficiency and business benefits associated with streamlining business processes. These drivers are likely to be particularly appealing to public sector organizations in Egypt, which are in the process of consolidating their administrative systems. Those organizations in particular are primary candidates for EDI implementation given the alignment of their corporate objectives with EDI functionality, their secured resource funding and government endorsement. Details of the specific factors to consider at the organization level are given in Section 4.5.3.

4.7.1.2 Synthesis of the infrastructure-related factors

The second component to consider within the CIC framework is *Infrastructure for implementation*. In examining this component, two aspects have to be accounted for. First, it is important to note that the infrastructure and implementation factors that influence EDI adoption are not typically technical. EDI technical infrastructure, by definition, involves not only IT resources, but also telecommunications platforms and legislative aspects to govern inter-organization relations. In this work, it is also believed that it covers the wider *know-how* perspective. For example, the factors investigated with respect to the role of INS in developing the UK EDI industry, was not only focused on the technical specification on VANS, but also included organizational and operational aspects which profoundly contributed to its success. Similarly, considering the nature of the EDI application used, was vital to achieve the reported results.

Second, as with the variation in the context-related factors at the three levels investigated (national, industry-sector and organization levels), technical implementation challenges and prospects also vary at these levels. At the national level, the legislative aspects as well as the national IT and telecommunications infrastructure, in general, and the role of VANS and coordinating bodies, in particular, have to be accounted for. Whereas, at an industry-sector level, the means of promoting community development and the extent of EDI integration with core business processes cannot be overlooked. The organization level analysis needs to investigate aspects pertinent to the complexity of EDI implementation, in terms of addressing trading partners requirements, adapting traditional business processes, software integration with internal processes, budget constraints and management commitment. Details of the pertinent infrastructure-related

factors at the national, industry-sector and organizational levels are given in Sections 4.3.3, 4.4.3 and 4.5.3.4, respectively.

4.7.1.3 Managing capacity to change

EDI in one of its simplest definitions, is the *automated exchange of standard documents*. It is purely a *store and forward* technology that can be tailored to cater for business requirements. Although, the technology was traditionally adopted as an inter-organization system, this research promotes its intra-organization potential. EDI's *capacity to change* provides an efficient mechanism to accommodate both technical and business requirements. This ability to absorb change is instrumental in defining not only the short-term EDI implications, but is also fundamental to the long-term appreciation of EDI potential. The knowledge and awareness of such capacity is conducive to achieving maximum benefit as observed in the UK experience.

From a *management of change* perspective, Walsham (1993) considered three main questions of interest. First, who is responsible for the change process? Second, how is the change managed? Third, what resources are needed to manage the process? The current thesis emphasizes that EDI is a resource in itself that can be utilized to affect change. This is demonstrated in the HMSO case study detailed earlier. It is also illustrated by the increasing number of EDI applications recently adopted across various industry-sectors to cater for industry specific requirements which are captured during the questionnaire survey carried out in this work. By changing the definition in message standards, the requirement for change is absorbed without the need to alter existing systems. Such knowledge of EDI's capacity to change, is fundamental in developing a national EDI strategy. Awareness of policymakers of such capacity provides new avenues for potential EDI applications that go far beyond the traditional inter-organization trading applications.

By definition, technology developments and the business environment are not static. Therefore, there is a continuous pursuit for IT tools that can assist in accommodating these changes. It is argued that EDI provides such facility. It offers a strategic tool to accommodate both changing business requirements and technology developments. In the same time it is a powerful tactical tool that has direct benefit on inter- and intra-organization information exchange. This is fundamental to appreciating EDI's untapped intra-organization potential and bringing in this dynamic dimension to cater for the changing surrounding environment. Policymakers are, therefore, urged to take

into account this capacity when developing a national EDI strategy. The value of this inference is further illustrated in Chapter 5, where an implementation approach is recommended to CEA, and later in Chapter 6 where relevant lessons and recommendations are given.

Change is a recurring phenomenon. Nations and industries alike are under pressure to integrate in the global economy. As a result, there is a constant requirement for legislation changes to accommodate electronic trading requirements in a national setting. Similarly, within an industry-sector context, there is a continuous requirement for integrating new EDI applications with existing or reengineered business processes. Meanwhile, organizations are under pressure to provide better services/products under stringent cost controls and highly competitive markets. Hence, their production strategies, corporate processes and practices are continuously changing. It is believed that, flexibility in implementing EDI is critical to exploiting its non-traditional EDI potential to maximize business benefit. This study tries to show how EDI as a technical platform may be manipulated to accommodate this dynamic environment.

In this research, EDI *capacity to change* is defined in terms of its capacity to accommodate changing business requirements and technological developments. This notion has been only introduced by this work. It has neither been addressed nor examined by previous EDI literature. Lack of awareness of this EDI ability is believed to have limited EDI implementation to traditional trading applications and consequently under-utilization of EDI full potential. Cases where EDI has been innovatively implemented whether on a national level, industry-sector or organizational level have reported higher benefits as discussed in Sections 4.3, 4.4 and 4.5. Including the *capacity to change* as an integral framework component urges EDI decision makers and practitioners to continuously identify and exploit EDI's inter and intra organizational potential.

4.7.2 The Value of the CIC Framework

The CIC is a multi-dimensional conceptual research framework which attempts to convey the complexity and the inter-relatedness of the business and technical determinants of successful EDI implementation. The framework in not conceptualised in isolation. It builds on the knowledge gained from the current theoretical and empirical research findings.

As mentioned in Chapter 2, theoretical ideas of considerable significance to the research were obtained from Pettigrew (1985,1987, 199) , Kling and Scacchi (1982) and Walsham (1993) work on contextualism. In the more specific EDI domain, valuable insight was provided by the work of Banerjee and Golhar (1991) and Reekers and Smithson (1993,1994) investigating particular benefits and barriers to EDI adoption, and the work into business process reengineering and EDI integration by Venkatraman (1991) and Swatman (1994), respectively. In attempting to locate the work within particular IS tradition using the classifications used in the literature, the research approach builds on the strength of both the positivist and the interpretive research traditions as presented by Orlikowski and Baroudi (1991) and discussed earlier in Chapter 3. Such complementary approach benefits from both theoretical insight and practical field conformity.

It is worth noting at this point a brief aside on the relationship between theory and research in the current work. The development of the CIC framework aimed at building on the theoretical background and insight offered by the above-mentioned references as well as the literature discussed in Chapter 2. The process involved informing nature between theory and research whereby the use of theoretical insights was used at different stages of the research progress. This contributed to enhancing and refining the research results interpretation as shown in the case of HMSO. This process was adopted to optimize on the use of theoretical frameworks and ideas, in a non-binding manner, to illuminate interesting elements which are inherently complex in practice. The focus on empirical research approach represents a continuing effort to understand the phenomenon in its natural setting. In attempt to provide a systematic approach to information synthesis the CIC framework is put forward for consideration by policymakers and practitioners as well as to researchers in the field.

The strengths of the CIC framework is based on its call for methodical approach relating the process of EDI implementation to the internal organizational structures and the external surrounding context. It brings to the forefront the part EDI plays in addressing change which may be external to the organization or internal to the systems. The framework gives due attention to the concept of *change* in a manner different from that typically applied in IS. For example, Walsham (1993) addresses change using the structuration theory as mentioned earlier. The CIC addresses change utilizing the technology capacity to be defined and redefined to absorb change as

illustrated by the case of HMSO. This concept, in itself, is believed to offer new opportunities for the adoption of EDI

It is proposed that the framework will be applied in the case of the CEA in Egypt where intense pressure exists to move towards compliance with international standards and changing trade practices as described in Chapter 5. It will serve to illustrate how benefits derived from EDI implementation can be enhanced by incorporating the contextual environment and specific corporate requirements. Furthermore, applying the CIC framework is suggestive of the fact that although there are a number of lessons to learn from the mature EDI markets in the West, criteria for technology transfer must be well-defined to ensure that nations gain maximum benefit from EDI adoption (see Chapter 6). For example, applying the standard supply driven approach which focused only on infrastructure technology transfer issues in developing a national EDI industry, substantially delayed the development of the EDI industry in Egypt. It, unfortunately, failed to incorporate the nation-specific requirements. This is discussed in Chapter 5.

In light of the above, the contribution of the CIC framework is fourfold. First, successful development of a national EDI strategy requires an analysis to be undertaken of both *context-related* and *infrastructure-related* setups whilst accounting for EDI *capacity to change*. Second, *context* is an integral framework component. If a firm, an industry-sector or a nation is to maximize business benefits as a result of EDI adoption, it must clearly define its specific contextual drivers. Third, both the managerial and technical aspects of EDI implementation are equally addressed in developing the EDI strategy at the national, industry-sector and organization levels. Fourth, the CIC framework does not prescribe a specific recipe for a particular nation, industry-sector or organization, but rather gives a set of principles that can be broadly applied contributing towards increasing the understanding of the issues involved in developing a national EDI strategy. The objective is to provide a direction to the ad hoc strategies employed with respect to EDI adoption. It provides general implementation guidance of importance to the research, business and policymaking communities.

4.8 CONTRIBUTION OF THE CHAPTER

The work reported in this Chapter is based on a study of the EDI characteristics in the UK at the national, industry-sector and organization levels.

National level analysis investigated the role of the domestic trading community, EDI coordinating bodies, service providers and the role of government in establishing the EDI industry. Critical success factors pertinent to the role of each are identified.

Industry-sector analysis examined the impact of EDI on various sectors of British industry. The empirical data presented suggests that the drivers, benefits, barriers and implementation difficulties to adopting EDI vary between sectors. Such differences need to be taken into account early in the EDI implementation planning process. The research explored the hypothesis that maximum benefit is achieved in industries where EDI is integrated into those processes which are representative of the core business activities. Support was found for this assumption and also for the hypothesis that difficulties in the EDI implementation process are more likely to be significant in these industries which have failed to integrate EDI in core business activity.

Organization level analysis describes HMSO strategic use of EDI and suggests that the role of EDI may be extended to both that of a change agent and systems integrator. It supports the view that although the initial effects of EDI are at the interfaces of the organization, normally the purchasing and sales department, change permeates further throughout the whole organization.

The results of the study are integrated in two frameworks. The PIP implementation framework which provides a practical tool for EDI practitioners and the CIC which provides an integrated conceptual framework that emphasizes the importance of incorporating the *context*, *infrastructure* and the *capacity to change* in developing a national EDI strategy. The research results also render empirical contribution to the EDI body of literature. The analyses contribute to a better understanding of the issues involved in establishing a national EDI industry.

CHAPTER 5

THE CASE OF EGYPT

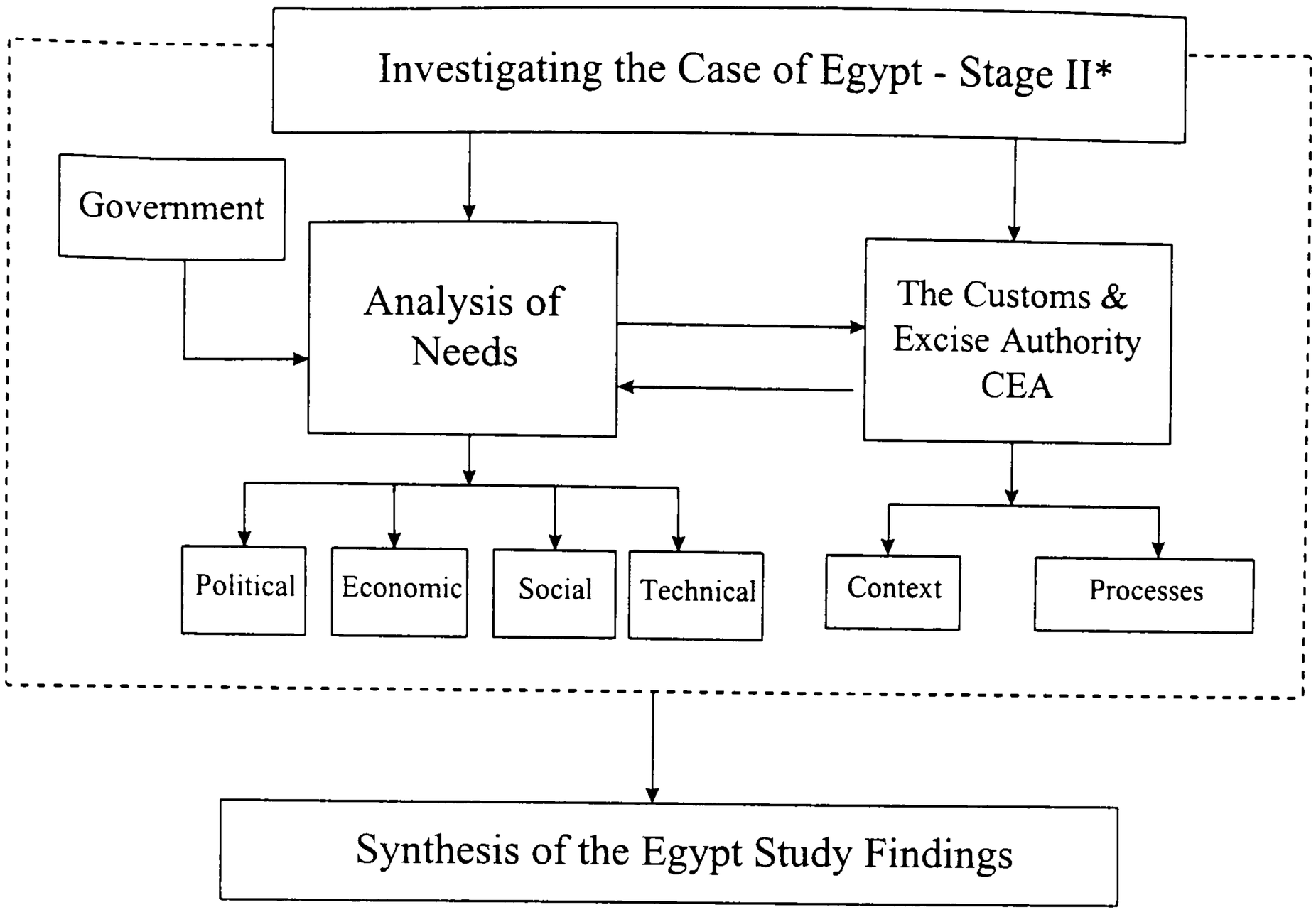
5.1 INTRODUCTION

A major limitation of current macro-level theories that influence information systems research is that generalizations are made on the basis of phenomena observed in particular regions in the world, mainly in the USA and Northern Europe. These theories may not necessarily apply to different regions of the world, especially to developing nations (Avgerou and Doukidis, 1993). Bearing the above in mind, the aim of this chapter is, therefore, two fold. First, to identify the nation-specific pressures and constraints to developing a national EDI industry in Egypt. Second, to apply the generic research findings, discussed in Chapter 4, within the Egyptian context. Through investigating the case of the CEA, it is possible to practically demonstrate potential substantial national gains to the GOE, if EDI is applied. Interviews were held with senior CEA officials, top level informants from government, business and management consultancy to accurately identify the nation-specific requirements in order to formulate a practical EDI proposition to address the national trading requirements.

As discussed in Section 4.7, it is suggested that developing a national EDI strategy should consider the EDI context, the infrastructure and the capacity to change. These elements are integrated in the CIC framework which is applied to the study of Egypt. To this end, the analysis procedure for conducting the research work in Egypt is given in Section 5.2. The previous attempt to develop a national EDI industry is assessed in Section 5.3, whereas the current pressures and prevailing challenges and constraints to developing a national EDI industry are examined in Sections 5.4. and 5.5 respectively. The role of the GOE is then discussed in Section 5.6 followed by describing the case of the CEA in Section 5.7. A synthesis of the study findings is given in Section 5.8. Section 5.9 concludes with the contribution of this chapter.

5.2 A GENERAL OUTLOOK ON THE ANALYSIS PROCEDURE

Figure 5.1 depicts the analysis procedure developed for the study of Egypt.



* See Figure 3.2 for Stages I and III

Figure 5.1 Simplified Flow Chart of the Analysis Procedure for the Study of Egypt.

The analysis was conducted along two main streams. First, investigating the necessary background to introducing EDI to the GOE, taking into account both the contextual drivers to adopting EDI and the infrastructure constraints of the country. Second, examining in detail the CEA requirements and challenges to implementing EDI. As mentioned earlier, the findings presented in this chapter are based on a series of semi-structured interviews which were held over a two-year period with senior management at the CEA, IT consultants to the CEA Efficiency Development Programme and advisors from the Cabinet Information and Decision Support Center (IDSC) to examine the factors that promoted and hindered efforts to develop an EDI industry in Egypt and to investigate the potential for EDI within CEA (see Annex 5). The reader is referred to Section 3.7 for a full description of the analysis procedure adopted.

5.3 DEVELOPMENT OF THE EDI INDUSTRY IN EGYPT

In 1995, a project proposal for the establishment of a national EDI Service Provider was put forward to the IDSC, Cabinet of Ministers. The initial project proposed was primarily supply driven by a major multinational contractor. The vendor aimed to sanction an EDI service provider to offer a full range of EDI solutions linking major

companies (hubs) with their trading partners (spokes). It was estimated, at that time, that the project would cost in the region of US$ 2 million over the first three years of operations. The vendor offered business, marketing and technical assistance as part of the package to establish the project, and targeted IDSC as the candidate service provider to capitalize on its credibility in the Egyptian market. The vendor also hoped to promote IDSC's role as a business problem solver, offering productivity and profit enhancing solutions to customer business problems. Despite these efforts and negotiations over a three months period, the project failed to materialize. Upon investigation, this study reveals that a number of serious considerations were overlooked which hindered the project launch as discussed below.

First, the vendor's approach was exclusively supply driven. The proposed offer had not been preceded by a market study to investigate the potential Egypt-specific drivers to adopt EDI. As such, although policymakers accepted the theoretical benefits of EDI in general, they could not specifically relate its potential benefits to Egypt-specific requirements.

Second, the vendor repeatedly emphasized the success of EDI in the UK retail industry. At that time, the retail industry in Egypt lacked both the network structure and the information capacity enjoyed by a developed nation such as the UK. As a result, the GOE could not map its requirements to the opportunities offered by the EDI industry.

Third, because of the lack of an initial market study, the vendor could not offer the GOE a potential cost-benefit analysis to persuade IDSC to undertake the project.

Fourth, the consultancy offered by the vendor was confined to the technical service specification for the development of a national VANS and did not incorporate the analytical capacity to examine the nation-specific contextual and implementation requirements. The project document relied at the time on the argument that *Egypt needs a commercial EDI service.* This argument was mainly based on the EDI capacity to create electronic distribution channels, improve time to market, increase productivity, reduce cost of goods and provide the infrastructure required to link with global economies. However, the project document failed to account for the country-specific requirements with respect to incorporating both the national and international trade facilitation conditions.

It is believed that lack of awareness, of the potential direct business benefit of EDI to the nation specific prerequisites, coupled with lack of domestically-rooted demand driven initiatives, substantially delayed serious initiatives to establish a national EDI industry in Egypt. The vendor failed to attain the government support and endorsement, as the GOE could not specifically relate the benefits to particular user groups, nor incorporate the project within the wider national scope. Consequently, the project was not instated.

However, two years later the World Bank recommendations put forward to the Cabinet of Ministers in 1997 suggested that an EDI system would streamline documentation procedures and retool practices among the parties trading at the national and international levels. It specifically recommended the use of EDI to simplify and speed up customs and inspection processes, to provide customs with the information it needed on incoming shipments in advance of their physical arrival for inspection. The recommendations were put forward based on the World Bank study conducted in 1995, which endorsed the use of EDI in particular and electronic trading in general, as critical components of a trade facilitation strategy to promote trade competitiveness both domestically and internationally (Schware and Kimberley, 1995a). It appeared in the interviews that since then, the GOE has placed EDI on the national agenda to specifically address Egypt's trade facilitation requirements.

As a result, Egypt, is under increasing pressure to adopt new technologies in order to adjust to the emerging trading requirements. By definition, trade facilitation requirements stemming from the changes in the global trading system entail the following implications. First, to compete effectively, sophisticated technologically-oriented solutions are required for producing, selling and marketing of products nationally and internationally. Second, trade liberalization can indeed be expected to stimulate growth at world level, but the extent of benefit will depend on adopted policies and existing institutions. As such the role of government in regulating and institutionalizing the use of e-commerce at large and EDI more specifically must not be under estimated. Third, there is a unanimous agreement on the positive impact and usefulness of trade facilitation (Croome, 1998). The task assigned, to the World Trade Organization (WTO) Goods Council, is to clearly identify the terms of trade simplification based on WTO rules. In effect, the import and export procedures of many countries must be simplified, harmonized and made more automatic, so that documentation is reduced and transparency is increased. These are provisions which

would benefit all, especially smaller firms and developing countries, for which the costs involved in respecting the present procedures are relatively higher (Guerrieri and Falauntano, 1999). Fourth, there is strong pressure from private business calling for trade facilitation measures to be brought into the WTO sphere and the next round of negotiations (Croome, 1998). It is, therefore, clear that electronic trading, EDI and customs applications are expected to be aligned with the emerging global trading challenges or else risk severe competitive disadvantage.

5.4 ANALYSIS OF PRESSURES AND NEEDS

In this section the CIC framework is applied to Egypt. The contextual factors are examined within the PEST framework in Section 5.4.1. The infrastructure and EDI's capacity to change are then discussed in Sections 5.4.2 and 5.4.3, respectively. As previously mentioned, the framework recognizes the complexity and inter-relatedness of the business and technical determinants of successful EDI implementation. Justification for applying the CIC framework to Egypt is based on the following. First, due attention is given to the context of the host country as it is argued that, from a national perspective, what works for one country may not necessarily apply to another. For example, in both the UK and North America, EDI has been successfully driven by the private sector rather than government initiatives, whilst in Hong Kong, for example, the totally private initiative funded by trading companies resulted in considerable delay in adopting EDI. Contrary, in Singapore the introduction of a government driven EDI initiative proved very successful. Whilst India case has been less successful despite government support (Schware and Kimberley, 1995). In the case of Egypt, demand by business to develop a national EDI industry did not make progress until government backing was received. The contextual factors that typically influence/are influenced by EDI adoption have been identified in Chapter 4. The Egypt-specific contextual drivers are outlined in detail in Section 5.4.1.

Second, the sophistication of the infrastructure must also be examined on a case by case basis. It is acknowledged that the introduction of EDI in countries such as the US, Europe and the Far East differs greatly from its introduction in the Middle East and North Africa. However, there are a number of valuable lessons to be learned from mature EDI markets. For example, the role of the VANS provider is critical. Britain, where a single VANS provider was endorsed in the early stages of development, has been highly successful in the introduction of EDI (Section 4.3.3). Whereas in South

Africa and Brazil where several VANS providers are represented, EDI development has been hampered due to local competition. The development of standards is also crucial to success. The UK adopted a lead position in EDI in Europe with its development of national TRADACOMS and EDIFACT standards (Section 4.3.2), whereas Japan and Korea with almost no equivalent and operating about 1000 VANS acknowledge that this is a barrier to electronic trading (Schware and Kimberley, 1995a). The technical implementation, infrastructure requirements and know-how factors that typically influence EDI adoption have been identified in Chapter 4. The Egypt-specific infrastructure potential and constraints are examined in Section 5.4.2.

Third, the initiators' appreciation and knowledge of EDI's capacity to cater for changing business requirements and technology developments is critical to successful EDI implementation. Considerable resistance to change can be expected where there is history of deep rooted values and invested interested in maintaining traditional business processes. Therefore, careful consideration should be given to existing procedures and attitudes to change in order to tailor EDI implementation accordingly. This is discussed in detail in Section 5.4.3.

The proposed framework identifies the major criteria to be considered when adopting EDI. Rather than call for a universal EDI strategy, a successful EDI strategy must grow out of a sophisticated understanding of the surrounding business and technical requirements and structure and how they are changing. Only strategies that are tailored to the particular business requirements and existing inter- and intra firm systems and processes, and that have the flexibility to accommodate change are likely to succeed as discussed in Chapter 4.

5.4.1 Contextual Environment for EDI

5.4.1.1 Political environment

It is crucial that due attention is given to the political environment into which EDI is to be introduced. Of primary importance is the role of government is establishing national EDI strategies. Singapore is a clear example of a successful government-sponsored EDI initiative (Cash *et al.*, 1994). In contrast, Latin America has achieved limited success mainly because of lack of serious government intervention (Schware and Kimberley, 1995). In Europe, there have been a number of initiatives, both national and international, aimed at establishing European-wide EDI policies and standards. For example, in the early 1990's, the European Commission allocated ECU 30 billion to

spend over a ten year period to establish a pan-European EDI infrastructure (Lamb, 1991). Likewise, Egypt is under pressure to extend IT policy in general and EDI specifically. The various political features of relevance to EDI adoption are discussed in detail below, whereas, the role of the GOE is specifically outlined in Section 5.6.

Globalization has been the most dominant feature of the new world economy which has underpinned the continued expansion of trade and foreign direct investment (FDI), including intra-industry trade (Safadi, 1996). In fact, Globalization presents nations with an important opportunity to enhance competitiveness, increase productivity and expand resources available to the regional economy, all of which could potentially contribute to improved growth performance (Yousef, 1997).

In response to these pressures, an increasing number of regional initiatives are emerging. The formation of regional trading blocks has important ramifications for the development of EDI. The European Economic Community, Asian Pacific Economic Cooperation, ASEAN Free Trade Area and North American Free Trade Agreement are some examples of such agreements. The EDIFACT development in itself is an example of a regional initiative reflecting a European orientation and compliance with cross border trade facilitation objectives. It has, in turn, influenced the EDI adoption and the migration of organizations from national to regional and international standards as in the case of the UK. Farhoomand and Boyer (1994) assert that the advantages of EDI would be drastically diminished where members in the trading block rely on more primitive manual processing of transactions. As such, specific political requirements in various regions mandate efforts to expand EDI usage under regional regimes where trade is being selectively liberalized. Therefore, Farhoomand and Pace (1995) endorse the requirement for considering the political dimension in planning for global EDI implementation.

Egypt is a strategically located nation amidst growing regionalism initiatives, driven primarily by economic and political interests. Inter- and intra-regional initiatives involve upgrading means of communications, networking and data exchange. As in Europe, the impact of new legislation, including the Single European Market has necessitated a review of the existing systems used for processing trade documentation, in general, and Customs entries, in particular, to take advantage of the new commercial environment (Sawhney and Williams, 1994). In the same way, Egypt is involved in a

number of regional agreements, for example, Egypt is a member of the Euro-Med Partnership, the Egypt-USA and the Egypt-Arab Trade Agreements.

In response to these trading initiatives, the proposed World Bank recommendations, put forward to the GOE in 1997, identified a number of immediate priorities to boost Egypt's trade performance as part of its continued pursuit of trade and the promotion of foreign direct investment (FDI). These recommendations were primarily concerned with: introducing customs, inspections, regulatory and procedural reforms to strengthen Egyptian competitiveness in world markets; accelerate the pace of moving goods into and out of the country, improve the reliability of importing and exporting processes, and generally reduce the transaction costs of exporting.

Although considerable effort has been made by the GOE to enhance the transparency of trade procedures, this remains problematic. The relevant CEA procedural flows are discussed in detail in Section 5.7.2. Nonetheless, it is worth noting that the GOE has now lent its support to the implementation of EDI. It sees its role as a regulatory one, securing funding and providing for the required infrastructure.

5.4.1.2 Economic environment

Trade liberalisation and economic transformation round the world in recent years have increased the pressure to review existing systems used for processing trade documentation. There is an urgent need to achieve faster economic growth, which depends in part on the ability of firms to participate in the world economy. The GOE is committed to liberalizing imports, promoting exports and encouraging foreign direct investment. Such development strategies entail removing barriers to trade that require reforming traditional standards, procedures, and agreements, which facilitate international trade.

The economic factors are amongst the primary drivers endorsing the requirement for EDI in the case of Egypt. This section describes in further detail the international trends and the prominent national features of the economy that influence EDI adoption.

Prospects for faster economic growth in the Middle East and North Africa, in particular, have been associated with the ability of policymakers to hasten integration with the world commodity and capital markets through structural adjustment and trade

liberalization (Diwan, 1995; IMF 1995; World Bank, 1997). As a result, trade facilitation initiatives are rigorously pursued to integrate nations in the world economy.

Meanwhile, EDI-specific initiatives have been recently pursued at the March 1998 trade facilitation symposium (UN, 1999). The Council on Trade in Goods of the European Community has proposed developing a set of WTO rules to simplify trade procedures. The specific proposals on trade facilitation are concerned with border crossing procedures, particularly Import Licensing, Technical Barriers to Trade (TBT), Rules of Origin, and Pre-Shipment Inspection (PSI). There is particular interest in: the reduction and harmonization of data and documentation for import and export; modernizing customs administration methods; reducing separate interventions by different agencies, the *one stop* or single window approach; and automating import, export and customs procedures. The WTO trade facilitation initiative in relation to existing WTO agreements specifically defined the use of EDI to achieve those aims. It recommends that EDI be introduced across all trade/government interface including not only customs procedures, but also the regulatory interface. The framework of WTO rules on the simplification of trade procedures would also have broader implications for certain agreements. For example, it would improve the supply of trade in services, especially the transport and distribution services, thus generating indirect positive effects on the operation of the GATS. The WTO initiative provides the best means to provide both high level political impetus and the overall trade policy framework needed if, simplified procedures suited to today's international trade, are to be introduced globally.

Recent developments in the national economic environment are also bringing about change to Egypt. Based on a recent report published by the UNCTAD, there is a general consensus that Egypt is experiencing a take off (UN, 1999). Real economic growth is up in the 5 percent range as the macroeconomics adjustment and stabilization efforts pursued since 1991, have successfully redressed the internal and external imbalances. The sources of growth are also more broad-based, reflecting accelerated private sector investment, particularly in the tradable sectors of agriculture, manufacturing and mining, transport and tourism (UN, 1999). These developments reflect on Egypt as an emerging economy. The ambitious development plans entail by definition embracing the state of the art techniques to facilitate achieving both the development and competition goals.

To integrate in the global economy, the export oriented industries are expected to be the main engine of growth (UN, 1999). On another front, the process of privatization is also being accelerated and capital markets are being strengthened, to give an important boost to FDI and portfolio flows into the economy. The reports suggests that in the years ahead, Egypt has the potential to attract FDI of higher quantity and quality, commensurate with the fundamental strengths and opportunities that the economy offers. These strengths include a large domestic market, a wide industrial base, skilled and competitively priced workforce and a strategic location in the region. It is believed, however, that there is a requirement to complement these strengths with adopting enabling technologies such as EDI to cater for electronic trading requirements. The above-mentioned competitive advantages, coupled with recent legislative reforms promoting FDI were identified as primary drivers to promoting FDI in Egypt in recent years. Annual inflows were below US$ 200 million in 1990, they are now nearly US$ 2 billion. In fact, Egypt attracts more FDI than any other country in the Middle East and North Africa region (UN, 1999). However, it is acknowledged that more effort needs to be directed towards upgrading the information and telecommunications infrastructure to cater for attracting more FDI.

It is also important to note that Egypt currently boasts 26 out of 100 world's largest transnationals (TNCs). For example, the top TNCs in Egypt in electronics include General Electric, IBM, Philips, Siemens and Sony. Toyota, Nissan, Fiat, Dailmer Benz and BMW have invested in the automobile industry. In petroleum, key players are Amoco, Royal Dutch Shell, Mobil, Exxon, British Petroleum and ENI Group. Bayer, Glaxo, Hoechst, Novartis, Du Pont, and Rhone Poulenc are in chemicals and pharmaceuticals. Unilever and Nestle are in the food and beverage sector. It is believed that it is very much in the interest of these multinationals to enhance the information and telecommunications infrastructure at large and EDI more specifically to enhance their trading capacity. For example, both the motor and textile manufacturing industries, in particular, are primary candidates to initiating the EDI industry in Egypt. Motor manufacturing, in Egypt, is typically an assembly industry which summon large volume trading both internationally and domestically. While at the international level, sourcing parts from the headquarters and/or overseas suppliers is a core requirement, at the domestic level, distribution is instrumental. As such supply chain dynamics and power relations exist in favour of promoting EDI development. There is already limited use of EDI in this sector. However, it is confined to deploying the services of

an international VANS. Similarly, the textile industry is starting to enjoy franchise retail outlets which are keen to adopt the state of the art technologies and supply chain techniques. They are actively pursuing EDI applications particularly deploying the Internet as a platform as indicated by the technical experts interviewed. It is worth noting that the current use of EDI is particularly constrained as the service offered by an international service provider is at exceptionally prohibitive prices.

At the same time, the rise of FDI and transnational enterprises has meant that a large share of world trade is accounted for by the exchange of goods and services within a single firm and/or corporate network based in different countries. Thus a significant proportion of world trade is conducted on the basis of corporate strategies that interact with complementary suppliers and with customers across many countries and areas (Guerrieri and Falautano, 1999). This by definition facilitates the penetration of EDI as in most cases. The headquarters of these Transnationals already use EDI and will be in a position to extend its use to the subsidiaries. Another feature of FDI in Egypt is the state effort to diversify the geographical concentration of industry in the country, which by definition requires the deployment of IT and telecommunications technologies to facilitate efficient production and distribution. Technically, that translates into a requirement for a national EDI industry.

From a geographical perspective, Egypt is centrally located in close proximity to the markets of Europe, North Africa and the Middle East. This presents opportunities to serve as a hub for transport and other services and as an export platform (UNCTAD, 1999). It is also important to note that, the surge of FDI has been an important device for organizing production and distribution at international level and has been accompanied by new linkages with trade flows. Traditional economic theory has viewed trade and FDI as substitutes, but increasingly FDI and trade are becoming interrelated and to a certain extent complement each other. Both factors contribute positively towards formulating the requirement for a national EDI strategy.

A potential direct EDI benefit to Egypt would be reducing transaction costs. Despite the state effort to streamline trade processes, trade transaction costs in Egypt are high. These include unwieldy drawback and rebate schemes, expensive port and air cargo services, cumbersome import clearances, and a restrictive quality control system. Furthermore, the government monopoly has led to import and export costs through Egyptian ports that are among the highest in the World. For illustration, Tohamy

(1999), indicates that despite Egypt's proximity to the European market, Egypt transport costs exceed those of Cyprus, Greece, Israel and other nearby competitor countries. She indicates that these costs and delays are particularly debilitating for exporters attempting to compete in global and regional markets as they negatively influence productivity and exports. Privatizing and de-monopolizing processes, such as maritime port infrastructure, provide opportunities for EDI adoption.

On the global front, including regulation of electronic trading is high on the agenda of international trade organizations. Guerrieri and Falautano (1999) suggest that the regulation of e-commerce can be imposed within the framework of the GATS as a negotiating area in itself. Infact, Gamberale (1999), cited in: Guerrieri and Falautano (1999), predicts that, it is probable that the conclusions of the working programme will influence the negotiations of the Round on GATS 2000. Furthermore, believe that enhancing of the participation of developing countries in e-commerce and the use of information technology in the integration of developing countries into the multilateral trading system will be a key issue in the new trade agenda.

5.4.1.3 Social environment

Studies in Europe and the USA have highlighted the power of the business community to drive forward the adoption of electronic trading standards (Banerjee and Golhar, 1991; Reekers, 1994; Reekers and Smithson, 1994). For instance, in the UK, the success of the introduction of EDI may largely be attributed to the pressures exerted by the business community to establish standards (Section 4.3.1). The changes in business requirements in the 1990s can be attributed to a shift in high growth industries from capital and labor intensive to technology and skill intensive and the shift in economic activity from integrated production to global networks (Handoussa, 1996). This rapidly changing business culture mandates flexible processes to meet national objectives. Furthermore, increased globalization and trade liberalization have become an integral part of broader business strategies forcing organizations to pursue efficiency and cost control measures.

Egypt is coming under increasing pressure from the business community to adopt information technologies, which will allow it to react more flexibly and promptly to changing market demand. As a result of recent increased awareness of the business benefits associated with e-commerce in general and EDI in particular, members of the business community, the FEI and chambers of commerce are pursuing different

avenues to acquire new trading technologies. In that direction, they are endorsing establishing an electronic trading environment to cater for their emerging electronic trading and distribution requirements. New trading technologies are sought to achieve the above desires through technology transfer across various industry-sectors. They are advocating the use of information and telecommunication technologies to integrate in the world economy and meet future challenges. As a pressure group, they advocate adopting state of the art technologies as part of the national economic reform and structural adjustment programmes based on domestic market liberalization and outward-oriented growth, to rapidly integrate into the world trading system. Recently, there have been a number of efforts in that direction to promote the use of electronic trading, through holding seminars and training workshops. The aim is to increase awareness of the business community with respect to the benefits of these technologies. However, unfortunately, these efforts are typically fragmented and lack leadership and coordination. As a result, there is a clear requirement for leadership to systematically address market requirements and promote the use of EDI.

5.4.1.4 Technical pressures

As a member of the UNCTAD, Egypt is a participant in the trade efficiency program designed to enhance trade systems and services through the creation of Trade Points in each of the participating nations. Besides creating trading networks, Trade Points also provide trading facilities and linkages, and promote the introduction of EDI.

Egypt as an emerging market is also a recipient of aid, particularly allocated to electronic systems upgrading and IT-specific technology transfer. Technical pressures to adopt information technologies (such as e-commerce and EDI) and new logistics (such as JIT and QR inventory control systems) were primarily supply driven in the early 1990s by international organizations in an attempt to exploit the funds allocated. Although, technology has long received priority in Egypt, emphasis has been placed more on scientific research and less on technological innovation in manufacturing or at the enterprise level (UN, 1999). As a result, there remains a requirement to upgrade the telecommunications infrastructure and enhance the information services to cater for the manufacturing and trade requirements.

Technology developments are major drivers in their own right. Talero and Gaudette (1996) have emphasized how advances in information and telecommunication technologies are reinforcing economic and social changes. They assert that a new kind

of economy, *The Information Economy* is emerging, where industry, trade and investment are global and firms compete with knowledge, networking and agility. Moreover, entire industries transform or emerge through adoption of technological innovation. In India, the software industry has taken advantage of its low-cost, highly skilled labor to become a major producer of software. Similarly, new forms of networks and associations emerge to cater for industry-specific information requirements such as the ANA and VANS in Britain (Section 4.3.2 and 4.3.3). Electronic customs clearance, transportation arrangements and other electronic trading capabilities have reduced import and export transaction costs substantially for many countries consequently influencing corporate and national performance (Porter, 1990; Handoussa, 1996). Porter (1990) specifically calls for acquiring national advantage via competitive innovation, based on identifying technological progress and organizational/managerial innovation.

Developing countries are under pressure to catch up with the developed countries via technology acquisition. Special aid funds are allocated to technology transfer projects which are sought after by vendors of the western economies. A leading industry specialist interviewed in the UK, argues that developing countries are motivated to establish EDI industries either to integrate into the new world economic order, or find new IT markets to invest in and develop, or emulate success and technology leapfrog, or fulfill Governmental programs investing in efficiency initiatives and fast growth markets (Tate,1994).

Emergence of new technologies is also likely to influence EDI adoption. For example, the Internet has influenced inter-organizational systems in general and is likely to affect EDI systems in particular. It is expected to facilitate extending EDI to developing nations and SMEs. Kimberley (1998) attributes the shallow take-up of EDI in developing countries to cost of implementation, limited integration, lack of availability of VANS or prohibitive cost of service provision where available, as well as the difficulty of conceptualizing benefits and prioritizing resources to adopt the technology. Although the Internet facilities may potentially offer a reasonable cost effective solution, further research is required in order to identify the implications of the use of EDI on the Internet.

Although, technological developments afforded attractive opportunities for development, it is worth noting that developing countries are often skeptical of the

supply-push technology transfer initiatives. It has been indicated in the interviews that although these initiatives are often development oriented, they fail to acknowledge the contextual differences at variance with the developed nations. Thus, policymakers in developing countries are sometimes reluctant to extend the necessary support, and hence quite often, efforts towards technology transfer programmes are hindered.

Lack of awareness of the potential business impact of such IT applications on the one hand and lack of domestically rooted demand driven initiatives on the other substantially delayed serious developments to establish a national EDI industry in Egypt. However, the new Cabinet of Ministers instated in October 1999 has assigned, for the first time in the history of Egypt, a Ministerial position devoted to the development of the information and communications industry in the country. This is a very encouraging move from the newly formed government reflecting on its commitment towards a new information age for the nation. Previously national communications responsibility was assumed under the Ministry of Transport and no ministry took charge of information technology. Furthermore, the IT industry is endorsed at the Presidential level to ensure that Egypt is well-geared for the challenges of the forthcoming millennium. As such, both e-commerce and EDI are expected to be placed on the national IT agenda for development. This trend is also endorsed by a number of national initiatives. Since 1998 Egypt has been a participant in President Clinton's Internet for Economic Development Initiative to foster increased Internet usage in order to increase economic growth. On October 14th, 1999, US Commerce Secretary and the Minister of Economy and Foreign Trade in Egypt signed a Joint Statement on E-Commerce. They pledged the US and Egypt to support the growth of e-commerce around the world (Harnish, 1999). The Joint Statement sets forth the following broad principles that should govern the development of electronic trading: private sector leadership, minimal government regulations and restrictions, government encouragement of self-regulation, duty-free treatment of digital goods of value, and promotion of cooperation among all countries. The statement also covers issues related to privacy, intellectual property rights, content and consumer protection. Within the Trade and Investment Framework Agreement Council held in November 1999, in Cairo, the Egyptian delegation was also working closely together with the US delegation to investigate further means of promoting electronic trading (Harnish, 1999). Furthermore, it was clear from the interviews with the FEI, that the federation is adopting an *electronic trading awareness campaign* bringing together users and

service providers in an attempt to define the manufacturing community electronic trading requirements (El Kady, 1999).

5.4.2 Infrastructure

The extent to which a nation is able to adopt a new technology is heavily dependent on the state of its existing infrastructure. This is also supported by Juric (1994), McCubbrey and Gricar (1995) and Saxena and Wagenaar (1995) who stress the need for a well-developed and competitive telecommunications and informatics infrastructure as a basic requirement for the development of an EDI industry. Therefore, this section is devoted to examining the current state of the information and communications infrastructure in Egypt.

In 1985, Egypt started a big effort to build its national information infrastructure. Part of this strategy was achieved through establishing information and decision support centres at both central and local government levels under direct supervision of the Cabinet of Ministers Office. In addition, nationwide computerized databases were developed and major improvements in both communications and informatics achieved. Strategic alliances were formed with international IT leading organizations, and close bilateral cooperation with European Union countries was established to share experience and know-how (El Sherif, 1996). In addition, Egypt has participated in UNCTAD'S Trade Efficiency Program, aimed at establishing a worldwide network of trade facilitation centres called Trade Points. These are laboratories where the latest information and communications technologies, such as EDI, are applied to trade (UNCTAD, 1992). However, that Trade Point's plans to introduce EDI to the Egyptian market did not materialize. Trade and information technologies have been confined to data provision; Trade Point services, located within the Ministry of Industry, are limited to the provision of data and reports on national and international trade trends.

EDI services in Egypt are limited to access to international service providers. Neither the philosophy nor a local service provider are available at the national level. Use is confined to a limited number of multinationals committed to communicating with parent companies or trading partners. Dependence is primarily on one service provider. Experience in those countries where EDI has been successfully implemented highlights the importance of the role of coordination authorities and value added network service provides (see Chapter 4). Organizations such as the ANA and EDIA in the UK and EDIform in the Netherlands, play a crucial role in coordinating activities.

Egypt, likewise, requires the appointment of a national EDI service provider as well as a single, well-funded, one stop trade promotion agency with strong affiliation and networking capacity with various trade bodies.

It is also worth noting that recently there is a trend towards utilizing the Internet as a base for electronic trading. As revealed from the interviews, the private sector has resorted to utilize the Internet for e-commerce applications. Typically, they are web applications used for marketing purposes. However, it is a stepping stone towards electronic trading, mainly engaging business to customer trading transactions. In pursuit of developing the electronic trading community, inspite of the prevailing constraints, the private business community are endorsing a *Keep Going* strategy. This strategy advocates building on existing resources, i.e. the Internet, until the time when a full EDI infrastructure and legislation are in place. This is a reflection on their tenacity towards establishing a national electronic trading infrastructure.

The communications and information technology environment in Egypt is a booming investment sector. The GOE recognizes the importance of this sector at the threshold of the third millennium. Consequently, initiatives are undertaken in a number of directions to incorporate the state of the art technologies to upgrade Egypt's competitive capacity and stimulate growth. Furthermore, the GOE is implementing a *Technology Valley Project* on 16,000 feddans at an initial cost of US$ 120 to host 300 companies across seven industry-sectors including leading edge technologies, informatics, communications and electronics industries adding a conservative estimate of US$ 2.3 billion to Egypt's national income (Amcham, 1998).

Developments in the information technologies and communications front over the past 5 years alone have been impressive. Recent statistics indicate an increase in the number of personal computers, Internet hosts, and telephone lines, of 146%, 136% and 330%, respectively, between 1995 and 1997 (World Bank, 1999). Although, there is also a growing recognition of the potential of e-commerce and its associated benefits, there remains a concern regarding privacy, security and legislation.

A study conducted in 1998, by the American Chamber of Commerce in Cairo, concludes that there is potential for participation of Egyptian firms in e-commerce, but it is an institutional decision rather than a technical one. Similar to the case of the UK (Section 4.4.3.6), the report suggests that the decision of the firm is based on

organizational factors, namely the corporate strategic plan for development, rather than technical aspects, in terms of dealing with choice of service provider and standards. The report calls specifically for increased awareness of the implications of engaging in e-commerce trading and stresses the implications of the lack thereof. The report recommendations call for a national policy to promote the information society, facilitate growth of IT industry and promote national diffusion of IT use. It voices the requirement for adjustment in legislation governing copyright/privacy and openness laws. Furthermore, it encourages defining government spending on IT in priority areas and institutionalizing incentives for private sector spending on IT, whilst monitoring impact on social and economic growth (Amcham, 1998).

With respect to the communications industry, several studies that evaluate countries experiences of liberalization and deregulation of such services, provide evidence of increased efficiency and better allocation of resources (Majumdar, 1992). In light of the previous successful models, in March, 1998, Law 19/1998 was promulgated, transforming the National Telecommunications Authority, known as *Egypt Telecom*, into a joint stock company. This law allows now private-sector participation in the telecommunications industry in Egypt. The state is expected to initially retain 80% stake of the company, however, the law is an indication of a step in the right direction to increase service efficiency and allocation of resources. Such de-regulations are expected to contribute positively towards the development of the EDI strategy.

It is clear from the above that efforts to upgrade the IT and telecommunications is well-underway which would pave the way towards developing a national EDI industry. However, there still remains a need to raise the awareness of the EDI specific requirements in order to effectively direct the national strategy towards the development of a national EDI industry.

5.4.3 Capacity to Change

Another major determinant of the success of a national EDI strategy is the initiator's awareness of the EDI capacity to accommodate changing business requirements and technical developments as mentioned in Chapter 4. This section investigates the potential areas where such knowledge will be particularly useful.

By the way of illustration, e-commerce as an instrument of multilateral trade will be subject to international regulation. The Declaration on Global Electronic Commerce

adopted in the May 1998 WTO Ministerial Conference established a working programme to analyse trade issues relating to e-commerce, and to make recommendations for action at Seattle. A moratorium has also been fixed on customs and duties and free trade on e-commerce up to 2000 (Gamberale, 1999; cited in Guerrieri and Falautano, 1999). Hence, it is clear that infrastructure and procedures that enable both importers and exporters to access and exchange products will be affected. Therefore, it is necessary to ensure awareness of policymakers of EDI capacity to change in preparation for anticipated adjustment requirements.

At the same time, it is acknowledged that the Internet will extend the range of what is tradable. Traditionally, non-tradable goods, such as medical, legal, architectural, travel, accounting, education and other services have become tradable as a result of these new technologies (ESN, 1999 cited in Guerrieri and Falautano, 1999). Likewise, such extension can be easily catered for utilizing the EDI capacity to change.

From an international trade perspective, Schware and Kimberley (1995a) point out that international trade processes are typically characterized by complexity and redundancy. Some document handling procedures are surrounded by 500-year-old practices. A typical international trade transaction can take as many as 150 different documents to process. Meyers and Canis (1991) indicate that there are estimates of paperwork in international trade costing some 7 percent of the value of the traded goods. This complexity is not only as a result of the multiplicity of organizations involved in the supply chain, but is also a product of multiple data entries. It is believed that process change in international trade procedures, in particular, represents a major challenge in trade facilitation initiatives. Although EDI can play an effective role in reengineering such processes, the environment constraints are likely to inhibit such changes. For example, in India, where resistance to change is strong committed itself in 1993 to domestic EDI usage, but in 1995 there were no more than 200 users in the region (Schware and Kimberley, 1995). Meanwhile, where initiatives accounted for EDI's capacity to accommodate changing business and technical requirements, successful results were reported. Western countries such as France, Ireland, Germany, Spain, Switzerland and Benelux countries have focused from the beginning on defining EDI requirements ensuring connectivity and compatibility as well as primarily adopting EDIFACT to ensure homogeneity and integration with international standards to account for potential changes in the business and technical requirements. It is believed that appropriate knowledge of EDI capacity to change would aid

counteracting cultural resistance to change and should, therefore, be accounted for in developing a national EDI strategy.

Finally, at a national level there is a continuous change in policy to accommodate dynamic international trade requirements. Therefore, appropriate appreciation of EDI's capacity to accommodate such changes is critical to success. Although, it is difficult to assess or preempt the extent or nature of resistance to change that is likely to be encountered in Egypt, it is reasonable to assume that difficulties to adapt traditional business processes would at least be representative of those typically encountered in reforming international trade procedures. It is, therefore, recommended that initiators awareness is not confined to EDI's technical ability to streamline procedures as a part of a major reengineering strategy, but also encompasses EDI's potential to accommodate change and to possibly allow for a phased approach to account for the existing environmental constraints. This understanding provided the foundation of the proposed solution to the CEA in Egypt (Section 5.7).

5.5 THE CHALLENGE AND THE CONSTRAINTS

Based on the interviews with senior policymakers and technical consultants, the following key challenges and constraints to promoting electronic trading in Egypt are identified (see Annex 5).

- *Awareness and Education.* There is still a lack of awareness of the strategic benefits associated with electronic trading amongst the manufacturing and trading communities. However, it is believed that the situation is improving rapidly. The FEI and Chambers of Commerce are organizing a series of specialized seminars to promote the use of electronic trading. Nevertheless, it should be noted that unless increased awareness is reflected in incorporating electronic trading in corporate and organizational strategy, progress is not likely to be achieved. It was stressed during the interviews that there is a need to bring together key players to educate, lobby and motivate the society to adopt electronic trading (Ismail, 1999). Furthermore, there is a need for a national coordinating agency to hold national awareness campaigns, sectoral workshops and strategic round-tables for decision-makers to effectively develop the electronic trading community.

- *Human Resources.* There is a requirement for technical and professional expertise to develop the electronic trading culture in Egypt. Therefore, training of professionals in related fields of practice, i.e. legislation, tax collection, customs authority as well as

the technical expertise, is essential. In fact, the potential to establish a specialized institute to build capacity in this field is seriously being considered at the highest authority levels (Ismail, 1999).

- *Market size and content.* There is difficulty is assessing the potential electronic trading market size in Egypt. Difficulty is attributed mainly to two factors. First, the extent of IT infrastructure within organizations varies tremendously from one sector to another. Second, is with respect to the language barrier. Most, if not all electronic trading applications used in Egypt are in English. In order to properly develop the national electronic trading environment, the lack of Arabic trading applications has to be resolved and the use of the language institutionalised.

- *Electronic trading infrastructure.* There is a need to regulate both electronic trading activities and the relevant financial infrastructure. For example, there is a requirement to secure transaction compliance and legal acceptance of electronic payments. Therefore, endorsement of the Central Bank to online payment systems and coordination in the banking sector and building trust in electronic payment methods are key policy elements on the national agenda to institutionalise electronic trading (Ismail, 1999). With respect to telecommunications, recent trends towards liberalization and privatization of telecommunications services are encouraging indications towards a potentially more competitively priced service. Also, the infiltration of the Internet in public and private sector organizational culture is paving the way towards accepting electronic business communications at large.

- *Legal system.* There remains a requirement to adjust the legal and regulatory framework expected to govern electronic trading. Legal human resources also require training in order to be able to accommodate dynamic trading requirements. Furthermore, there is a need to follow-up on international developments in setting trading standards.

- *Pricing structure.* A review of the specific costs related to IT, telecommunications and potential electronic trading activity is necessary since the prevailing pricing structure is a major constraint (Ismail, 1999). However, it should be acknowledged that there is national interest to upgrade the state of information infrastructure in the country and as such the pricing structure is likely to be adapted to cater for promoting an electronic trading community (Ismail, 1999).

Finally, there is also the anticipated resistance to change. Decision makers are not willing to adapt their traditional business processes. Their resistance is justified within

the organizational context, if one considers the potential impact on adopting electronic trading on corporate staff. A number of constraints prevail, for instance, language and retraining requirements. It is therefore believed that there is not only a requirement for increased awareness, but also for *localizing* packages to cater for user requirements, including making allowance for language change.

Inspite of these major constraints, there is a strong interest in establishing a national electronic trading industry and infrastructure, in general, and EDI in particular. To illustrate, the success story cited in the maritime industry in Egypt, is that of Dammietta Container Handling Company (DCHC). The company was pressured to implement EDI in compliance with its international trading partners systems. Faced with the risk of business loss, DCHC invested US$ 150,000 in implementing an corporate EDI system, training staff and changing corporate culture. The company claims substantial financial gains as a result of adopting EDI (Abd El Fattah, 1999) and sets a success model for implementing EDI despite the prevailing constraints.

5.6 ROLE OF GOVERNMENT

The GOE endeavors to enhance the efficiency and effectiveness of cross-border customs procedures and inspections to boost Egypt's trade performance and facilitate access to international markets. Consequently, two main trade-related initiatives are instigated. The first calls for programmes to improve cargo handling, clearance and inspection procedures in order to speed the availability of inputs into export production. The second initiative advocates programmes to expand duty free importation schemes, in particular simplifying procedures for all manufacturers and SMEs. Within this context, it is evident that EDI represents a primary enabling technology to underline the actual implementation of these initiatives.

On the institutional economic front, GOE has achieved commendable progress in recent years by introducing policy and regulatory reforms to stabilize the economy, improve business confidence, and attract FDI. It is continuing to pursue a trade reform program to further reduce import tariffs, non-tariff barriers and effective rates of protection. However, both tariffs and rates of effective protection still remain relatively high, and the import and export trade processes are in need of reengineering and streamlining alongside requirements of trading partners (UN, 1999). Therefore, the need to adopt EDI is acknowledged.

With respect to developing a national EDI industry, GOE initially welcomed in 1995 the potential to develop a national infrastructure in cooperation with an international vendor. The project failed to materialize as discussed earlier (Section 5.2). Although willing to provide the regulatory framework, the government did not undertake the execution role which was proposed at the time and declined to establish the required strategic alliance with the vendor. It is worth noting, however, that although the GOE and IDSC were skeptical in 1995 of the potential EDI benefits and their application to the Egyptian business culture, they are now fully supporting e-commerce initiatives at large (Amcham, 1998). The GOE is currently considering an active role as a facilitator and key player to promote electronic trading as discussed in Section 5.4.1.4. It aims to establish a transparent and well-defined electronic trading environment, setting a role model as the *largest buyer*, as well as endorsing a national strategy at the presidential or prime-ministerial level (Ismail, 1999).

From the interviews, it appears that the GOE is expected to play an instrumental role in establishing the national electronic trading industry. Yet, it is believed it requires vision, direction, and momentum. Given the prevailing constraints, discussed in Section 5.5, trade legislation, technology endorsement and government support are fundamental to founding national infrastructure, regulating the trading environment and promoting the development of the EDI community.

The case of CEA described in the following section is likely to engage the interest of the policymakers towards the development of a national EDI industry. The case of CEA is particularly important as it demonstrates a demand-pull requirement to adopt EDI within a public sector authority of strategic national value. Egypt is primarily driven by its commitment to free trade agreements by 2004, which is anticipated to a have drastic impact on the revenues generated by CEA. Tighter controls need to be put in place to avoid loss of income due to systems inefficiencies. These issues are discussed in detail in the following section.

5.7 THE EGYPTIAN CEA CASE STUDY

Egypt's CEA was established in the early 19th century (1819) as the formal gateway for imports and exports. The CEA has focused, since its inception, on generating revenues for the national treasury through duties applied to imports and exports. Customs duties alone have accounted for approximately 30 percent of tax revenues over the past five years and 12 percent of the government revenues (World Bank,

1997a). Consequently, the efficiency of customs collection is a crucial dimension of the CEA's operation.

As Egypt pursues economic reform and seeks to integrate into the world economy, the role, mission, and objectives of Egypt's CEA is changing. Trade facilitation is becoming much more important. Progress in achieving the desired changes is hindered by numerous inspection agencies and layers of regulations, which slow the movement of goods to and from international markets, hinder trade promotion and administrative efficiency, and encourage theft and fraud.

The introduction of EDI within a trade facilitation framework would not only reap efficiency gains, in terms of use of accelerated, simplified systems and EDI-based pre-clearance of imports and exports, but would also provide the information necessary for decision making with respect to problem solving, facilities scheduling, and planning for maximum use of infrastructure. Such implementation would also cater to increasing the revenue generated by Egypt's CEA as a result of increased efficiency and enhanced transparency of the procedures involved in international trade.

Egypt is an emerging market that is heavily investing in development and growth strategies based on trade and FDI promotion and streamlining associated process. EDI provides the capacity to cater to Egypt's trade facilitation requirements and offers the potential for some dramatic national performance, as witnessed by the evidence of success in Singapore. It is, therefore, proposed that EDI's role in endorsing national strategies and safeguarding national interests should provide the basis of developing a long-term strategy in spite of the presence of major implementation barriers.

The CEA is selected to induce the development of a national Egyptian EDI industry based on the following. First, it enjoys government support and endorsement. Second, there are well-defined requirements and potential gains from adopting EDI. Third, integral to its core business processes is the handling of vast and increasing amount of structured data. Fourth, CEA acquires a well-established hub-spoke network structure in which it can dictate its preferred means and terms of trading. Finally, it is under increasing pressure, from both international and national trading communities, to integrate in the world economy and increase efficiency.

5.7.1 The Status Quo

The CEA has four geographical directorates: Cairo, Alexandria, Suez and Aswan. Each directorate has several customs posts – for example, the Alexandria directorate handles both Alexandria and Damietta seaports in addition to Egypt's western borders with Libya. Each directorate is organised around two functional layers: operational and financial. The operational layer is mainly responsible for the validation of regulatory permits and documentation as well as the valuation of goods and the application of the various duties and taxes. The financial layer is primarily concerned with duty collection and management of warehouse transactions.

Each directorate has distinct functions and features, reflecting the type and value of goods processed. In terms of transaction volume, the Cairo directorate handles around 300 000 consignments each year, compared with 70 000 for Alexandria. However, in terms of value, Alexandria handles 82 percent of the total value of imports and exports.

Since the inception of the process of automation at the CEA, initiated in the mid-1980's through a French government initiative, the focus has centered around Alexandria, which is the largest revenue generator (Zorkani, 1996). Since then, only 12 other customs posts have been automated. The majority of the others are still based on manual processes.

In order to illustrate the complexity of the situation and justify the potential benefit of adopting EDI, the following section analyzes the procedural flow of the documentation of imports through the CEA.

5.7.2 Flow of Documentation through CEA

As with most customs authorities, the current clearance system in place is based on the trader's declaration of goods entering or leaving the country. This customs declaration needs to be supported by a range of business documents, such as, the invoice, the packing list, the bill of lading, permits, licenses and other such approvals for import and export. Other crucial documents include the shippers manifest, insurance documents, payment instructions and possibly certificates of compliance from pre shipment inspection (PSI) companies and certificates of origin. In the majority of countries these documents are processed manually by the customs authority. Surprisingly, where there is use of computers, they are primarily used for statistical purposes (Kimberley, 1998).

This topic of CEA documentation occupied a considerable part of the interviews. Many discussion, and hence answers, were centered on the types of documents, their aim, size, how and by whom they are completed, the time needed for completion and the way they are processed afterwards. For analysis purposes, the flow of documentation through the CEA is outlined in Figure 5.2 and may be described in three distinct phases.

5.7.2.1 Step I - Receipt of goods

The shipper delivers goods to the designated CEA warehousing facility accompanied by the original shipping manifest documentation. The content of a shipment would normally contain several consignments, each owned by a specific importer. In addition to the manifest of shipment document, the shipper also delivers one complete set of shipping documents for each and every consignment within that shipment. These shipping documents include: commercial invoices, packing lists, bills of lading, insurance certificates together with any special requirements documentation. By law imports require a minimum of three original sets of shipping documents to accompany the goods - the first set goes to the CEA whilst the second and third sets are dispatched directly by the shippers' agents to the beneficiary and consignee of the goods, respectively. Handling and storing of goods are charged to the importer, with a grace period of one week for clearance of the goods. The shipper's agents notify beneficiaries and consignees upon the arrival of goods to expedite the clearing process.

It should be stressed that only upon receipt of a shipment, goods are logged into the warehouse audit control system as per the manifest documentation. The audits are, however, registered on a shipment basis and notably do not contain the details of each consignment. It is believed that this lack of detailed information in the Audit Control System represents the a loophole in the system leading to inefficient warehouse management and lack of control over inventory.

5.7.2.2 Step II - Clearing Procedures

In order for goods to be cleared the following documentation and procedures need to be completed (Figure 5.2).

- *Application Form.* The importer is responsible for collecting the bill of lading together with the shipping documents and filling in an import clearance form

(handwritten) to include details of the consignment as well as the importer and exporting company. This form together with the set of original shipping documents is then submitted to a computer department at the excise outlet.

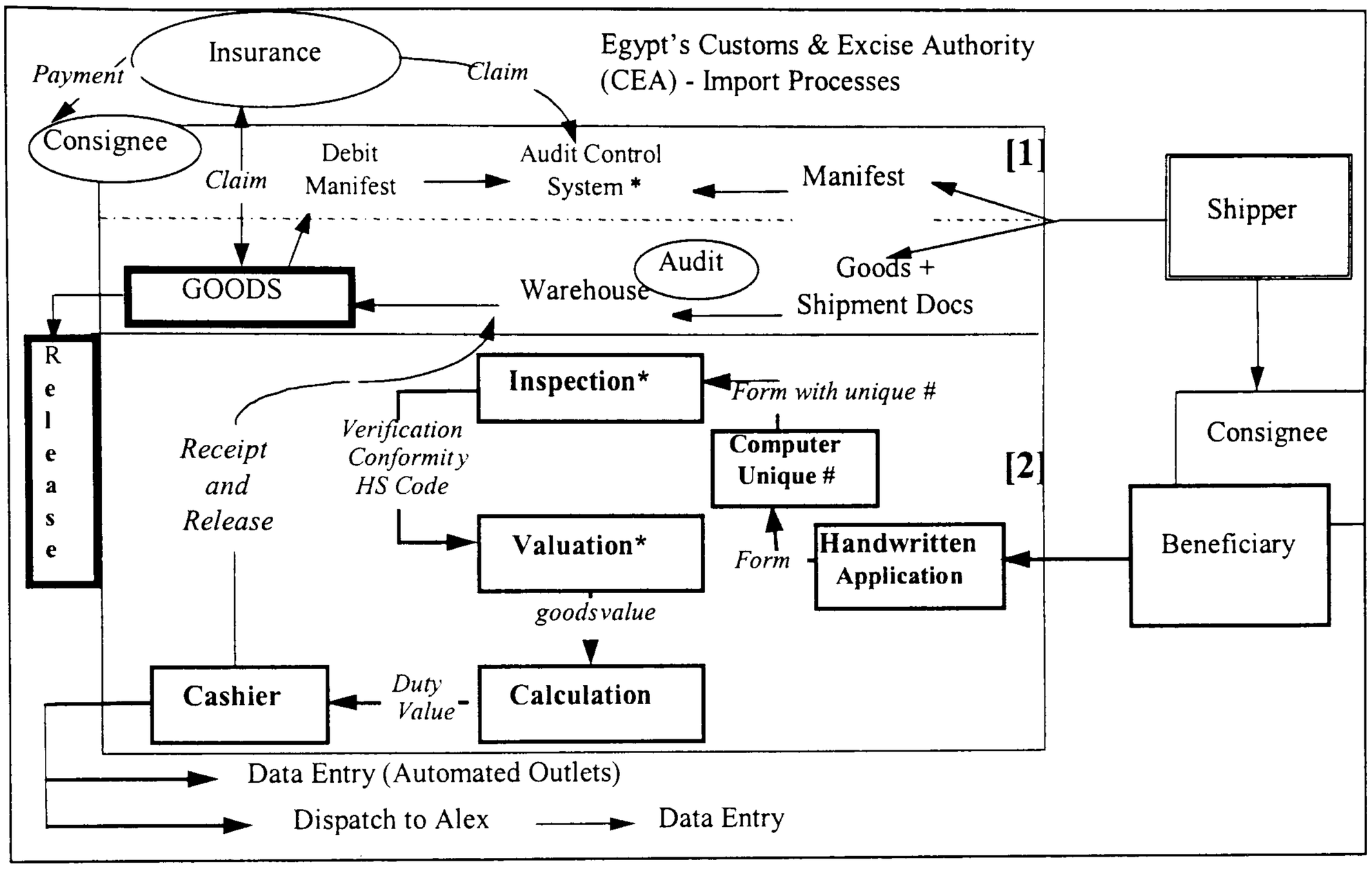


Figure 5.2 Flow of Documentation through CEA.

- *Reference Number.* The computer department then issues a unique import certification number to the importer, marking a specific consignment of a specific shipment according to the application form discussed above. Attention must be brought to the fact that the information contained in the import clearance form, completed by the importer, is not logged into the CEA computer system at this stage. In fact, details are only keyed into the computer system when the whole process is complete and the products released.

- *Inspection.* At this stage, goods are physically inspected to ensure that: the commodity is legally permitted to enter the country; the importer's documentation conforms to import requirements and regulations; and that there is consistency between form details and product and the detailed Harmonized Commodity Classification System (HS) classification code.

- *Valuation.* In the valuation phase, decision is based on either comparing the commercial invoice for goods with price lists of previous similar imports, or the personal judgment of the evaluator is used. As a result, serious error rates in establishing import value and in tariff classification occur. This can be attributed to

two main factors. First, the database of values used by customs is based on historical data from previous imports and does not contain the value of goods other than those determined at the borders. Second, there is incompatibility between this system, which is based on the Brussels Definition by Value (BDV), and the WTO valuation principles. Members of the WTO must abide by the requirements for custom valuation which implies that Egypt will have to alter existing customs valuation (World Bank, 1997b). It is worth noting that it has been suggested that the existing system will hinder Egypt's efforts to migrate to the WTO valuation principles (World Bank, 1997a). This stage is highly judgmental and is subject to manipulation. It is evident that valuation and classification of goods are a result of negotiation between importers and customs officers. To avoid false valuation, it is clear, there is a need for tighter controls over the inspection and valuation processes.

- *Duty Computation.* Technically, the result of the evaluation stage is an HS code number and the duty to be paid by the importer.

- *Payment.* Payment terminates the clearing procedures. This stage includes handing over the shipping documents in exchange for a payment receipt and a goods' release authorization.

- *CEA central registration process.* The documents then follow an audit check, to confirm their accuracy, and are forwarded to the computer section to be keyed-in at automated outlets, or simply stacked in paper form to be sent to the central computer department in Alexandria for data entry. As mentioned earlier, details are logged onto the system, for the first time, after the import clearance process has been completed.

5.7.2.3 Step III - Release of goods

Once release of the goods has been authorized, the importer can withdraw his goods from the CEA warehousing facility and the consignment is deducted from the manifest details. In the case of delay in clearing the goods, the importer has to settle storage fees prior to final release. If any goods are received damaged, defective or incomplete, the importer has to then notify the insurance companies with his claim prior to release and document the claim in the presence of a CEA representative. Theoretically, the CEA should return to the shippers' agents their shipping manifest thus offsetting any liability. This does not take place, however, due to the limitation on consignment data management.

This system lends itself to a number of problems causing some serious delays in products release. These delays are mainly attributed to: the lack of an automated information management system, the inefficiencies inherent in multiple system layers, the inconsistency in data registration and finally the subjective valuation of products. Only, upon complete or partial withdrawal of a consignment, the customs audit control deducts the value and tonnage of this particular consignment from its shipment manifest.

5.7.3 Evaluation of the CEA Procedures

The case study examined the extent of efficiency of the CEA procedures. Although varied views appeared from the interviews, there was some consensus on certain points. Thorough analysis was made which led to arriving at the following interpretation and evaluation of these procedures.

Technically, it can be argued that the overall process is representative of the systems applied in the majority of countries. Declarations are first submitted in special forms which are subject to examination for accuracy and completeness. Customs duty is then evaluated based on the data detailed in the form.

Problems of information flow within the CEA are typical of those encountered by institutions involved in international trade, namely, lack of detailed data and a series of complex processes in need of streamlining. Analysis of the existing flow of information through the CEA suggests that improvements can be made with respect to logistics and data handling, which could result in substantial financial savings. It is estimated that successful implementation of EDI within the CEA in Egypt may result in increasing the revenue generated by the authority by US$ 350 million annually (Zorkani, 1997). Areas of reform have focused on the requirement for detailed data, streamlining processes, and organizational challenges.

5.7.3.1 Requirement for detailed data

There is a fundamental requirement for detailed product information. The existing systems cater only partially to such a requirement. As a result, there is often inconsistency and discrepancy in the information reported, particularly with respect to estimated versus the actual revenue collected.

The analysis of the information flow at CEA reveal the following. First, the lack of product details in the shipper's manifest documentation combined with delays in product release result in a loss of revenue. Second, the existing customs clearance system does not provide adequate control to counter valuation fraud, and delays of payment of revenue by about two weeks on average. This is supported by a World Bank report (1997a, page 3) stating that, "*...There is no specific record to show how successful the present system is in collecting revenue, but the evidence suggests alarming levels of inefficiency. Officials estimate that disputes over customs declarations occur in 60 percent of all consignments, an estimated 75 per cent of these are related to valuation, 15 percent to classification and 20 percent to incomplete documentation. The statistics show that in most cases importers choose to settle disputes through negotiations away from the formal channels of recourse. In 1995/96, only 10 percent of the value of imports were subject to disputes through normal channels*". Evasion of duty through false valuation is notoriously difficult to prove and prosecute (World Bank, 1997a) given that the only measure available is confined to the duty value. Such inefficiencies carry an added complication which is manifested in importers claiming compensation from the insurance companies. Insurance companies in turn make claims against CEA which seriously hamper Egypt's shipping insurance premiums as well as national income. Third, a major constraint confronting importers, exporters and government policymakers in Egypt is the lack of accurate, reliable and reasonably up-to-date data on imports and exports trends and conditions. This concern is shared, *"This problem is sufficiently significant to warrant a prominent position in issues related to export development. Business executives have little reliable data on overall trends"* (World Bank, 1997c, page 6).

5.7.3.2. Streamlining Processes

A long tedious paper based system, by definition, lends itself to error. The presence of multiple agencies and multiple layers within each agency in the processing of information results in inconsistency in the data reported. Lack of systems transparency and consistency in procedures in applying and interpreting regulations contributes to systems complexity and ambiguity.

Customs officials indicate that clearance procedures could be streamlined and that substantial savings in the attendant time and costs could be achieved. The government

is seeking to introduce new procedures that use modern information technology that will effectively facilitate trade.

It is clear that the context setup encompassing CEA favours change. This is reflected in the recommendations put forward to GOE to enhance customs revenue collection. *"In the immediate term, given the government's policy of containing the fiscal deficit and as average tariffs are falling with the advent of trade agreements, the efficiency of customs revenue collection is a very pressing matter"* (World Bank, 1997a, page 3).

It is believed that in the long term, when tariffs will continue to decline, with sales tax replaced by VAT and trade acquiring a greater share in economic activity, valuation of imported goods at the border will become even more critical. Consequently, the aggregate effect on revenue of inefficient taxation at the border will become more serious. In this context, the GOE is under direct pressure to adopt EDI.

5.7.3.3 Organizational Challenges

Major strategic and organizational barriers exist that impede the adoption of EDI. First, the existing organizational and cultural setup of the CEA is complex and rigid. There is considerable resistance to altering inter- and intra-organizational power relations. Second, many customs posts are still manually operated and have a grace period of delay of one to three months to complete any one operation and report data to the central computing system. Third, the strategic alliance in place with the French organization in charge of operating and maintaining the central computing department in Alexandria is funded by the French government which has renewed its funding and maintenance contract of the systems through 1999. This alliance does not allow for any tampering with the existing system, nor is it flexible to accommodate new applications.

5.7.4 A Possible Approach

Given the existing organizational and cultural constraints at the CEA, a staged approach to introducing EDI within the CEA in Egypt is clearly required. Although a fully-fledged EDI implementation strategy, together with a fundamental business process re-engineering initiative, may contribute significant benefits to the CEA, the given constraints do not allow for such privilege. However, an initial phased approach leading eventually to business process redesign may be introduced through the simple application of an EDI system, external but parallel to the CEA flow of documentation

processes, which shadows the data processed. This would be transparent to the public, but avoid the major threats associated with a new implementation.

It is important to note here that it was clear throughout the interviews with the CEA officials that they welcome the introduction of EDI technology. The expressed concerns were mainly on how and at what expense. In order to reach a sound solution for practical introduction of EDI technology to CEA, a set of proposals were defined. These were based on the current research results, lessons learned from the British industries experience with EDI implementation, in general, and the case of HMSO, in particular, as well as the existing situation of the procedures of CEA and their current and potential capabilities. These proposals were, then, put forward to CEA top management during a repeated series on interviews focused only on the possibilities and barriers to implementation. The proposals were then subject to enhancement, sharpness and refinement. Eventually a three-phased approach to meet CEA-specific barriers and challenges was set out.

5.7.4.1 Phase I – Introduction of EDI

The proposed solution centers around the introduction of one/two PC stations at each CEA outlet throughout Egypt. These stations will maintain direct lines to global EDI networks utilized by most shippers worldwide. The shippers' core data is electronic and is usually transferred to the ship after deportation using EDI standards to avoid unnecessary delays at the port of export. The same data stream could be transmitted (shipping documents and debit manifest) to CEA stations adopting EDI standards and protocols. The data transmitted would not only include the aggregate manifest details but also the consignment details.

This initial stage aims at capturing detailed consignment details without tampering with the existing systems (denoted by [1] in Figure 5.2). In this introductory stage, EDI is used to shadow existing processes. The EDI-enabled PC at the warehouse audit control would ensure the capture of detailed consignment data, which can be electronically processed and await the goods' release authorization. This can subsequently be deducted from the debit manifest according to consignment details. This minor alteration does not interfere with any of the operational layer processes but provides a number of benefits:

- Detailed line items will be received from the shipper prior to docking, which will provide immediate access to information; cut down on time delays; include a

complete record of information, including customs code and product description; and provide control of warehousing inventory.

- The automatic tracking of products in process versus products released will be much better controlled and thus reduce opportunities for inconsistent data or discrepancy. Similarly, dumping processes will be better controlled.
- Audit for valuation of import goods could take place in advance, since details of a shipment would be available before the actual docking of the goods. This will enhance the systems' transparency.

This proposed system would also provide a more centralised audit of the functions of the CEA and help set the stage for expanding this pilot to a full and comprehensive EDI implementation. This pilot could be further extended to provide enhancement to existing paper process by enabling a preset form to be printed for importers upon submission of consignment. CEA management and the importers will, therefore, have the detailed information at the early stages of the paper processing cycle.

Although the proposed initial phase of EDI is confined to producing accurate data and providing initial information control, it provides the potential to streamline business processes, and improve control over the identified system loopholes.

5.7.4.2 Phase II - EDI community development

The second stage of the proposed solution aims at establishing the foundation for developing the national EDI community. This phase would be setup at the operational level, denoted by [2] in Figure 5.2 and would entail the use of a PC terminal at the initial stage of the clearance process. The consignment details are received directly from the shipper in EDI format. The data received is electronically mapped against CEA import clearance form. A unique reference could be then automatically generated. The importer is presented with a completed form to initiate the clearance process. This would result in the elimination of the final CEA central registration process in Alexandria. It would also facilitate communication with the importer or his/her broker, increase efficiency (avoid data inconsistency and procedural delays), and enhance the CEA services. Networking of PCs may be considered at a later stage. Such application would, however, require development and upgrading of the skills, knowledge, and expertise of existing staff.

5.7.4.3 Phase III - Establishing an EDI Gateway

Ultimately the CEA would benefit from the implementation of a full-fledged EDI implementation (see Figure 5.3). Such implementation would involve simplifying processes, removing excessive and obsolete controls, shortening and easing lines of communication, and using both bar coding and EDI for rapid, accurate transfer of data between computers. It would also require alignment with trading partners' systems and the adoption of international electronic trading standards.

The proposed solution is based on implementing a corporate gateway based on the HMSO implementation modality described in Section 4.5. As shown in Figure 5.3, all processes will stem from, and feed back to, the CEA Corporate Gateway, thus streamlining the processes involved.

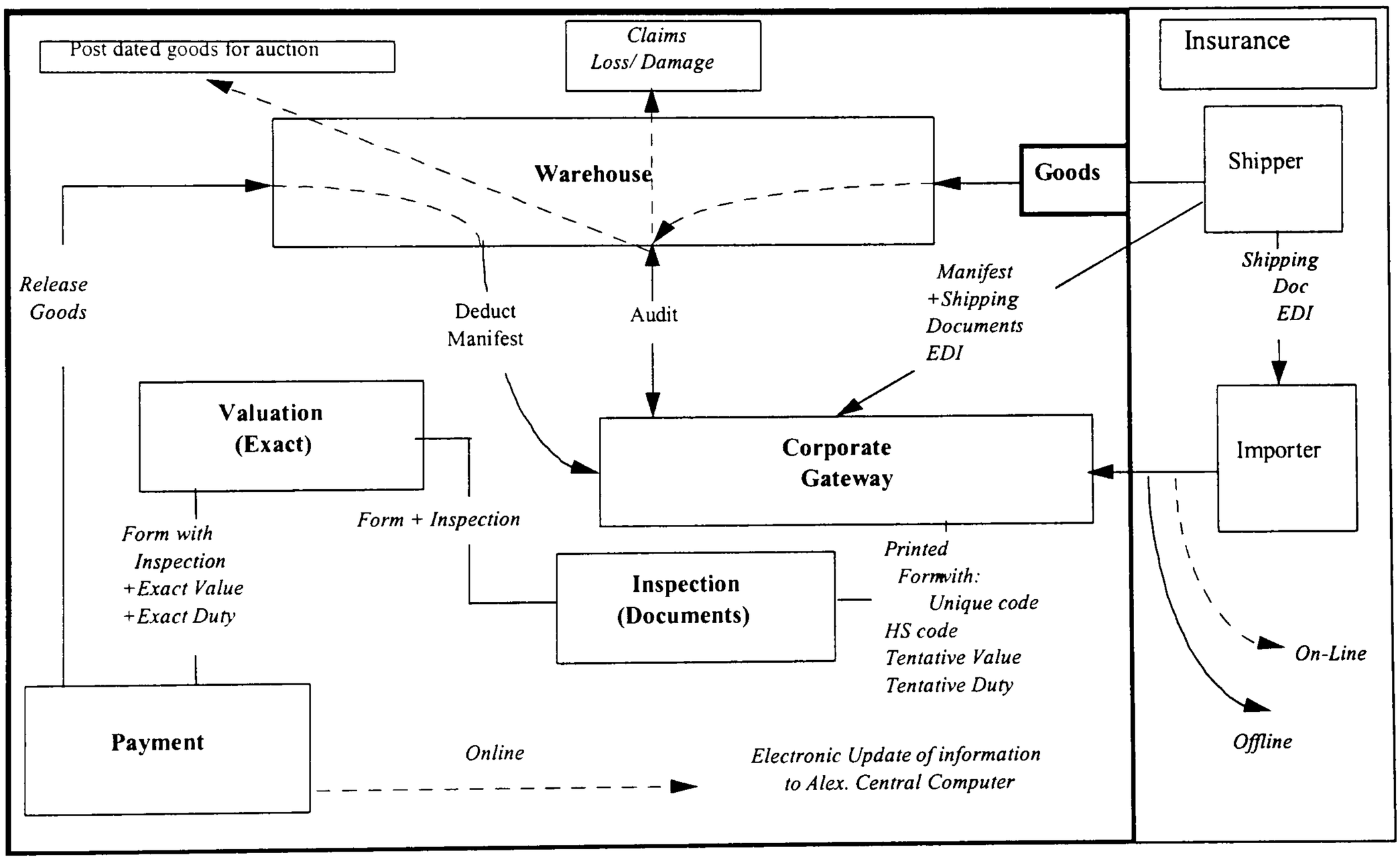


Figure 5.3 Full EDI Solution at CEA (Proposed).

The data processed is based on detailed information received directly from the shippers. Furthermore, the gateway will maintain the flexibility to cater to the changing domestic and international trade requirements with respect to changing the data definitions and values in accordance to the various trade commitments. As depicted in Figure 5.3, it acts as a processes and functions integrator, pulling together the traditionally fragmented activities. Thus, streamlining the processes will eliminate discrepancies and inconsistencies and provide CEA with reliable data and firm control over operations.

Given the existing constraints, this may only be considered as a long term strategy. As previously discussed an understanding of the social context is crucial if EDI is intended to play a meaningful role in managing change for development. As such it is necessary to accommodate the prevailing constraints in putting forward phased EDI implementation solution for the CEA.

5.8 SYNTHESIS OF THE FINDINGS OF THE STUDY OF EGYPT

Based on the above discussion of the case of the case of Egypt, in general and the case of CEA in particular, the following aspects critical to successful EDI implementation can be inferred.

5.8.1 Business requirements

First, a demand-driven national EDI strategy must be based on well-defined national business and economic needs and requirements. It should incorporate international requirements to streamline trade processes, which will reduce the trade information processing cycles to a minimum critical path, thereby achieving economies of scale and scope and maximizing competitive advantages (Schware and Kimberley, 1995a). It should also cater to the requirements of national industry-sectors, based on their perceived competitive and efficiency benefits. Unless there is recognition of business drivers as the main motivational factors to adopt EDI, limited benefits will emerge.

5.8.2 Role of government

The regulatory role of government, and its endorsement of developing EDI through securing funding and required infrastructure, is critical in project ramp up. The GOE has played a leading referee role rather than implementational one in the initial stage of introducing EDI. Following on from the Singapore experience, government endorsement of electronic trade in general and EDI in particular will be instrumental in promoting and institutionalizing EDI adoption nationwide. Development of the infrastructure does not necessarily need to be centrally funded by the government, but could be in the form of an endorsement or partnership with the private sector. The most important aspect is to institutionalize electronic trading and ensure an environment conducive to community development.

5.8.3 Trading partners' requirements

Increase awareness and enhance EDI specific education. Expert knowledge of business requirements and EDI capacity is a prerequisite to successful implementation. An awareness and education program is an important key to success. Lack of such program is likely to cause failure and delay EDI implementations (Schware and Kimberley, 1995a). Promoting EDI education will contribute towards human capacity building. It will not only help develop the skills and expertise required for maximizing the use and potential of EDI implementations, but also cater to tailoring EDI use to national requirements and constraints.

To ensure successful implementation, incorporating trading partners' requirements is also crucial. The success of Her Majesty's Customs and Excise Authority in the UK in endorsing electronic trading has been partly due to addressing and integrating trading community requirements in all activities related to collection d dissemination of information (Sawhney and Williams, 1994). Such a partnership can be seen as a fundamental requirement to facilitate later phases of EDI implementation and community development. Accommodating trading partners' requirements, particularly in terms of standards compatibility, is crucial in developing the EDI community. It is important that such a consideration be accounted for in the process of planning and strategy formulation. It should be noted that it was necessary to call on the experience of Her majesty's Customs and Excise Authority in the UK to stress the importance of accommodating trading partners requirements, given the limitation that EDI is yet to be established in Egypt.

5.8.4 Technical strategy

National infrastructure development is needed. A primary requirement for developing a national EDI industry is the availability of a sufficiently sophisticated, competitive, and reliable data communications network and VANS, as previously discussed. Although the EDI technology itself is transferable, local expertise is still required to apply domestic requirements, definitions and restrictions. This is applicable in terms of defining EDI applications and standards as well as developing the marketing and community development strategies. Developing the infrastructure should also take into account the know-how transfer to include factors critical to successful EDI adoption on a national level, including the role of VANS and EDI associations.

Technology transfer with a view to developing a national EDI industry in general or adopting EDI on an organizational or institutional level is not problematic. In fact some technical alternatives, such as using the EDI on the Internet, can be adopted immediately. However, in order to successfully and systematically develop a national EDI community, it is important to have a national vision and a clear strategy.

Widespread use of the Internet is potentially providing small and medium-sized enterprise with a cost-effective means of adopting EDI. There are some serious legal and security implications related to the use of electronic trading on the Internet, which lie beyond the scope of this work , but technically the internet may provide an interim stepping-stone towards the full, appropriate adoption of electronic trading.

5.8.5 EDI implementation at CEA

Direct gains to the GOE can be achieved if EDI is applied within the CEA. The implementation will not only reap efficiency gains, but will also provide potential for some dramatic national performance improvements as witnessed by the evidence of success in Singapore. The estimated increase in revenue if EDI is applied to CEA, as mentioned earlier, represents 0.7 percent of Egypt's GDP This is sufficient to warrant senior government authorities support and endorsement of EDI implementation. It is, therefore, suggested that the role of EDI in endorsing national strategies and safeguarding national interests would provide a favorable norm to appeal to in the process of legitimating the need for a national EDI strategy.

Inline with the CIC framework, the proposed development of an EDI strategy is demand driven to cater to national requirements. The phased nature of the implementation solution is driven by business requirements to fulfill trade facilitation initiatives, integrating core business application identified as the information contained within shippers' documentation. A phased-approach is also needed in recognition of CEA-specific barriers and challenges. The first phase's *parallel shadowing* will improve system accountability, enhance CEA access to detailed data, and indirectly help control theft and fraud. In the second stage – community development – the use of EDI is extended to importers to enhance efficiency and promote an electronic trading culture. The third stage – development of a CEA EDI gateway – will result in a full fledged EDI operation based on a business process redesign and quality management strategy. This will bring Egypt inline with international efficiency standards. Unlike the initial implementation phases,

implementing a corporate EDI gateway would involve fundamental changes in procedures and processes.

Finally, the national strategy should include an institutional mechanisms for monitoring and tracking business and technical requirements in order to cater to the required changes – in legislation, for example – effectively and efficiently.

In conclusion, the success of a national EDI strategy will primarily depend on integrating business requirements, government intervention, infrastructure efficiency, and capacity to change to cater to changing market and technical requirements. The above summary set the foundation for the policy recommendations articulated in Chapter 6.

5.8.6 Theory relevant issues

The social context and process were accounted for in formulating an implementation approach for CEA. The proposed approach stresses the use of EDI as a key instrument for economic development and accordingly recommends a strong senior authority, close to the center of power, to undertake the change. Considering the deficiency with respect to EDI knowledge and expertise, a phased approach is suggested.

Similarly, the cultural and political perspectives were taken into consideration. The proposed solution accounts for resistance to change and advocates a shared vision based on first hand appraisal of the benefits of EDI adoption. The concerns of the various subcultures have been emphasized as potential barriers to change which would require senior, high powered management of the cultural and political perspectives. From a political perspective, senior authority backing is engaged based on working towards a value system of national interest in order to synchronize incompatible perspectives of subcultures. Management should be fully aware of the existing system deficiencies and resource limitations as well as the needed relationships and interactions between involved staff at all levels. The philosophy of top down control is persuasive reflecting on the nature of social relations in Egypt.

Finally the context/process interaction was also considered where, for example, the structure of signification is altered in view of the use of EDI and the call for change is legitimated through appeals to desirable norms of economic development and national gains. Similarly, altering the structure of domination is accounted for through

exercising power and control over reliable data generated through the use of EDI. Such theoretical insight into the social context and social process and their interaction contributes positively to enriching the investigation and in drawing on factors critical to EDI success.

5.9 CONTRIBUTION OF THE CHAPTER

The research reported in this chapter is based on a study of the factors that are likely to influence EDI adoption in Egypt. The nation-specific pressures to adopt electronic trading are investigated. Similarly, the challenges and constraints are identified. The case of the CEA is investigated and documented. A possible approach to introducing EDI in Egypt is put forward. It illustrates the direct benefit to the GOE, potentially increasing the revenue generated by the CEA by US$ 350 million, if EDI is implemented. Such potential benefit of adopting EDI extends beyond corporate efficiency gains to safeguarding national interests to sanction senior policy and decision making endorsement. The research results and analysis contribute to a better understanding of the issues involved in developing a national EDI strategy for Egypt.

CHAPTER 6

POLICY RECOMMENDATIONS

6.1 INTRODUCTION

This chapter draws heavily on previous ones in so far as it addresses the policy recommendations set out to develop the Egyptian EDI industry. Arriving at these recommendations is not easy, since many elements had to be borne in mind concerning the wide area of EDI industry and its applications and the diversity of the issues involved. The reviewed literature, the UK experience and Egypt trading domain were obvious inputs. Based on the above, it was important to develop a methodological procedure that sets the requirements and puts the actions in the right sequence, so as to arrive at the required policy measures without duplicating or neglecting any element of the basic inputs. This methodology is given in Section 6.2. Relevant lessons learned from the literature review and the study of the UK EDI industry undertaken during the course of this thesis were firstly drawn out. The transferable lessons are then identified from amongst this wider group of lessons learned. This was done after examining each lesson against a set of pre-defined criteria in what may be called a filtering process. These criteria were based on the prevailing local capabilities and constraints in Egypt and the anticipated future directions of the trading community in the country. Accordingly, it was possible to formulate policy recommendations for developing a national EDI strategy.

The recommendations are written with the *perception for action* in mind and in a manner that ensures three elements. These are: applicability, phrasing simplicity and ease of understanding. The objective is to materialize the results of this research effort into an implementation format together with the pure academic research results. By doing so, it is hoped that these recommendations will reinforce and encourage current moves towards building national initiatives to introduce EDI which are gathering momentum in Egypt and across other developing countries in the region.

Section 6.3 gives the lessons learned. Section 6.4 identifies the transferable lessons and discusses the required corrective measures (actions and initiatives) necessary to make non-transferable lessons transferable. Section 6.5 shows how recommendations stem from the lessons learned and reflect on the CIC framework. Sections 6.6, 6.7 and 6.8 highlight the policy recommendations at the national, industry-sector and organization levels, respectively. Section 6.9 addresses views on complementary issues for

successful implementation of EDI. Section 6.10 presents the policy recommendations stemming from the theoretical background. In Section 6.11 practical guidelines to implementation are given. The chapter contribution is given in Section 6.12.

6.2 A GENERAL OUTLOOK ON THE ANALYSIS PROCEDURE

The analysis procedure given in Figure 6.1 illustrates the process of deriving the policy recommendations presented in this chapter.

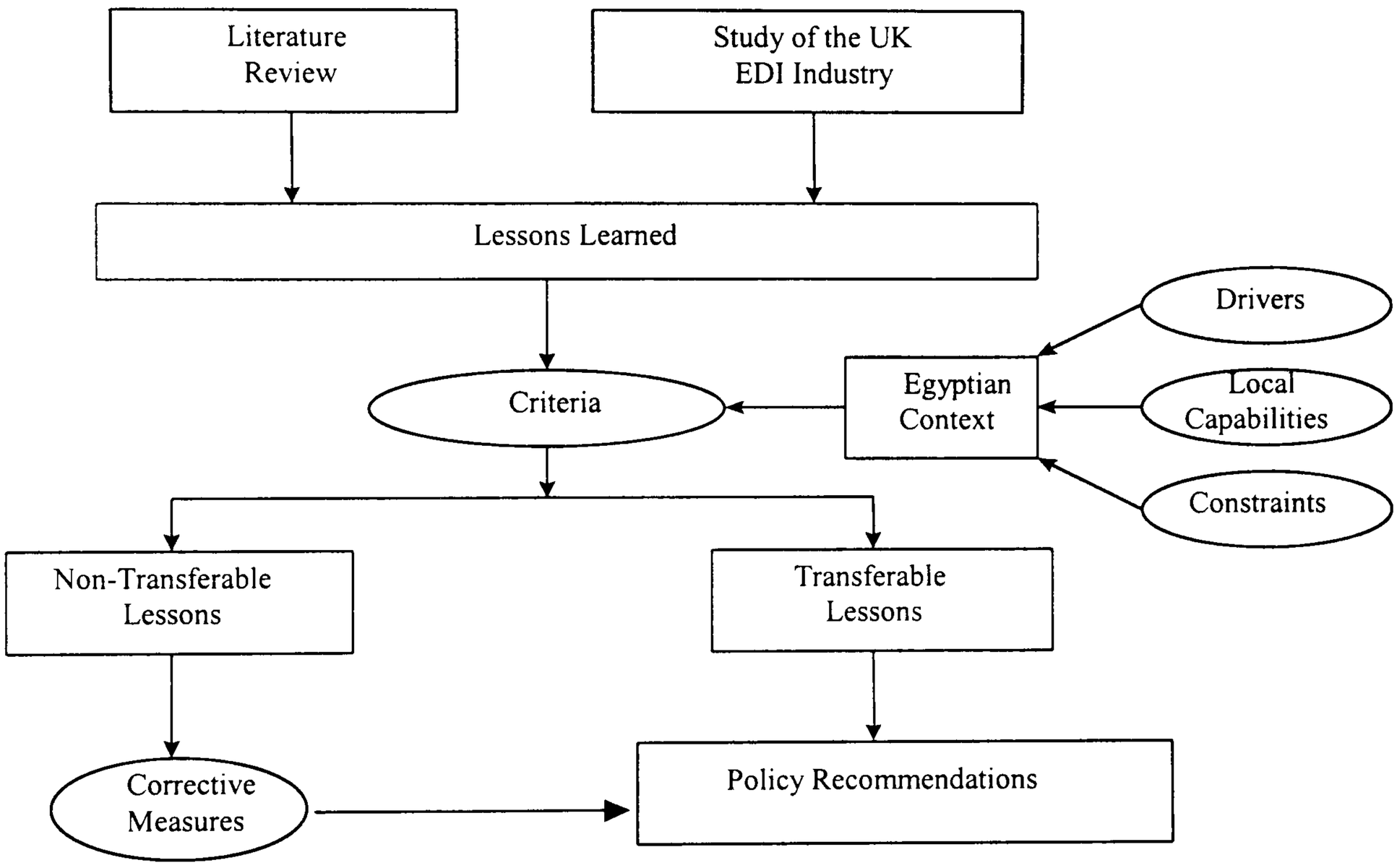


Figure 6.1 Flow Chart of the Analysis Procedure for Deriving the Policy Recommendations.

It builds on the research findings described in the literature (Chapter 2) and the study of the UK EDI industry (Chapter 4) to define a set of lessons learned. These lessons are then filtered, taking into account the national agenda, contextual environment and prevailing technical constraints, as discussed in Chapter 5, to distinguish the transferable ones applicable to Egypt. These transferable lessons are next interpreted as policy recommendations for immediate consideration. To capitalize on all lessons learned, non-transferable ones are subject to corrective measures to transform into transferable ones that Egypt can benefit from.

6.3 LESSONS LEARNED

The lessons learned listed in Section 6.3.1 emanate from the literature review (Chapter 2), whereas those registered in Section 6.3.2 stem from the study of the UK as a mature EDI market (Chapter 4). A total of 75 lessons learned have been identified as given below. For convenience, the lessons learned are given in sequential numbers irrespective of the section they fall under.

6.3.1 Lessons Learned from the Literature Review

To facilitate cross-referencing, the lessons listed hereinafter are classified in sub-groups corresponding to the sub-headings used in Chapter 2. The reader is referred to Chapter 2 for a full discussion and reference.

6.3.1.1 EDI definition (derived from Section 2.2)

1. Unlike many IT applications, EDI impact extends beyond the boundaries of the organization. It affects both intra- and inter-organizational trading processes. Inter-organization trading is governed by established legislation. Therefore, EDI adoption involves the participation of the organization, the trading community (industry-sector) and the government.
2. EDI is not confined to trading applications. Although traditionally it has been associated with retail applications, it is progressively being utilized across other industry-sectors such as services, utilities and government.
3. EDI is differentiated from other IOS on the basis of its cooperative, rather than its competitive role. This is based on the long-term mutual benefit gained by the organizations involved in the trading process.

6.3.1.2 Impact of EDI on inter-organizational relations and competitiveness (derived from Section 2.3)

4. Competitive advantage may be gained from EDI implementation. The extent of the advantage depends on the competitive position of the organization and the industry structure in which it operates.
5. EDI induced competitive advantage is difficult, but possible to sustain. Three situations contribute towards sustaining this advantage, where: EDI is instrumental in gaining market share; strategic alliances are formed; the market is substantially redefined in favour of the organization.

6. Organizations leading EDI adoption in developing countries have the opportunity to benefit from EDI induced competitive advantage. Leading organizations stand to gain from their first move in the EDI market.
7. EDI is regarded as a competitive necessity in a number of industry-sectors. It has essentially become a way of doing business and pre-requisite for competing in certain markets such as the automotive manufacturing and assembly industries.
8. EDI implementation can lead to short-term competitive advantage and/or long-term strategic advantage; depending on the extent of EDI adoption within the trading industry-sector and corporate strategy.

6.3.1.3 EDI benefits (derived from Section 2.4)

9. A clear vision of EDI operational and strategic benefits promotes EDI adoption at the organization, industry-sector and national levels.
10. EDI has many direct benefits. These include, labor savings in the area of data transcriptions, controls, error investigation and correction, fewer data handling. These result in improved internal operations, reduction in process cycle time, better responsiveness to customers through better speed of communications, improving trading partners relationships and increasing the ability to compete.
11. EDI long-term strategic benefits are more significant, but are harder to quantify. This particularly applies to gaining competitive advantage.
12. EDI is perceived as a pre-requisite for JIT and QR inventory and production systems. It can lead to cost reductions, primarily due to lower inventory costs and productivity improvements.
13. Rigorous evaluation can be performed to justify EDI costs in contrast to its potential benefits. Techniques can be applied to quantify inherent savings and cost reductions associated with improved information exchange particularly in manufacturing industry-sectors.
14. General lack of awareness of EDI benefits will negatively influence the extent of EDI diffusion and limit the pace of EDI community development.
15. There are educational tools that can be used to promote EDI benefits to enhance senior management and policy-makers understanding of implementation issues involved at the early stages of EDI adoption.
16. For developing countries, the widely cited benefits are particularly appealing to policymakers and may be used to promote EDI adoption at the national level.

6.3.1.4 EDI technical implementation and integration (derived from Section 2.5)

17. Establishing EDI requires defining a set of compatibility requirements that need to be in place to technically enable the implementation process. Compatibility requirements include, communications networks, communications protocols and document standards. Choice of communications platforms and trading standards is often governed by the wider community preference.
18. Technical issues, in terms of selecting a VAN, trading standard or software, have to be accounted for in the early stages of EDI implementation.
19. Unlike other IT applications, planning for EDI implementation involves defining corporate trading requirements and accounting for trading community preferences.
20. Top management commitment and endorsement, involvement of internal users and trading partners, are critical factors to successful EDI implementation.
21. The level of EDI integration with internal business processes is positively related to achieved benefits. Non-integrated systems are likely to offer direct benefits only, whereas integrated systems will offer both direct and indirect benefits.
22. EDI reengineering capacity can be utilized at the national level. This is particularly valuable in trade facilitation applications, streamlining international trade processes with respect to import and export procedures.

6.3.1.5 EDI theoretical and conceptual frameworks (derived from Section 2.6)

23. Within a strategic IS planning framework, EDI must be considered from a strategic as opposed to a technical perspective. For maximum effect, EDI needs to be integrated with business reengineering and business strategy.
24. EDI can benefit small and medium enterprises. SMEs extent of EDI adoption will depend on organizational readiness, external pressures and perceived benefits.
25. EDI diffusion needs to take into account the macro, meso and micro factors, within which the local dyadic relationships, industry networks and national initiatives have to be considered.
26. National EDI strategies should consider: the legal and regulatory requirements, the skills and technology infrastructure, local business considerations, investment costs and benefits, technology and cost options.
27. Legal, cultural, political and economic factors are likely to sway EDI successful adoption and implementation.

28. Lack of standards, systems costs and security concerns in international trade may represent major barriers at the firm level, and cultural and political differences are the main international hurdles.
29. Technical, political, cultural, economic and legal prevailing setups are likely to affect international trade flows.

6.3.1.6 Contextual analysis (derived from Section 2.8)

30. The wider IS contextualist body of literature offers guidance to identify the factors that influence EDI.
31. National IT strategies should be primarily demand driven to be effective.
32. It is important to improve understanding of the social context, relevant to implementation of IS, and how this context affects and may be affected by the process of technological intervention.
33. IS study can not be divorced from the historical, organization and economic environment from which it is embedded. This linkage is critical to understanding how IS are likely to be constrained by the context in which it developed and how in turn it contributes to maintaining or altering this context.
34. IS are complex social objects constrained by context, infrastructure and history. Within this complex web structure, systems capacity to change must be accounted for in order to counter act systems' tendency to become institutionalized.
35. The content, social context, social process and the linkage between the latter two provide a useful framework to examine the IS contextual setup.
36. It is important to develop an integrated comprehensive framework that accounts for the contextual and the technical requirements when developing a national EDI strategy.

6.3.2 Lessons Learned from the Study of the UK EDI Industry, Context-related
6.3.2.1 At the national level (derived from Section 4.3)

37. Political, economic, social and technical pressures influence EDI adoption at the national level.
38. Successful EDI industry development in the UK is attributed to private and public domestic trading requirements.
39. The pressure group created by the domestic trading community, is effective in guiding and institutionalizing domestic electronic trading.

40. EDI is perceived as means to remain competitive, strengthen trading partners relations, streamline trading processes and enhance customer service.
41. USA and Germany have also been driven by the same motivational factors as the UK. Although the importance and significance of the factors can vary from one country to another, in terms of importance, there is, however, a general agreement on the leading factors driving EDI adoption (see Section 4.3.1).
42. EDI leads to improved cooperation with trading partners, improved speed of communications and improved data sharing.
43. It is essential to account for the prevailing context in identifying the important drivers and constraints to EDI implementation at the national level.

6.3.2.2 At the industry level (derived from Section 4.4)

44. It is necessary to define leading industries and to identify the underlying factors that promote or hinder EDI development within particular industry-sectors.
45. Awareness of industry specific requirements, characteristics, drivers and barriers is critical to successful EDI implementation.
46. Experiences with EDI vary from one industry to another and from goods-related industries to service-related businesses depending on industry structure, business network, motivational drivers and perceived benefits.
47. Retail, manufacturing and distribution industry-sectors are the primary drivers promoting EDI use in the UK.
48. Retail, manufacturing and distribution industry-sectors reported the maximum business benefit achieved as a result of EDI adoption.
49. Primary factors driving EDI adoption vary from an industry-sector to the other. For example, manufacturing and distribution industry-sectors aim to enhance inter-organizational relations and to improve efficiency whereas retail is pursuing streamlining business processes and reducing costs. For a full discussion, the reader is referred to Section 4.4.3.1.
50. Perceived benefits vary from an industry to the other. For example, sectors of retail, distribution and utilities reported improved trading partner cooperation, whereas retail sector reported increased internal efficiency. For a full discussion, the reader is referred to Section 4.4.3.2.

6.3.2.3 At the organization level (derived from Section 4.5)

51. EDI adoption is not an end in itself, but a means of fulfilling business objectives.

52. Market dynamics, corporate strategy and requirements have to be accounted for in planning for EDI. A Corporate SWOT analysis would provide valuable input to define corporate functions that would benefit most from EDI adoption.
53. An innovative perspective to EDI implementation can tap on EDI intra-organizational potential.
54. Strategic advantage associated with EDI implementations contribute towards improving business performance permanently. The extent of benefit achieved as a result of EDI implementation depends on the position of the organization in the supply chain, dynamics of the market place and prevailing conditions.
55. EDI strategy should be built on a clear business vision of how to utilize the technology to cater for corporate objectives and core business processes.
56. EDI use in the public sector can potentially achieve widely cited strategic and business process reengineering benefits associated with private sector performance.
57. Successful EDI implementation requires management commitment. An EDI initiative requires a strategic plan and a shared vision of the outcomes and the benefits.

6.3.3 Lessons Learned from the Study of the UK EDI industry; Infrastructure-related

6.3.3.1 At the national level (derived from Section 4.3)

58. Coordinating bodies have played an important role in developing the national EDI trading community in the UK. Factors involved their role in increasing awareness of the industry-related benefits and developing the national industry standards. Further factors include pursuing government liaison and specifying the requirement for VANS to cater for domestic trading requirements.
59. VANS are found to be instrumental in developing the electronic trading community since the inception of the EDI industry in the UK. Successful operation depends on business orientation, strategic alliance with major industry players, ability to provide business driven technical solutions, tenacity to develop the national trading community and finally capacity to accommodate changing business requirements.
60. TRADACOMS definition, development and use catered for the requirements of the electronic trading requirements in the UK. This alignment to business requirements had a catalytic effect in developing the national trading community.

61. The role of government is essential in regulating electronic trading and the use of EDI. Customs adoption of electronic trading has positively contributed to the extent of EDI diffusion across various industry-sectors.
62. Nations have the opportunity to leapfrog to the latest state of the art in EDI adoption. This provides them with an opportunity to also benefit from the experience of developed countries.

6.3.3.2 At the industry-sector level (derived from Section 4.4)

63. The extent of EDI integration with core business processes is a determining factor to achieve maximum business benefit. Integrating EDI with internal business processes is important, but not sufficient to achieve maximum business benefit. To maximize potential benefits EDI must not only be integrated with internal processes, but also with those processes that are representative of core business.
64. There is a lack of correlation between what respondents initially perceived as potential barriers to the introduction of EDI and the actual difficulties subsequently experienced in the implementation process itself. Therefore, there is a requirement for accounting for the potential impact of EDI implementation on traditional processes in the early stages of EDI technical planning.
65. Perceived barriers to EDI implementation vary from one industry-sector to another. For example, the pharmaceutical industry reported that trading partners not using EDI is a significant barrier, whereas manufacturing concerns focused on lack of awareness and budgetary limitations. For a detailed discussion the reader is referred to Section 4.4.3.5.
66. Perceived difficulties to EDI implementation vary from one industry to another. For example, manufacturing, utilities, services and pharmaceutical industry-sectors reported difficulties with cost justification, whereas utilities reported significant difficulty with integrating EDI with internal systems and adapting traditional business processes.

6.3.3.3 At the organization level (derived from Section 4.5)

67. Understanding of the issues involved in the EDI implementation at the micro (organization) level is crucial at the early stages of EDI implementation.
68. Technical issues are not problematic. EDI implementation problems are typically organizational in nature and stem from failure to recognize the contextual and organizational environment within which the EDI system is implemented.

69. EDI can be used as an enabling mechanism and vehicle for business process and network structure reengineering. EDI is seen as a key strategic tool in this domain that can provide long term strategic advantage.
70. EDI can be used as a systems integration tool. This applies to integrating diverse hardware and software platforms.
71. EDI can be used as a corporate change agent, based on its capacity to accommodate changing business requirement and technical developments. It provides a solid IT foundation for managing change.
72. Sound technological infrastructure, comprehensive review and assessment of processes are essential ingredients to successful EDI implementation. Monitoring changing business requirements and technology developments is fundamental to ensure continuity in achieving maximum business benefit. A dynamic tracking component is required to monitor changes and ensure innovative application of EDI to cater to specific corporate requirements.
73. A phased approach, where EDI implementation entails major business process reengineering is likely to account and accommodate the organizational prevailing constraints and resistance to change. A staged systematic approach to launching EDI based on knowledge, EDI integration with core business activity and continuous monitoring of change is crucial to successful implementation.
74. Trading partners requirements, infrastructure setup and existing processes have to be incorporated in planning for EDI implementation. The PIP model provides a practical tool for practitioners.
75. The role of EDI champion within an organization is instrumental in planning and execution of the implementation process. His/her assigned responsibility for networking with trading partners and suppliers, designing business process reengineering, coordinating and executing EDI implementation must not be underestimated.

6.4 LESSONS TRANSFERABLE TO EGYPT

6.4.1 Criteria for Identifying the Transferable Lessons

The previous section presented a comprehensive listing of the lessons learned. Although these lessons are valuable for providing general guidance to successful EDI implementation, they are not necessarily directly transferable. This is attributed to the prevailing local contextual and infrastructure constraints in Egypt (Chapter 5). The criteria to define transferable lessons, given hereinafter, therefore consider the local

capabilities and capacity for successful implementation, minimizing costs and ensuring sound benefits. They are also designed to safe guard against recommending lessons that are highly dependent on and mainly applicable in, an industrialized country with advanced institutional structure, well-trained human resources, and advanced economy. For instance, lesson number 60 (Section 6.3.3.1) is typically British in nature and does not lend itself to replication in a developing country. For example, TRADACOMS standard specifications cater specifically to British industry requirements which differ from those of Egypt. The criteria, in addition, cater for excluding lessons that are meant for countries with mature EDI industries and well-established relevant culture. It is obvious, that for a lesson to be declared transferable it had to pass/satisfy all the 17 criteria, detailed below and not to fail any single criterion.

A. Persuasive to respective authorities.
B. Caters for the immediate private sector need to implement EDI.
C. Accounts for prevailing industry-sector constraints.
D. Pursued benefits are tangible.
E. Does not require legislative change.
F. Does not assume the existence of a mature EDI industry.
G. Builds on existing infrastructure resources.
H. Cost feasible.
I. Can lead to sound financial return.
J. Does not rely on advanced technology.
K. Implementation and maintenance can be undertaken by national authorities.
L. Allows for decision-making independence from foreign vendor.
M. Does not require highly skilled labor.
N. Can be easily implemented.
O. Can be implemented in a reasonable time frame.
P. Does not require major business process reengineering.
Q. Does not entail corporate restructuring or culture change.

6.4.2 Transferable Lessons

Having examined each of the 75 lessons learned given in Section 6.3 against the set of 17 criteria defined in the above section, 53 lessons appear to fulfill these criteria. These are referenced in Table 6.1. The transferable lessons are interpreted to derive relevant success determinants in the form of policy recommendations as discussed in Sections

6.5 – 6.10. These recommendations will take into account applicability in Egypt. However, they may entail some modifications by the executing agency during implementation.

	Lesson Number*	
	Transferable	**Non-transferable**
Lessons from the Literature Review (Section 6.3.1)		
1. EDI Definitions	2, 3	1
2. Impact on Inter-organization Relations	4, 6, 7, 8	5
3. EDI Benefits	9, 10, 11, 14, 15, 16	12, 13
4. Technical implementation and integration	17, 18, 19, 20, 22	21
5. EDI theoretical and conceptual frameworks	23, 26, 27, 28, 29	24, 25
6. Contextual analysis	30, 31, 32, 33, 34, 35	36
Lessons from the Study of the UK EDI Industry – Context-Related (Section 6.3.2)		
1. At the national level	37, 42, 43	38, 39, 40, 41
2. At the industry-sector level	44, 45, 46, 49, 50	47, 48
3. At the organization level	51, 52, 53, 54, 55, 56, 57	
Lessons from the Study of the UK EDI Industry – Infrastructure-Related (Section 6.3.3)		
1. At the national level	62	58, 59, 60, 61
2. At the industry-sector level	64, 65, 66	63
3. At the organization level	67, 72, 73, 74	68, 69, 70, 71

*Lesson as of Section 6.3

Table 6.1 Transferable and Non-transferable EDI Lessons with respect to Egypt.

It can be observed from Table 6.1, that 22 of the lessons learned have not succeeded in fulfilling all the criteria specified in Section 6.4.1, hence, are not directly transferable to Egypt. Table 6.2 sets out the corrective measures to make non-transferable lessons transferable to Egypt. The table indicates the key player(s) for undertaking the suggested initiatives and measures as well as showing the criteria (A, B, …or Q as explained in Section 6.4.1) on which a lesson is declared non-transferable.

6.4.3 How to Make Non-transferable Lessons Transferable

Based on Table 6.1, the total number of non-transferable lessons reached 22. This is in fact about 30% of all the identified lessons. Furthermore, most of the non-transferable lessons are of vital importance for the development of the EDI industry in general and in Egypt in particular. For example, Lesson 1 detailing EDI definition incorporates regulating electronic trading activity. This requires active government involvement since EDI inception. Unless appropriate regulation is instituted, electronic trading activity will remain fragmented and of limited benefit. Similarly, Lessons 58 and 59, concerning establishing the EDI coordinating body and VANS to provide the constitutive infrastructure to establishing the national EDI industry. Their roles and

factors critical to their success are discussed earlier in Sections 4.3.2 and 4.3.3, respectively. It is believed that unless the UK relevant experience can be replicated in Egypt, the extent of EDI diffusion in the country may be hindered. Experience in Germany and Japan support the requirement for both services as witnessed in the UK. Furthermore, government endorsement will be instrumental to their successful undertaking of the responsibility to develop the electronic trading culture and community.

S N	Lesson No	Description	Criteria	Key Player	Suggested corrective measures to make non-transferable lessons transferable
1	1	Unlike....governed by established legislation. (Section 6.3.1.1)	E	Gov.	Legislation change
2	5	Sustaining EDI induced competitive advantage is difficult. (Section 6.3.1.2)	F	Org.	Management commitment Trading culture change Strategic alliance
3	12	EDI is perceived as a pre-requisite for JIT and QR inventory & production systems. (Section 6.3.1.3)	F G J N O P Q	Org.	Investing in implementing production management systems Training human resources Changing corporate culture
4	13	Rigorous evaluation .....potential benefits. (Section 6.3.1.3)	F	RC	Quantify benefits Quantify costs
5	21	The level of EDI integration....to achieved benefits. (Section 6.3.1.4)	F N P	Org.	Increase awareness Management Commitment BPR Expertise Culture change
6	24	EDI can benefit small & medium enterprises. (Section 6.3.1.5)	D G H Q	Org.	Promote awareness Use of Internet Accommodate SME requirements
7	36	It is important to develop ...strategy. (Section 6.3.1.5)	F	RC	Adapt existing frameworks Define factors specific to Egypt
8	38	EDI industry development ...requirements. (Section 6.3.2.1)	E F	Gov.	Increase awareness of Benefits Government commitment
9	39	The pressure group....electronic trading. (Section 6.3.2.1)	C F	CB	Increase awareness Encourage active private sector participation
10	40	EDI is perceived as...customer service. (Section 6.3.2.1)	C F G Q	Org.	Promote awareness Build expertise Promote BPR culture Investment allocation Culture change

Table 6.2 Suggested Corrective Measures to Make Non-transferable Lessons Transferable to Egypt

SN	Lesson No	Description	Criteria	Key Player	Suggested corrective measures to make non-transferable lessons transferable
11	41	USA, Germany….as the UK. (Section 6.3.21)	C F	CB	Increase awareness Recognise differences
12	47	Retail….in the UK. (Section 6.3.2.2)	C F	CB	Increase awareness of industry benefits Alternative leading industries Develop the Retail industry infrastructure
13	48	Retail …EDI adoption. (Section 6.3.2.2)	B C D F I	CB	Increase awareness of sector specific benefits
14	58	Coordinating bodies ….in the UK. (Section 6.3.3.1)	A C E G F	CB	Federation of Industries, or Chambers of Commerce, or Dedicated Coordination Association to assume responsibility
15	59	VANS …in the UK. (Section 6.3.3.1)	A C E G	Gov. Org.	Allocate investment Secure funding Amend legislation Accommodate industry requirements Ensure private sector participation
16	60	TRADACOMS…in the UK. (Section 6.3.3.1)	B E	CB Gov.	Adopt an International Trading Standard Participate in Standards Development Boards Attain Government endorsement Defining national standards
17	61	the role of government …of EDI. (Section 6.3.3.1)	E	Gov.	Active regulatory role
18	63	The extent of EDI integration ….. business benefit. (Section 6.3.3.2)	M N O P Q	Org.	Increase awareness Building expertise Management Commitment Culture change
19	68	Technical issues are not problematic. (Section 6.3.3.3)	E F		Well-established trading infrastructure – VANS Well-defined trading standard Government endorsement Skilled human resources
20	69	EDI can be …for BPR and network structure reengineering. (Section 6.3.3.3)	M N O P Q	Org.	Increase awareness Build expertise Management Commitment Culture change
21	70	EDI can be used as a systems integration tool. (Section 6.3.3.3)	M N O P Q	Org.	Increase awareness Building expertise Management Commitment Culture change
22	71	EDI can be used as a corporate change agent…technical developments. (Section 6.3.3.3)	M N O P Q	Org.	Increase awareness Build expertise Management Commitment Culture change

CB= Coordinating Body, RC: Research Centers.

Table 6.2 (Continued) Suggested Corrective Measures to Make Non-transferable Lessons Transferable to Egypt

Lesson 47, provides an example of the necessity to consider prevailing industry structure in planning for EDI development. Reliance on the retail experience in particular hindered EDI development in Egypt over the past five years. Further in-depth understanding of the industry-sector dynamics was necessary to define alternative candidate industries as discussed in Chapter 5 and as proposed in the relevant set of national recommendations (Section 6.6.1).

Bearing in mind the above discussion on the importance of the non-transferable lessons, it was decided to carry out the analysis investigating the required corrective measures (activities and initiatives) that can make them transferable. Table 6.2 summarizes some of these activities.

The main comments on Table 6.2 are given below.

- Some of the corrective measures are overlapping. In other words, one corrective measure can have impact on more than one lesson to make them transferable. For example, increased awareness of the organizations is a corrective measure (or one of them) for lessons number 63, 69, 70 and 71.

- In many cases more than one corrective measure are suggested. These are not alternatives, but rather to be taken as mutually exclusive.

- In order to know what are the priorities of undertaking necessary actions to realize the corrective measures needed to make a non-transferable lesson a transferable one, it was interesting to examine how frequent, a selection criterion of sieving the lessons, (i.e. each criterion that caused a lesson to be declared non-transferable), has occurred. This is given in Table 6.3.

Criteria*	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
% appear**	3	3	10	3	10	19	7	1	1	1	-	-	6	9	7	9	10

*As of Section 6.3 ** Based on Table 6.2

Table 6.3 Frequency of Selection Criteria for Declaring Non-transferable Lessons.

- From this table, it can be observed that criterion F is by far the one with the most frequent appearance (19% of the times). The repeated requirement for a mature EDI industry entails the need to develop a well-established EDI infrastructure. It also supports the call for the establishment of a national EDI industry and not confining electronic trading to other routes. Furthermore, it negates recent motivation to consider

trading through the Internet-based facilities. Unless the use of EDI is institutionalized in Egypt, alternative routings are unlikely to succeed.

- Criteria C, E and Q come in second place, each is repeated 10% of the times (see Table 6.3). With respect to C, the result supports previous discussions (see Section 4.4) about the necessity to consider industry specific characteristics, market dynamics, drivers and barriers. It also endorses the current research perspective accounting for the prevailing *context* in planning for EDI. As with these considerations at the industry-level, organization implications particularly with respect cultural issues and resistance within the organization should not be underestimated. There is a need to acknowledge and plan for the potential impact on organization and culture. These findings again support the current work proposals with respect to: considering how the surrounding *context* affects and is affected by EDI implementation and the requirement for knowledge and education. It is also argued that in light of the UK research results and the CEA case study in Egypt, knowledge of EDI capacity to change, would absorb a lot of the surrounding changes and thus facilitate the process of EDI implementation.

- As far as E is concerned, EDI use by definition requires legislation. In the case of Egypt, there is a need to endorse this requirement within the decision-making circles. Recent initiatives towards use of electronic trading within the private sector are still seeking government support and legislation. In the spirit of *keep-going* strategy, onus has been on organizations to adopt *e-commerce* measures which are typically of a marketing as opposed to trading direction. Initiative to create the environment to promote *electronic trading* is gathering momentum, but is very much in need for expert guidance and government support. Recent changes within the GOE are very promising in this direction. Instituting a ministry for information and telecommunications and placing IT on the national agenda with special presidential endorsement, is a steppingstone towards creating the *enabling environment*. It is, therefore, recommended that the GOE be approached with a solid proposition for the establishment of a national EDI industry, in which the regulatory role, respective legislation change requirements and solicited endorsement are carefully prescribed.

- Addressing corporate culture issues, brought forward by Q, is reliant on two factors. First, the extent of corporate awareness for the requirement and implications associated with EDI implementation. Second, the extent to which traditional business processes can be altered. A number of organizational issues are involved which require intra- as well as inter-organizational commitment to change. Within the intra-organization framework, it is recommended that need for EDI is reflected in the organization

strategy, led by senior management as witnessed in the case of HMSO. Management vision and commitment are the principal measures to affect the change required to adopt EDI. This is witnessed, within the Egyptian context, by the case of Dammietta Container Handling Company (DCHC) mentioned in Chapter 5.

- Regarding implementation issues, the repetition of N and P highlights the requirement for smooth technology transfer implementation measures. Given the recent developments in information and communications technologies (ICT) at large and EDI more specifically, this is not a major concern. Importance is given to the surrounding know-how to set the EDI industry establishment on track. These issues have been systematically addressed throughout this thesis with respect to developing the infrastructure at the three levels (see Sections 4.3, 4.4, 4.5).
- Tables 6.1 and 6.2 also confirm that not all the criteria for selection of transferable lessons (17 ranging from criterion A to criterion Q, see Section 6.4.1) appeared in declaring non-transferable lessons. Criteria L and M are satisfied by all the 75 lessons. This, however, should not hinder their validity as they still can be used for examining transferability for other lessons in the future.
- Table 6.2 also lists the major players on which lies the responsibility to implement the suggested measures. Table 6.4 indicates how frequent each key player was selected as the candidate for undertaking the corrective measure. It highlights the importance of the *organization* in executing change in favor of effecting the corrective measures. Organizations are the ultimate beneficiaries from implementing EDI and are therefore urged to lead the change to establish the necessary electronic trading environment. This endorses the requirement for active private sector participation from the early stages of developing the national EDI strategy.

Key Player	Government	Organizations	Research Institutes	Coordinating Bodies
% appearance*	23	42	8	27

*as of determined from Table 6.2

Figure 6.4 Frequency of the Key Players Undertaking to Make Non-transferable Lessons Transferable.

6.4.4 Closure

Transferability of the non-transferable lessons is critical to leapfrog to the latest state of the art in electronic trading. Organizations and industries can not expect to reap the widely cited EDI benefits in absence of the appropriate *enabling environment*. As such, it is recommended to both policy-makers and practitioners to ensure that

measures are in place to make non-transferable lessons transferable. For general guidance, Table 6.2 summarizes the suggested corrective measures relevant to each non-transferable lesson. In terms of primacy to establish this *enabling environment*, it is proposed that priority should be to address Lessons 1, 58, 59, 60 and 61. These will practically address the national issues to establish the EDI industry infrastructure in Egypt. For academic purposes, they will also set the foundation for the *well-established EDI industry - F* which will as a result pave the way to making the majority of the other lessons, coupled with appropriate EDI knowledge, transferable.

6.5 POLICY RECOMMENDATIONS

6.5.1 Background

It is believed that a clear national strategic vision, particularly for nations adopting EDI within an international trade facilitation initiative is a pre-requisite to success. This vision should reaffirm the importance of EDI in enabling firms, industries and nations to meet the challenges of the emerging international competitive environment. This belief is supported by previous research. Saxena and Wagenaar (1995) suggest that countries that view EDI as a foundation technology to realize their strategic vision have successful experience with EDI implementation more than these of other countries that lack such vision do. The case of Singapore illustrates the fundamental requirement for a strategic vision. Because trade has been Singapore's main source of survival, Singapore's EDI strategy was focused on enhancing its global competitiveness as a trading nation (Neo, 1994). Singapore developed its national Technology Plan in 1986 which identified EDI implementation as part of the plan (Raman, 1993). Such vision was central to Singapore's success and pioneering role in electronic trading founded on an EDI-based community trading system (Saxena and Wagenaar, 1995). Meanwhile, as mentioned earlier, because export-dependent Hong Kong lacked such vision and perceived EDI as a replacement for trade paperwork; EDI adoption was considerably delayed (Damsgaard and Lyytinen, 1994b).

In light of the above, this section identifies a set of policy recommendations to developing a national EDI strategy for Egypt based on the research findings presented in this thesis. In addition, this section highlights the generic conceptual lessons transferable to Egypt. To avoid repetition, only success determinants are given at the national (Section 6.6), industry-sector (Section 6.7) and organization (Section 6.8) levels to provide guidance to developing the national EDI strategy.

6.5.2 How Policy Recommendations Stem from Transferable Lessons and Reflect on the CIC Framework

Policy recommendations detailed in Section 6.6, 6.7 and 6.8 stem from the lessons learned discussed in Section 6.3 as shown in Figure 6.2. Lessons learned feed directly to either the context, infrastructure or EDI capacity to change related recommendations groups at the national, industry-sector, and/or organization levels. Therefore, all recommendations put forward are either based on previous literature or the analysis of the practical experience gained in the current work including UK analysis (questionnaire survey, interviews and HMSO case study) and Egypt analysis (interviews and the CEA case study). Typically recommendations fall under the above-mentioned categories, with the exception of those which are directed to the GOE detailed in Section 6.6.1. Figure 6.2 shows the direct relation between the lessons learned and the recommendations determined in the following sections.

The CIC framework, described in Chapter 4, provides the basis for presenting the recommendations given in Section 6.6, 6.7 and 6.8. These recommendations are consistently classified in terms of context, infrastructure for implementation and capacity to change at the national, industry-sector and organization levels. This CIC framework is useful as it provides methodological means to conduct the analysis, facilitates extracting lessons learned and simplifies classifying policy recommendations.

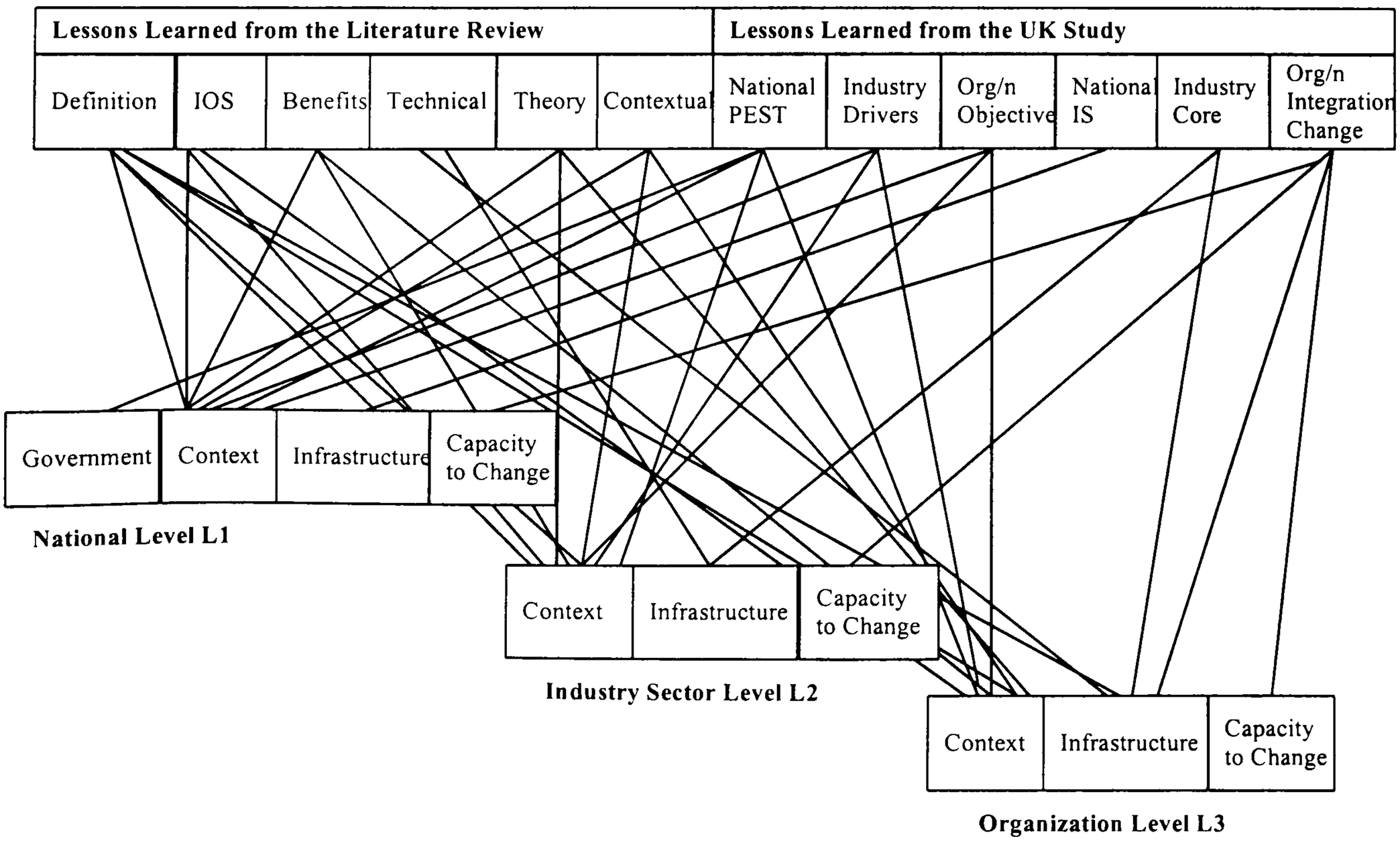


Figure 6.2 How Policy Recommendations Stem from Lessons Learned.

6.6 POLICY RECOMMENDATIONS AT THE NATIONAL LEVEL
(L1, Figure 3.2)

Four principal success determinants are needed for establishing EDI industry. As a priori, for example, government endorsement and commitment to the cause are of prime importance. A number of policy recommendations are drawn out focusing on the role of government. These are set out in Section 6.6.1. Secondly, successful national EDI industry calls for a well-defined demand driven strategy reflecting national and international trading requirements. In order to achieve this strategy, a set of policy recommendations are discussed in Section 6.6.2. The third prerequisite for successful EDI implementation at a national level is the provision of a well-resourced electronic trading infrastructure. Relevant policy recommendations are given in Section 6.6.3. To speed up and to ensure fulfilling the above mentioned success determinants, adequate awareness of EDI capacity to accommodate changing business requirements and technology developments is required as a fourth success determinant. Related policy recommendations are given in Section 6.6.4. Furthermore, industry (L1-IS1, in Figure 3.2) and organization-specific (L1-OS1, in Figure 3.2) success determinants with national implications have to be considered in developing the national EDI strategy. Respective policy recommendations are set out in Sections 6.6.5 and 6.6.6, respectively.

Therefore, in developing a national EDI strategy, the GOE and national organizations are encouraged to consider the following.

6.6.1 Recommendations for the Role of Government

The role of government should not be underestimated. It should, rather, be clearly defined, well-structured and efficiently coordinated. This role is instrumental in developing the EDI industry infrastructure, particularly in the early stages of development. First of all, the government power to alter regulations to accommodate electronic trading requirements should be mastered. Second, the government should have the capacity to secure funds and to act as a catalyst in developing the EDI community by endorsing an inter-government electronic trading strategy. Nevertheless, it should be noted that development of the infrastructure does necessarily need to be centrally funded. Other flexible means in tone with market economy suggest that the government can encourage partnership with the private sector and can even delegate authority to a totally private funding under its full supervision and

observance. The most important objective is to institutionalize electronic trading and to ensure a conducive environment for community development. Previous research and practical experience support this motion. EDI success in the Far East, particularly in China, Malaysia, Singapore, and Taiwan is primarily due to secured funding and government sponsorship. This region has been particularly active in terms of trade facilitation initiatives and implementation that were made possible because of such support. In some cases, in the developing countries, however, because of the initial limited size of the market, the lack of sufficient trade facilitation culture and/or the prevailing technology transfer restrictions, it may be necessary for the government to solely fund the VANS or assume their duties in the initial period of establishing the EDI industry. Third, there is, therefore, a need for a clear global vision and active State commitment to EDI development in order to ensure smooth diffusion of EDI at the national level. This is evident in the case of Singapore which reflects on a national strategic vision incorporating government regulatory and refereeing intervention demonstrated in establishing a state-of- the-art IT, telecommunications and EDI infrastructure fulfilling the national requirements. In Hong Kong, a totally private initiative funded by trading companies with vested interests was responsible for establishing the EDI industry. It is reported in the literature, however, that this private initiative coupled with a clear lack of national vision and government commitment (Schware and Kimberley, 1995a), resulted in considerable delay in adopting EDI (Damsguard and Lyytinen, 1994b). In the case of Egypt, therefore, it is recommended to endorse a public/private partnership philosophy, if not application. This is believed can ensure successful EDI adoption in its early stages of development. It is feared that neither extremes (totally private or solely public) would be applicable based on the above mentioned lessons.

In light of the above, it is believed that in articulating a national EDI strategy, it is recommended to give special attention to the importance of the role of the state in creating an *enabling environment* and in facilitating the development of an *electronic trading culture*. This is coupled with stimulating and promoting inter-firm cooperation both nationally and internationally. Government policies should focus on creating and maintaining an *enabling environment* conducive to promoting EDI use in Egypt. The relevant policy recommendations are setout below.

- To ensure that the legal framework is favorable to electronic trading. This warrants clearly defining the legal and regulatory measures that govern business and inter-firm

transactions and collaboration, including contract law, commercial law, earmarked taxation and measures of arbitration and dispute settlement. In addition, it is important to take the necessary actions to ensure effective and efficient implementation of these legal and regulatory measures.

- To take into consideration the prevailing political and economic international pressures, national social and business requirements, and cultural factors that are likely to sway the extent of domestic EDI diffusion
- To consider the technical security barriers and cultural and political differences in adopting EDI in international trade that are likely to hinder or promote international trade flows.
- To provide close support and encouraging the creation of efficient, flexible and independent local organizations such as business associations, chambers of commerce and industry associations to undertake national EDI coordination role.
- To encourage the private sector to play effective role in preparing the ground for inter-firm partnerships through raising their awareness of potential EDI benefits.
- To foster the promotion and application of EDI through endorsing the use of EDI in public sector organizations.
- To endorse and promote development and upgrading of the electronic trading information and telecommunications infrastructure in order to provide an efficient cost effective platform for a national EDI industry.
- To utilize EDI reengineering capacity in trade facilitation applications, streamlining international trade processes with respect to import and export procedures.
- To liaise with international donor agencies to fund and develop the electronic trading infrastructure.
- To boost, at least in the early stages of development, the standardization process in order to ensure its alignment with the national regulatory framework.

6.6.2 Context-Related Recommendations

At the national level, context-related recommendations focus on identifying trading requirements within a context of a demand driven strategy. Integrating business requirements in developing a national EDI strategy is a fundamental recommendation for establishing a successful national EDI industry. The strategy must be demand-driven in response to well-articulated business provisions. The definition of these provisions should involve both the public and private sectors participation and account for the prevailing contextual environment. Business provisions can be based on

international pressures accounted for through a PEST analysis or in response to national trading requirements which will have to be assessed in terms of motivational drivers and perceived potential business benefits as mentioned in Chapters 4 and 5. The developed countries experience with EDI, as in North America and Western Europe, where the extent of the technology diffusion and use is advanced, suggest that demand driven EDI initiatives based on integrating business community requirements are critical to their success. In defining the requirements, strategic benefits should be promoted to endorse the essential background for EDI adoption.

6.6.3 Infrastructure-Related Recommendations

At the national level, infrastructure-related recommendations, consider technical implementation, infrastructure requirements and know-how as well as the IS-related management mechanisms. These are viewed with respect to defining and institutionalizing the role of EDI service providers in developing the national EDI industry, and that of the coordinating bodies in establishing the national and international trading standards and promotion of electronic trading.

It is recommended that the national information and telecommunications infrastructure should be well-developed and competitively priced to provide the basis for electronic trading. Although Internet facilities may be considered as an immediate avenue, the establishment of VANS dedicated to the provision of EDI and e-commerce solutions, is strongly encouraged. This research identified the criteria for the success of VANS (Section 4.3.3). Attention focused on traditional EDI, utilizing VANS services, as opposed to Internet based EDI. Recently, Internet applications are offering emerging trading communities the potential to consider EDI at more affordable startup and maintenance cost compared to traditional EDI. As a result, it is expected that users will be tempted to adopt the cheaper route, unless otherwise mandated by their international trading partners. However, it is the author's contention that to institutionalize electronic trading the role of VANS should neither be minimized nor overlooked. However, it is important to note here that VANS have to reengineer themselves to remain part of the e-commerce picture. VANS have an edge in providing structured, secure, proprietary e-commerce pathways and EDI translation services. To survive and compete in today's electronic trading environment, they must expand their services portfolio to offer various non-EDI based electronic business and trading services. Their ability to accommodate changing business requirements and emerging technologies is

critical to their sustainability and expansion (Section 4.3.3). This view is supported by a recent article (Kilbane, 1999a) endorsing that VANs are indeed integral to the e-commerce business through the provision of EDI services.

The GOE is encouraged to endorse the establishment of national VANS to cater for both domestic and international trading requirements. This call is further supported by the World Bank recommendation put forward in 1997 as discussed in Chapter 5. It is believed that the presence of a national EDI service provider will promote electronic trading nationally and internationally and will cater for Egypt's expanding trade agenda. With the prevailing security concerns related to trading over the Internet are resolved, it can not be expected that large corporations and multinationals may accept such an interim solution. However, in order to institute VANS for EDI service provision, a number of policy instruments must be institutionalized. First, the GOE will actively promote electronic trading and EDI through legislation and endorsing its use in public sector firms or in customs applications to promote trade and streamline import and export processes. Second, active private sector participation will be encouraged. Third, funding to establish the pursued infrastructure will be secured. Fourth, a coordination activity amongst industry practitioners and service providers will be activated.

EDI coordination and leadership must be institutionalized. National industry federations and/or chambers of commerce can effectively participate in defining trading community requirements, raising awareness and government liaison to promote EDI development. It is recommended that the designated coordinating body should undertake the responsibility of aligning standards and services to business requirements and effectively participate in the process of community development. Furthermore, it will be expected to participate in the international forums for defining and developing international standards to represent the interests of the national trading community. Considering adopting accessible international standards, such as EDIFACT can accelerate the process of EDI implementation and integration in the global trading economy.

It is also recommended to utilize funding and technical assistance offered by international agencies in order to establish the electronic trading environment. International organizations such as the UNCTAD, the national European Article Numbering (EAN) and the International Chambers of Commerce (ICC) organizations

play a leadership role in introducing EDI to countries in their early periods of adopting EDI. These organizations play an instrumental coordinating role. Farhoomand and Pace (1995) suggest that as coordination increases among these organizations and agencies concerned with trade efficiency, the EDI-specific worldwide developments will become more significant. Leadership in Latin American countries is primarily coming from the EAN, the EU and Economic Commission for Europe (ECE) and ICC organizations, especially in Colombia, Chile and Brazil. Similarly, international agencies and aid organizations are driving initiatives emerging from the former Soviet bloc to catch up with the West (Schware and Kimberley, 1995). For example, Global Trade Point Network initiated by the UNCTAD can be employed as an instrument for the dissemination of EDI training tools and exchange of information. Although the EDI technology itself is transferable, local expertise is still required to apply domestic requirements, definitions and restrictions. This is applicable in terms of defining EDI applications and standards as well as in developing the marketing and community development strategies.

Finally, human resources elements with respect not only to availability of technical documentation and skilled programmers, but also the capability to produce them on demand, as advocated by Walsham (1993) based on the web models (Kling and Scacchi, 1982), should also be accounted for.

6.6.4 Recommendations Related to EDI Capacity to Change

Both the government and executing agency should maintain the capacity to change to accommodate changing market and legal requirements. To maintain the state of the art technology, it is recommended that the GOE should include a monitoring mechanism to account for changes in the business requirements and technology developments within the strategy review for future maintenance and upgrade. This will enable altering legislation accordingly or allowing direct coordination and funding efforts in response to the changing requirements. Practical experience reveals requirement for such monitoring, particularly with respect to the prevailing requirement for dynamic national regulations and changing business requirements. This is illustrated by the case of Singapore where, for instance, TradeNet resulted in dramatic organizational and networking transformation (Teo *et al.*, 1997). Clarke *et al.* (1992) also called for monitoring the extent of EDI diffusion and amending marketing and community

development strategies accordingly. This capacity to change allows for effective utilization of EDI's potential and maximizes benefits reaped.

Finally, it is also recommended that a national EDI initiative must be based on a strategic plan and a shared vision of the outcome and benefits. This form of leadership and commitment at the highest policy-making levels, in collaboration with the business community having a unified commercial interest, will ensure successful EDI diffusion across the various industry-sectors.

6.6.5 Industry-specific Elements with Implications on the National EDI strategy

Two industry-specific elements that have implications on EDI strategy at the national (L1 IS1 as shown in Figure 3.2) are identified in the current work. These are *identification of leading industries* and *trading standards*. As for the first element, it is to be noted that leading industries play an instrumental role in developing EDI at a national level. In developing a national EDI strategy, the choice of industry is critical in terms of the importance of the sector to the country. This is supported by previous research (Saxena and Wagenaar, 1995; van der Net and de Bruijin, 1992). In the Netherlands, the VEDI project was initiated in 1989-92 to identify industry-sectors of strategic importance to the country. With respect to the UK, both the retail and manufacturing industries have been instrumental in developing the UK EDI community. For countries in the early stages of developing EDI, like Egypt, it is important to note that industry-sector choice is confined to identifying a leading industry, with the appropriate supply chain structure and coordination needs (as discussed in Chapter 4), ready and able to act as a nucleus to develop the national EDI community. Otherwise the government will be instrumental in endorsing national EDI diffusion. For example, Singapore has not only identified critical success factors for its vision of an *intelligent city* in its IT2000 plan, but also initiated sector level planning (Soh *et al*, 1993). Despite the retail industry success in the UK to assume leadership in promoting EDI use, in Egypt, given the prevailing constraints it can not be expected of the retail industry to pioneer EDI development. It is acknowledged that there are a number of public sector reform attempts in this sector that are currently gathering momentum either through privatization initiatives or through business process redesign which can benefit from EDI adoption in the future. However, unless government support is evident in terms of commitment to altering legislation to favor electronic trading and securing funding to promote the use of EDI it is unlikely that these emerging initiatives can handle such leadership role. This research extended beyond identifying retail as a leading industry-sector promoting EDI development in

the UK, to examine the reasons behind its leading role. As discussed in Chapter 4, this is attributed to the inter-organizational relations governing the trading requirements from an organizational perspective and to the integration of EDI with core business applications from a technical perspective. This leads to identifying other industries that can potentially lead EDI adoption in Egypt. For example, the manufacturing industry-sector, particularly textiles, pharmaceuticals and motor assembly industries as well as government organizations are prospective candidates as discussed in Chapter 5. It is therefore suggested that until the GOE is in a position to institutionalize electronic trading to cater for Egypt's retailing industry, leadership may be potentially assumed by the proposed candidate industries or more specifically through customs adoption of trade facilitation measures as discussed in Chapter 5.

The second of the above mentioned two elements is the selection of EDI trading standards. Although this has not been problematic to the UK as a result of the sophisticated level prevailing in the country, yet it is a matter of concern in countries in process of establishing their EDI industry. For nations in the early stages of EDI implementation, careful planning and participation in standards development is crucial. As discussed by Saxena and Wagenaar (1995) based on d'Udekem-Gevers (1994), EDI standards can be proprietary, industry-specific or inter-industry de jure. They argue that as EDI becomes increasingly inter-sectoral and international, de facto industry-specific standards such as ODETTE in the European automotive industry will become increasingly restrictive and impede the attainment of international trading. Although, it has been learnt that EDI success in the UK has been attributed to the development of TRADACOMS, the national EDI trading standard, the interpretation of transferability lies in the alignment of the trading standard to the business requirement rather than prescribing the use of TRADACOMS standard in particular. Furthermore, recent years have witnessed a trend towards adopting international standards to integrate global trading activities. As such there is a tendency to adopt EDIFACT, for example, rather than develop a national trading standard. In fact, the survey held in 1993 in the UK was already reflecting such growing trend. Association with EDIFACT development bodies is a fundamental requirement in order to ensure standards applicability to and validity for sectoral and national requirements. Accordingly, nations in the early stages of adopting EDI are encouraged to consider international trading standards and actively participate in the relevant committees and boards to account for their national requirements. They are urged to take part in international standards development at the

outset of the planning process. Accordingly, it is strongly recommended for Egypt to be aware of and to provide the, necessary precautions for a clear directive to the potential implications entailed in adopting a national or international trading standard in the various industry-sectors. This is crucial, as such standards will have serious implications for the development of EDI at the national level.

6.6.6 Organization-specific Elements with Implications on the National EDI Strategy

With respect to organization-specific elements with national level implications (L1-OS1 in Figure 3.2), two important features are identified in this work. These are related to expanding on the intra-organization role of EDI and its capacity to induce strategic benefits.

As far as, expanding on EDI intra-organizational role is concerned, it is recommended that EDI should not only be viewed as an automation, or a mechanizing force, but also as a tool serving corporate objectives and enabling the integration of various functional systems. It is important to increase the understanding of the issues involved in EDI implementation at the micro-level (organization level) at the early stages of planning for a national EDI strategy. This is particularly valid in nations like Egypt to solicit support and endorsement of the private business community and public sector leaders. This would also expedite national EDI community development. With respect to EDI technical capacity and implementation strategy: it is advocated to promote that EDI could provide organizations with a solid IT foundation for managing changing market and business requirements and to achieve the pursued strategic advantage. It can also provide the technical capacity to develop new products, services and markets. Though such benefits are of obvious direct value to the organization itself, they also have merits at the national level. This is particularly evident in large size organizations as demonstrated by the case of CEA.

In short, it is recommended to call the attention to EDI capacity to render strategic benefits by providing an enabling applications and systems integration tool and a facilitator to accommodate for future change in business requirements and technology developments. It is important to note that, the innovative use of EDI to meet strategic objectives of the organization may require changes in the organizational structure and culture. Furthermore, this can possibly contribute to establishing the needed business vision and objectives for enhancing and differentiating customer service and focusing

on the core business processes. Hence, promotion of EDI strategic benefits will contribute to institutionalizing the use of EDI and developing the electronic trading community.

6.7 POLICY RECOMMENDATIONS AT THE INDUSTRY-SECTOR LEVEL

(L2-IS2 in Figure 3.2)

6.7.1 Context-Related Recommendations

The research findings indicate a requirement to increase awareness of industry-specific contextual factors that influence/are influenced by EDI implementation. It is hypothesized that, with increased EDI adoption across various industries, sector-specific/community-wide schemes are more likely to emerge (Clarke *et al.*, 1992). This notion is supported by the survey results endorsing the requirement for such schemes to develop collaborative initiatives such as those adopted by the retail and manufacturing industries in the early stages of EDI adoption in the UK. Therefore, it is recommended to consider proactive sector-wide strategies to entertain industry specific requirements and means of promoting electronic trading within specific industry-sectors.

Three relevant recommendations are arrived at through this research work concerning increasing the industry-sector awareness of the context of EDI implementation. First, efforts should be concentrated on defining the sector-specific drivers and benefits from EDI (why?), not just only considering its technical aspects (how?). In other words, there is a need to direct attention to why EDI is needed, rather than solely on how EDI can be technically realized. This calls for a business orientation towards defining the requirement for EDI as opposed to a technical orientation. Second, emphasis is to be given to demonstrating the industry-specific benefits associated with implementing EDI. This is to be based on good understanding of many elements such as industry-specific characteristics, business network and trading requirements, industry-specific applications and standards and motivational drivers. It should also be pointed out that business benefits, associated with EDI implementation, can not be achieved accidentally. Unless particular aspects of business performance, efficiency or inter-organization gains are targeted and incorporated in the implementation plan, the resulting benefit may be quite disappointing. This is supported by the work of (Leyland, 1993; and Szal and Escue, 1992) who suggest that articulation of sector-specific business vision not only provides direction for the EDI implementation, but also contributes to the extent to which the benefit is achieved. Finally, it is recommended to consider trading partners requirements during the early stages of planning EDI implementation.

6.7.2 Infrastructure-Related Recommendations

The section is devoted to derive recommendation on the aspects related to the infrastructure of EDI implementation at the industry-sector level (L2 IS2, Figure 3.2). Analysis of the results of the questionnaire survey leads to recommending that detailed planning for EDI should incorporate industry-specific requirements. The consistent gap between pre-implementation barriers and post-implementation reported difficulties reflects underestimation of the difficulties involved in implementing EDI infrastructure. When the above recommendation is fulfilled, it is hoped to overcome this shortcoming, particularly with respect to introducing new trading partners, adapting traditional business processes and cost justification aspects. Furthermore, the questionnaire results indicate that integrating EDI with internal business processes is important, but not sufficient to achieve maximum business benefit which varies from one industry-sector to another. To maximize potential business benefit, it is recommended that EDI must not only be integrated with internal processes, but also with those representative of core business activity. See Section 4.4.3.4 for a full discussion.

6.7.3 Recommendations Related to EDI Capacity to Change

It is evident from the analysis of the UK survey results that monitoring of changing industry requirements is a fundamental recommendation to ensure continuity in achieving maximum business benefit. As in the case of retail, manufacturing and distribution industries, there is a continuous search for EDI applications that maximize business benefit. There is also a clear planning direction towards exchanging a number of planning EDI applications that would improve trading partner cooperation and enhance their business performance.

6.8 POLICY RECOMMENDATIONS AT THE ORGANIZATION LEVEL

(L2-OS2 in Figure 3.2)

6.8.1 Context-Related Recommendations

EDI adoption should not be seeked as an end in itself, but it should rather be viewed as means of ensuring that maximum business benefit is achieved. Two recommendations result accordingly. First, business drivers should be recognized as the main motivational factors involved in adopting EDI. Otherwise, limited benefits will accrue. Second, industry-specific characteristics and market dynamics should be accounted for in the planning process. This calls for an increased awareness of EDI operational gains and strategic benefits relevant to both the organization and the

industry-sector. It calls for in-depth knowledge of corporate and trading partners requirements as well as the key process areas. It is advocated that business requirements are considered as the main input to strategy. The strategy is incorporated with the key process areas identified in order to satisfy those business requirements and to determine how goals may be achieved and how effectiveness may be measured. These variables are then translated into the required activities to be undertaken and the relevant tasks to be implemented against which conformance levels. It is important to set this strategic vision of the project implementation in the beginning to ensure that the corporate business requirements are fulfilled. Higher managerial understanding of the relative advantage of EDI increases the likelihood of the allocation of managerial, financial and technological resources necessary to implement and integrate EDI systems. Hence, enhanced knowledge will also allow for allocating and committing resources accordingly. Furthermore, it is recommended that management commitment is guaranteed for successful EDI initiative. The commitment of the business community at large, in cooperation with the policy-makers is required to endorse the use of EDI and electronic trading. An EDI initiative is rarely successful when driven from bottom up. Success requires a strategic plan and a shared vision of the outcome and benefits. Without this form of leadership from the highest levels demonstrating a unified commercial interest, the result is a fragmented effort with consequent wasteful use of scarce resources. Finally, the role of the EDI champion (within the organization) is instrumental in planning, developing and executing the corporate EDI strategy. Effort in networking with trading partners and suppliers, business process reengineering and coordinating and executing EDI implementation should never be underestimated.

6.8.2 Infrastructure-Related Recommendations

The availability of a sound EDI infrastructure platform and expert practitioners are recommended throughout the implementation, operation, maintenance and upgrading processes. A staged systematic approach to the launching of EDI, based on knowledge, integration with core business activity and continuous monitoring of changing business and technical requirements is recommended based on the HMSO case study findings (Section 4.5). Technical planning should not be confined to EDI specific infrastructure aspects, that is, not limited to choice of communications method and standard, but should wherever possible include the impact on traditional business processes. Early planning for potential impact on traditional business processes must be accounted for.

Technical implementation planning is two-fold: first, documenting existing systems, and second, designing reengineering scenarios. Technical documentation of systems flow as they really are, and not as they were originally designed, is highly recommended (Schware and Kimberley, 1995a). The design process of reengineering existing processes may be initiated based on the documentation and analysis of existing systems. Once the information flow has been defined, the data should be compared with existing approved standard messages. Because message design and approval can be a time consuming process, adoption of internationally accepted standard such as EDIFACT is recommended. If new messages are deemed necessary, compatibility with accepted message syntax should be incorporated. Trading partners requirements and agreed international standards must be adequately investigated to facilitate the choice of an internationally accepted standard that fulfills the national information requirements. Practitioners are encouraged to exploit EDI intra-organization potential to cater for corporate requirements with respect to systems' integration and as a corporate change agent.

6.8.3 Recommendations Related to EDI Capacity to Change

A dynamic tracking component is required to monitor changing business requirements and technology developments. This is also needed in order to ensure innovative application of the EDI technology to cater for specific corporate requirements. This dynamic component advocates awareness of the strategies adopted and expertise in technologies implemented. It also involves knowledge of case studies, understanding of trading partners' business processes, and awareness of what is required for an international alignment system, both in technology and business practice. It is believed that there is a need to build in a two-tier tracking component to continuously review business requirements and technical developments to improve on systems' functionality whenever required. It is expected that institutionalizing such a mechanism will maximize benefits accrued as a result of EDI implementations. The PIP model provides a practical utility and demonstrates the importance of accounting for such capacity.

6.9 VIEWS ON COMPLEMENTARY ISSUES FOR IMPLEMENTATION OF THE EDI POLICY RECOMMENDATIONS

For practical reasons, it is important to draw the attention that many complementary issues and actions need to be taken care of, if successful implementation of the policy

recommendations is to be sought. This is out of the scope of the current work. However, it is felt necessary to reflect some views on some of these issues that take advantage of the experienced gained throughout this work.

Four of the main issues are selected for brief discussion hereinafter. These are:

a. Creation of awareness.
b. Time frame for implementation.
c. Maintenance, update and expansion.
d. Warrants for continuity.

Firstly, in the *creation of awareness*, it is clear that the UK 1993 questionnaire results consistently highlight the need to promote the use of EDI as a business application and to increase awareness of the existence and potentials of EDI. This is also supported by many authors (e.g. Schware and Kimberley, 1995a). It can be argued, however, that in the case of many developing countries, there is a need to create awareness of EDI, rather than to increase it! The latter would eventually be needed in later stages after the EDI awareness has been already created. It is acknowledged that there is increasing interest in the field in Egypt, but as previously mentioned efforts are fragmented and lack vision, direction and coordination. Drawing from the ideas and recommendations raised by Huzayyin (1988), though on the topic of raising awareness of city decision-makers on urban transport in developing countries, which can be applicable in the current case, the following views are felt important. There is a need to stimulate organized awareness to solicit policy-makers and business endorsement and commitment to electronic trading. It is believed that stimulating such awareness lies with academic institutions, industrial federations and chambers of commerce. For example, this research offers a contribution in this direction, where the results can be applied for demonstration purposes to illustrate the potential impact of adopting EDI which in turn can create the required awareness. A basic catalyst for the stimulation process is the government's revealed interest and potential support for the establishment of a national EDI industry. The recommended approach calling for creation of awareness should incorporate the following elements, for example,

- emphasizing the requirement for EDI electronic trading to fulfill national objectives,
- demonstrating the inadequacy of traditional processes to cater for these objectives,
- stressing the need for partnership between government and business to establish the industry, and

- illustrating how economic and infrastructure constraints are likely to prevail and what can be done in the immediate versus the short term.

It is believed that this systematic approach will not only contribute towards creating the appropriate awareness, but also to stimulate the *political will* to establish the right climate for action as detailed in Section 6.6.1. Having created the political will supported by increased awareness among the concerned bodies, the infrastructure for electronic trading can be gradually established. This approach which can be replicated in the EDI case was earlier developed and recommended by Huzayyin (1988) though on promoting low cost transport improvements in developing countries.

Secondly, the need for *implementation timeframe* is another very important complementary issue. To set this time frame one has to examine a host of elements. Examples of these elements are given below.

- Instating a national EDI vision.
- Priority listing of recommendations.
- Actions needed to implement each recommendation.
- Time required to implement each recommendation (vision, articulating implementation strategy, government cooperation, legislation modification, infrastructure development, etc.).
- Cost of implementation (institutional, know-how, technical, administrative, human resource development, etc.).
- Testing and operations (pilot, industry awareness, electronic trading community development, etc.).

As mentioned earlier, specifying time-frame parameters are not included within the scope of this study, however it is felt necessary to bring the decision makers attention to the factors that are likely to influence the time-frame within which to consider developing a national EDI industry. It has been suggested, based on experience in South Africa and Ireland, that technical negotiations to establish the EDI industry with the respective authorities interested in initiating a national EDI industry last approximately 9-12 months to conclude the technical agreement. Systems installation to setup a VANS including market study, training personnel and gearing up the organization for the EDI service provision takes from 6-9 months (Myles, 1994). However, amending institutional aspects including soliciting government endorsement, adapting legislation etc. are difficult to estimate as are highly dependent on the

prevailing business culture and national trading constraints. Therefore, it is recommended that planning for EDI implementation should consider both institutional and technical aspects in defining the time frame for implementation.

It is hoped that after implementation of the given policy recommendations, an EDI industry would have been gradually established in the country. This makes it suitable to briefly discuss the third complementary issue of implementation, namely *maintenance, update and expansion*. At the early stages of the industry development, many actions are obviously required to maintain this achievement in tact. These include, for example, increasing the already created awareness of EDI importance, solving any of the faced problems of implementation, physical maintenance of the newly introduced infrastructure, software maintenance. Updating and expansion of the EDI networking and community development are also essential. It should be noted that the notion of *capacity to change* is also applicable to continuously strive to accommodate the changing business requirements and technical developments as discussed with respect to the role of VANS in Section 4.3.3. Once an EDI industry is established, it should never stop at this end. It is rather a one way dynamic procedure that should be very ambitious, very promising and, hence, very rewarding to the entire trading business community. Therefore, update and expansion of the elements involved in the technical (hard and soft), administrative, regulative and logistics elements involved are to be carefully introduced. Moreover, this is to be done by the different specialists and practitioners, in full cooperation, supported by the endorsement of policy-makers and business leaders.

In the developing countries trading domain, many externalities exist, a variety of practice difficulties are often met and the market dynamics are temporally unsteady. Accordingly, business leaders and executive managers find themselves having to deal with so many incidents that need decisions on a daily basis. Attention is, therefore, sometimes diverted away from the basic objectives, the main tools and also from continuing business processes that run the work vehicle. Business is faced suddenly with such diversion of priorities. This brings the importance of continuing the earlier launched initiatives to the scene, which is the fourth and the final complementary element to be touched upon. It is feared that after adoption of EDI, the industry will face similar situations that can seriously hinder the process of development of the technology. It is believed, therefore, that warrants to safe guard continuity of EDI practice and performance are needed. These warrants, can include, for example,

- Frequent effort to re-energize and re-vitalize awareness among policymakers, business leaders and perhaps more important at this stage, are those related to the EDI executive managers.
- Continuous upgrading of EDI systems and applications.
- Renewing EDI-related hardware and software maintenance contracts on regular basis.
- Organizing special events (conferences and exhibitions) for the EDI community.
- Encouraging training of the human resources involved in EDI on a regular basis and at all levels of management.
- Joining EDI and electronic trading professional institutions, associations and societies and following up their respective events.

6.10 COMPLIMENTARY POLICY RECOMMENDATIONS BASED ON THEORETICAL LITERATURE

The above mentioned policy recommendations were set out in order to develop EDI strategy that leads to establishing EDI industry and culture at the national level and EDI adoption at the organization level. These recommendation touched upon several issues in several occasions, that partially resemble some theoretical underpinnings of relevance to the definition and scope of 'context' raised by Pettigrew (1985, 1987, 1990), Kling and Scacchi (1982) and Walsham (1993). It is felt important to indicate a few examples on how these theoretical approaches and concepts support many of the above policy recommendations and indeed provide further insight into further complementary ones. These are outlined below.

For instance, the social context defined in the web models (Kling and Scacchi, 1982) and adopted in the Walsham (1993) analytical framework included the social relations between participants in IS, the infrastructure that includes the human element for its support, and the history of commitments in connection to computerization. All these elements of the social context are touched upon in the previous sections on policy recommendations (see Sections 6.6.1, 6.6.2, 6.7.1 and 6.8.1). This is applicable not only at the organization level as indicated in the web models, but also can apply at relevant parts of the policy recommendations at the industry-sector and national levels. Such theoretical support is very important as it endorses the recommendations policies put forward which are based on practical cases.

Another example is the definition adopted by Walsham (1993) of the concept of social process, which has cultural and political dimensions. When considering the cultural

aspect of the social process, Walsham (1993) stressed on how IS are related to the maintenance and change of sub cultures, the interaction at the boundaries between subcultures and the multiple meanings given by the different groups to the same event and action. This in fact emphasizes the type of conflict that can occur between the different subcultures, first at the top level and then at the middle and lower hierarchy levels involved in EDI development. To illustrate, at the decision making level a number of subcultures occur, namely top government officials (e.g. ministers), legislation elected persons (e.g. MPs) and top civil servants (e.g. undersecretaries). Each group certainly has different background, different ambitions, and different angles of thought and different aims and requirements. This obviously presents problems of conflicting views and multiple meanings and misunderstanding which can decelerate EDI adoption. The same can happen with varying scales and consequences, at the different groups of the middle management and the lower hierarchy levels. Emphasis was, therefore, placed on a clear management structure at the outset of launching resources and mechanisms towards establishing a national EDI industry in Egypt (see Section 6.11). Furthermore, in a vertical fashion, interactions between the three levels of management (top, middle and lower hierarchy) when developing and implementing EDI exist. Such interaction if not well-characterised and carefully directed can cause unnecessary delay in EDI development, particularly when dealing with organizations. Accordingly, it is necessary to define the roles and responsibilities of the various parties engaged in the implementation process (see Section 6.11).

Considering the political perspective of the social process, Walsham (1993) talked about the process of control and domination as being implicated in moral issues such as quality of work life and having a part to play in the dynamics between autonomy and control in organizations. In fact one can capitalize on this point in two main ways. First, it is important, for example, when exerting/ stimulating a change in the trading community by introducing EDI, to demonstrate that there is a political dimension linked to this new technology. This can be stressed through proving that the quality of trade activity will improve as a result of shifting to EDI technology, which will in turn exert similar improvement on the economy and certainly on the services offered to the public. Second, in order to maximize the role of government and top management, more attention should be given to achieving a balance between autonomy and control particularly at the organization level.

In addition, in addressing implementation, Walsham (1993) draws the attention to a fact that actually exists but unfortunately typically overlooked. That is, implementation and infrastructure of IS are not only technical. The social (human) aspects of both are no less important. The people who (and relations which) run the system contribute a lot to the success of the system. This is again applicable in EDI development particularly in developing countries bearing in mind the nature of social hierarchical relations and limited resources and expertise. One should concentrate on these social aspects for both top (political), middle and lower hierarchy levels. For the top level, effort is to be directed to increase of the political will and raising the degree of awareness of EDI importance (see Section 6.9). For the other levels, it is necessary to raise the capabilities of personnel so as to be able to deal with the new trading culture and the new EDI technology and requirements.

Finally, successful EDI implementation calls for multilevel cooperation and understanding and efficient interaction within any organization that would join. In other words, for the one organization, the different departments, sections and small units should all work in harmony. Such contextual element is also stressed by the web models which added that it is not only the multi levels entities involvement that is required, but also defining the dealings and interactions amongst those entities is equally important. Accordingly, these factors were accounted for in setting out the practical implementation guidelines set out below.

6.11 DEVELOPING A NATIONAL EDI INDUSTRY: PRACTICAL GUIDELINES FOR IMPLEMENTATION

In this section, guidelines are given to pave the way for the GOE to establish a national EDI industry. The guidelines are of a practical nature and are based on the research findings reported in this thesis. Figure 6.3, outlines the steps needed in order to establish, monitor, evaluate and later expand a national EDI industry. These are outlined in the following sections.

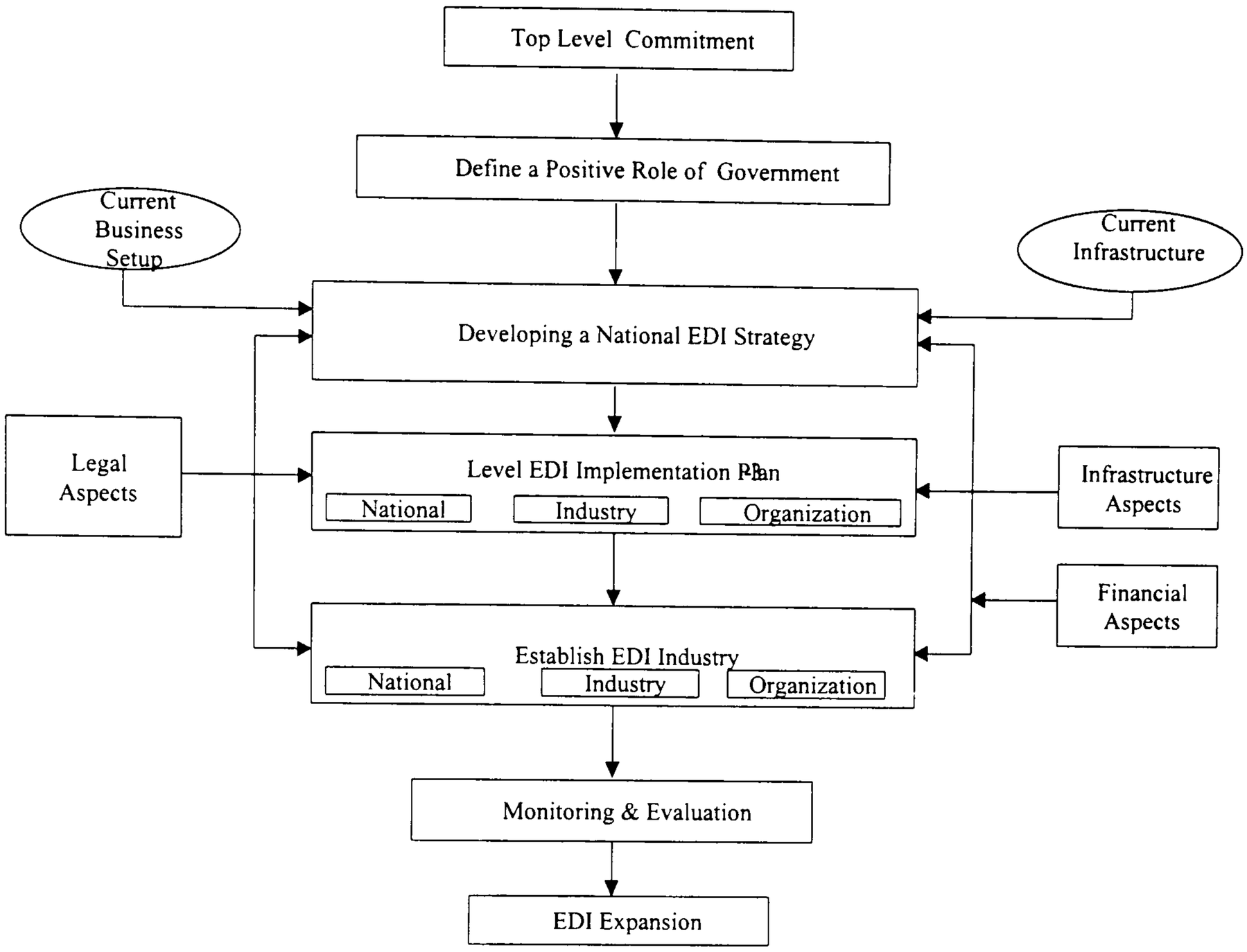


Figure 6.3 Steps for the Establishment, Monitoring and Evaluation, and Expansion of a National EDI Industry in Egypt.

A national policy is needed to promote the orderly development of an EDI industry. In absence of such policy, there is a real danger of losing direction in terms of national EDI development goals and priorities. The proposed guidelines are based on the premise that the GOE acknowledges the fact that electronic trading is radically changing the nature of individual business, industry-sectors and entire economies. That is why the Government is committed to establishing in Egypt a national electronic trading industry based on EDI at par with international standards. To this end, the GOE must:

Coordinate the EDI industry establishment, monitoring and evaluation, and future expansion.

Help individuals and business to take full advantage of the opportunities in electronic trading through provision of relevant educational programs, access to EDI advice and support services for business and emerging trading communities.

Remove barriers to electronic trading at the national, industry-sector and organization levels.

Build trust in electronic trading and become an exemplar of EDI use through moving into electronic procurement, embedding the technology in government business processes and its delivery of services.

In light of the above, the following steps provide the necessary directions to developing a national EDI industry in Egypt.

6.11.1 Engage top level commitment

- Learned personalities to lobby with top-level politicians about the urgency to develop an EDI industry, pointing out the national benefits and the consequences of falling behind the global move to electronic trade and advanced information and telecommunications applications. The learned persons should not only be from academia, but also from the business sector.
- The Government should then organize a national conference on the need for creating and spreading EDI and electronic trading culture as an umbrella for developing the EDI strategy and establishing the industry in the country. The Ministries of Economy and Foreign Trade, Industry and Technology Development, Trade and Supply, Information and Telecommunications, should actively participate in the conference, preparing background papers on the status quo and identifying potential requirements for electronic trading with technical guidance from the learned persons. The conference should bring together policymakers, concerned government officials, industrial and trade professionals, businessmen and researchers. The conference should aim at pooling existing relevant practical knowledge to guide the establishment of the industry, including updates on relevant national and regional initiatives and success stories from mature EDI markets. The conference recommendations should focus on generating pragmatic policy recommendations to aid the national implementation process.
- Following on from the recommendations of the conference, soon afterwards, a workshop and roundtable meetings should be organized by the Government. Participants should come from: (a) the above mentioned ministries, trade and industry, professionals, businessmen as well as researchers and (b) representatives from the regional donor agencies (e.g. Arab Fund for Economic and Social Development, etc.) and international organizations (e.g. The European Commission, UNDP, The World Bank, etc.). This event is to aim at materializing the ideas and recommendations of the National EDI Conference and to setup general directions

for developing EDI strategy in the country as well as to communicate to the external donors the wish and seriousness of the Government in establishing the EDI industry. Also this event would be used to establish good contacts for financial or technical aid in the future.

- Trade, industry and business community leaders to council with top level officials of the Ministries of Economy and Foreign Trade, Industry and Technology Development, Trade and Supply, Information and Telecommunications, and Ministry of Planning and International Cooperation. Topics on the agenda should be the resulting recommendations of the above-mentioned workshop on how to establish an effective role of the government for introducing and developing EDI culture and strategy. The outcome of these meetings should be put forward to concerned Ministers for eventual discussion and approval of the Prime Minister and the Cabinet.

6.11.2. Define a Positive Role of Government

- The Cabinet and the Prime Minister to initiate the establishment of the EDI strategy in Egypt should form a ministerial Committee. The committee should include the Ministries of Economy and Foreign Trade, Industry and Technology Development, Trade and Supply, Information and Telecommunications, Planning and International Cooperation, with high level membership from business, trade and industry leaders representing the private sector. The Committee will undertake developing an impressive policy statement focusing on developing an appropriate EDI strategy and creating the required EDI culture among the trading environment. The general policy statement should revolve around the need to establish a national EDI industry to cater for the national trading requirements and the integration in the global economy. Instituting the use of EDI at CEA can act as a gateway to the EDI industry development in Egypt. Given the leadership role assumed by the nation, in due course, Egypt can consider acting as a regional hub for EDI services in the region. The policy statement should also be time bound, for example, by 2002.
- Under such policy, the role of government would be consolidated under the following sequential and later interacting steps.
  - Setting the national direction.
  - Consolidating its coordination role as a *facilitator*.
  - Developing a national EDI strategy.
  - Establishing a national EDI industry.

- o Creation of a follow-up mechanism that would ensure continuous assessment and enhancement of the EDI industry.
- o Creation of another mechanism that can take the established EDI industry into the 21st century through expansion and diffusion across various applications through monitoring changes in the electronic trading technologies.
- o In parallel, the role of government should also extend to awareness, training, capacity building and education in areas related to establishing the electronic trading culture.

- Accordingly, the Ministerial Committee should issue the ministerial directives needed for the creation of:
  - o A National EDI Steering Committee (EDISC) to develop the national EDI strategy catering for business and infrastructure considerations based on the local relevant setups and capabilities. Work of this Committee should aim at producing a sound implementation plan for an EDI industry in Egypt (work of EDISC is highlighted in Section 6.11.3).
  - o National EDI Directorate (EDID) to establish the EDI industry based on the implementation plan mentioned above. Work of the EDID is highlighted in Section 6.11.4.
  - o National EDI Monitoring Directorate (EDIMD) in order to follow-up, evaluate and enhance the established EDI industry as highlighted in Section 6.11.5.
  - o National EDI Expansion Directorate (EDIED) that should take care of the future developments of the EDI industry according to the latest state of the art, Section 6.11.6.
  - o A permanent EDI initiative to take the burden of creating and sustaining a national EDI culture in the country among business community and players of the electronic trading sector. Section 6.11.7 gives a brief on the work of EDIAC.
- The charter for these entities will provide guidance and input to ensure that the goals from the larger national development plans are implemented and supported appropriately.

6.11.3. Developing the National EDI Strategy

Developing the national EDI strategy will be in the hands of EDISC.

- The EDISC should include top level officials and private sector representatives that have: (a) extensive expertise in national and international trade, (b) commitment to the cause of establishing the electronic trading environment and EDI industry.

- The EDISC should form seven technical committees as follows:
  - o National Specific Committee (NSC)
  - o Industry Specific Committee (ISC)
  - o Organization Specific Committee (OSC)
  - o Infrastructure Committee (IC)
  - o Legal Committee (LC)
  - o Funding Committee (FC)
  - o Implementation Plan Committee (IPC)
- The EDISC should also act as a coordinating body between the six technical committees. It should have the means and power to solve any problems that may face any of the technical committees so as to facilitate their work.
- A timeframe should be enforced by the EDISC to set dates for finalysing the work of the six committees.
- After receiving the final reports and recommendations of each of the six technical committees, the EDISC is to solicit a highly specialized technical committee to set out the implementation plan of establishing the EDI industry in Egypt (see Section 6.11.3.7).

6.11.3.1. National Specific Committee - NSC

This committee is commissioned to assess the main EDI requirements at the national level. It will:

- Differentiate between the international and the national trading processes at the outset of the assignment and commission the tasks to two sub-committees with relevant expertise.
- Work with state agencies and foreign trade groups to define national and international trading pressures and requirements.
- Identify the key business community players to define domestic trading requirements. This can be done through survey of the current trading processes and their perception of benefits and barriers to electronic trading.
- Initiate market research to survey EDI related business perceptions and requirements.
- Commission detailed documentation on the national trading processes across major industry-sectors.
- Commission detailed documentation of international trade processes, based on a bird's eye revision of procedures connected with foreign trade, with a view to

boosting exports via electronic trading and facilitating the action of electronic trading operators. Document the import and export procedures at CEA and related trading entities.

- Employ technical and advisory assistance from trade boards with extensive expertise, such as that of Singapore, in undertaking the documentation process.
- Identify potential barriers, particularly with respect to adapting traditional business processes through surveying the extent of automation within organizations and assessing management interest and commitment to upgrading the corporate infrastructure.
- Examine implications of other barriers to electronic trading, such as human resources, cultural resistance to change and language. Map these barriers against similar experiences to recommend to the EDISC possible solutions and best practice measures to overcome them.

6.11.3.2. Industry Specific Committee - ISC

This committee is commissioned to increase understanding of the issues involved at the industry-sector level. It will:

- Identify leading industries with the potential to drive EDI adoption. Effort may also focus on leading industries of strategic national importance such as textiles, electronics and automotive.
- Study the prevailing industry structure characteristics and capacity to adopt EDI.
- Invite cross industry committees to review industry specific potential benefits and barriers to adopting EDI.
- Assess industry specific requirements through mapping the actual needs against the industry perception of EDI associated benefits.
- Determine the way forward with respect to developing EDI within specific industry-sectors. A number of sub-committees can be formed at this stage as requirements of different industry-sectors can differ sharply necessitating specialized expertise.
- Develop industry specific programmes that can dramatically increase the deployment of EDI and the extent of its diffusion across various industry-sectors.

6.11.3.3. Organization Specific Committee -OSC

This committee is commissioned to increase understanding of the issues involved at the organization level. It will:

- Identify organizations where EDI has the potential to render strategic benefits through the deployment of EDI trade facilitation or process reengineering capacity potentially within the national privatization program.
- Assess their corporate business requirements and potential to adopt EDI. Survey corporate-specific requirements to identify most appropriate corporate entry strategies.
- Examine the requirements of large, medium and small size enterprises that have the potential for converting to EDI use and formulate a statement of requirement relevant to each of the categories.
- Examine SME requirements and specifically formulate tailored strategies to cater for their operational and funding constraints.

6.11.3.4. Technical Committee -TC

The Technical Committee must assess technical requirements to implementing a national EDI industry.

- Review and assess the existing national informatics, telecommunications and Internet service provision infrastructure features and capacities.
- Review technology alternatives to provide high performance platform and design the appropriate business model to suit the national business requirements.
- Investigate the various modalities for industry implementation based on transferable experience of other countries with well-established mature EDI and electronic trading markets.
- Identify infrastructure development requirements with respect to the need for adequate telecommunications infrastructure, managed network services, and specialized service providers.
- Map existing IT and telecommunications infrastructure capacity against best implementation modality.
- Consider soliciting technical assistance and know-how transfer to assist in undertaking the assessment assignment.
- Define the role of the key players in the industry, especially the role of EDI coordinating bodies and service providers based on international experience.
- Develop terms of reference and systems specifications for services offered by the emerging EDI service provider to cater for national EDI industry requirements. Highly specialized sub-committee can be sought for this task.

- Define the role of EDI coordinating bodies in aligning standards and services to business requirements.
- Employ both local and international expertise to identify national technical requirements, definitions and restrictions
- Identify the appropriate international trading standards that will promote the development of an electronic trading culture.
- Develop a framework for short, medium and long-term plans for implementation of the EDI industry infrastructure to determine required implementation strategies and stages of programme development.

6.11.3.5. Funding Committee - FC

The Funding Committee must identify potential national and international funding.

- Investigate potential national public and private funding.
- Investigate potential international funding sources through the international donor community. By the way of illustration, The World Bank and the European Commission have budget allocated to enhancing the national IT and telecommunications infrastructure in the Euro-Mediterranean area, which may be tapped to finance the establishment of the national EDI industry in Egypt. For example, the EUMEDIS (Euro-Mediterranean Information Society Initiative (strand two) Regional Pilot Information Society Projects has recently launched a Call for Proposals for regional E-Commerce projects in the Euro-Mediterranean. A total of Euro 7 million, to be allocated in the year 2000, have been earmarked for such projects (Project I.D. SCR-E/110979/C/G. Financing the industry development may also be pursued more specifically from initiatives targeting e-commerce and/or EDI which may be targeted through Framework Five under the European Commission or alternatively through smaller project funding venues such as those addressing productivity maximization under the Enterprise Asset Management for large-size organizations or the SMERPS for Small and Medium Enterprise Resource Planning System under the Medressa, European Commission.
- Communicate with neighboring states who are in process of launching similar electronic trading initiatives, in general, and EDI ones, in particular, to assess their financing modality and investigate the funding sources. For instance, Tunisia has secured from the World Bank a total of US$ 120 million over a four-year period ending 2001 towards modernizing its trade facilitation infrastructure, customs and ports to streamline cargo clearance processes (World Bank, 1998).

- Liaise with international donor agencies to fund and develop the electronic trading infrastructure. Egypt has the opportunity to solicit funding towards the establishment of the national EDI industry or possibly more specifically towards particular project modules such as upgrading the systems at CEA based on introducing an EDI solution.
- Investigate partnership, strategic alliances and/or joint ventures opportunities available through international funding channels.
- Engage the interest of the private business community to part finance the process of implementation through possibly calling for a build up of an endowment fund.

6.11.3.6. Legal Committee -LC

The Legal Committee must work towards proposing a legal framework that is favorable to electronic trading.

- Differentiate between the international and the national trading legislation at the outset of the assignment and commission the tasks to two sub-committees with relevant expertise.
- Examine the existing national legal infrastructure to assess if paper-based form requirements prevent laws from being applied to electronic transactions and to determine whether such requirements should be adjusted to make laws technology-neutral and to permit their interpretation and application in an electronic environment.
- Review the structure of the prevailing legislation that governs national trading processes to examine requirements for change and determine the necessary law amendments to cater for electronic trading at the national level.
- Review the structure of the prevailing legislation that governs international trading to determine requirements for change.
- Consult multilateral laws as a basis of preparing the new laws or adjusting the current one to be inline with international regulations.
- Examine legal considerations for the establishment of the EDI industry with respect to software licensing and intellectual property rights.
- Propose creation of a regulatory and legal framework to support the development of a national EDI and electronic trading industry.

6.11.3.7 Implementation Plan Committee - IPC

This committee will coordinate input from all other technical committees to draft an EDI Implementation Plan.

- Prepare a national EDI implementation plan to present to the EDISC and Ministerial Committee for authorization. The main elements of the plan focus on establishing the industry infrastructure, setting achievable goals and timeframe, reconnaissance work, resources, coordination and logistical support. Another important element in the plan is to focus on target user groups at the national, industry-sector and organization levels. A third element of the plan will be to develop and present specific activities as discrete products, for example, modalities to increase awareness and establishing national expertise.
- Obtain senior government endorsement to ignite business interests and ensure implementation sustainability.
- Develop a partnership strategy (Public/Private) to leverage resources available to support industry.
- Create momentum in agencies and contracts to use electronic trading to the fullest extent possible. Utilize networking institutes and chambers of commerce to promote the use of EDI.
- Set dates for the EDI Directorate and the associated Sub-Directorates to determine realistic expectations and timelines to implementing the industry.

Based on the above,

- The EDISC should present the Implementation Plan to the Ministerial Committee for endorsement and authorization.
- Then, the EDISC is to suggest the formation, membership, powers and duties of six new sub-directorates that should take charge of establishing the national EDI industry in Egypt based on the approved implementation plan, under the umbrella of the National EDI Directorate (EDID). These are:
  - Legal Sub-Directorate
  - Funding Sub-Directorate
  - Infrastructure Sub-Directorate
  - National-Level Sub-Directorate
  - Industry-Sector Level Sub-Directorate
  - Organization-Level Sub-Directorate

- Necessary formal authorization of the six sub-directorates is to be issued by the Ministerial Committee and the relevant ministerial authorities.

6.11.4 Establishing the National EDI Industry

- Assign leadership of the National EDI Directorate to a dynamic senior decision-maker with extensive expertise in large-scale IT-oriented project management.
- Within the organization of the National EDI Directorate, establish 6 Sub-directorates to undertake the implementation of various aspects of founding the national EDI industry, on the national, industry-sector and organization levels. These six sub-directorates will be responsible for undertaking all the assignments detailed in this section. All sub-directorates will be undertaking their assignments in parallel, reporting back to the National EDI Directorate according to a preset agenda of control meetings. Activities will be centrally managed by the Directorate Head.

6.11.4.1 Legal Sub-Directorate

This Sub-directorate will be responsible for establishing a favorable electronic trading legal environment.

- Amend legislation to cater for EDI trading requirement in light of the Legal Committee recommendations to implement a legal framework regulating electronic trading in tune with the new modes of commercial transactions and exchange of trading documents electronically, as approved by EDISC and the Ministerial Committee. This is to be done through, for example,
  - o Establishing viable legal guidelines and policies enforcing electronic trading use and standards.
  - o Establishing meaningful and enforceable penalty deterrents for system abuse.
  - o Educating law enforcement authorities on the importance of electronic trading.
  - o Establishing incentives for using electronic trading, for example, broadening the tax holiday structure, provision of tax breaks and/or technology assistance programs.
- Consider technical assistance in reviewing and adapting national laws to accommodate electronic trading.

6.11.4.2 Funding Sub-Directorate

This Sub-directorate will be responsible for securing project funding from both international donors and the business community.

- Short list serious potential funding sources and assess their finance modality in light of prevailing budget constraints. By the way of illustration, the European Commission often allocates budget towards such initiatives provided that the private sector secures partial financing whereas projects financed by the World Bank do not dictate such requirement. The applicability of the various modalities within the context of EDI implementation in Egypt would require further research. The underlying concept is to secure funding and government endorsement.
- Setup a charter meeting to review potential of the development of the joint projects and support characteristics.
- Apply for the various international assistance programs. Attain endorsement from the Ministerial Committee to secure the pursued funding.
- Encourage partnership with the private sector by providing special investment incentives, for example, through the setup of a tax-free endowment fund, the proceeds of which may be used to finance the project for a defined period of time.
- Consider a longer-term strategy towards total private funding under the State full supervision and observance.

6.11.4.3 Technical Infrastructure Sub-Directorate

This Sub-directorate will be empowered to establish the national EDI industry infrastructure by developing and upgrading of the existing electronic trading information and telecommunications infrastructure in order to provide an efficient cost-effective platform for a national EDI industry:

- Commence with improvement in the current electronic trading infrastructure with respect to increasing the availability of high performance options.
- Seek all technical means to reduce the costs and tariffs for communications charges.
- Expand on the provision of the IT, telecommunications and Internet infrastructure and capitalize on such investment.
- Establish an Electronic Trading Enterprise focused in offering EDI services. Given the changes in technology and terminology, this enterprise will be expected to assume the role played by VANS in developing the EDI industry in the UK.
- Contract with a well-established service provider to provide the basic technology solution and contract with local expertise to customize the user interface.
- Endorse the role, vision and operations of the Electronic Trading Enterprise to secure rapid community development.

- Endorse the standardization process in order to ensure its alignment with the national regulatory framework.
- Institutionalize the use of international trading standards such as EDIFACT to accelerate the process of EDI implementation and integration in the global trading economy. Encourage coordinating bodies to participate in the international forums for defining and developing international standards to represent the interests of the national trading community.
- Establish a base of human resources development advance local capabilities and knowledge to cater for industry implementation and future expansion.
- Secure availability of a sound EDI infrastructure platform and expert practitioners throughout the implementation, operation, maintenance and upgrading processes through technical assistance and involving the necessary national and international expertise.

6.11.4.4. National Sub-Directorate

- Undertake careful revision and documentation of procedures subject to electronic trading. Avoid simple automation and encourage reengineering initiatives where applicable taking into consideration impact on traditional business processes.
- Foster the promotion and application of EDI use in public sector organizations and introducing EDI in government operations through establishing goals for computerization in key government ministries, possibly through the well-developed government computerization program.
- Target the establishment of a simple automated customs procedure at CEA. Facilitate foreign trade processes by setting up an EDI service center to allow various trade agents: importers, exporters, trade organizations, customs authorities, banks and forwarders to exchange EDI documents electronically. As discussed in Chapter 5, CEA may act as a gateway to developing the national EDI industry in Egypt. As such the government will represent the hub of the various trading operations. It is, therefore, recommended to assign a specific sub-directorate to upgrade the CEA IT and telecommunications infrastructure. The sub-directorate will be commissioned to:
  - Set a strategic direction for CEA.
  - Commission detailed documentation of trade processes.
  - Ensure active participation of the parties involved in the trading cycle in formulating the EDI strategy.

- o Study the potential user requirements.
- o Study the basic processing requirements.
- o Evaluate potential applications.
- o Aim at streamlining processes, not simply automating them.
- o Develop the electronic trading business model.
- o Prepare project proposal and solicit senior government support.
- o Develop the system specifications.
- o Issue terms of reference to vendors.
- o Select vendor based on an established track record to develop the main system functionality. Use local expertise to develop the user interface.
- o Establish a strategic alliance relationship with vendor.
- o Maintain an ongoing relationship to ensure system development, installation, customization and engineering of change procedures.
- o Secure resources to ensure rapid progress.
- *o* Continue to monitor performance and enhance system accordingly.

- Promote the industry and coordinate activities in government, in domestic and foreign trade groups and among the general business community.
- Work with the public and private business institutions at different levels of senior management and across different organizational functions to set and enforce measurable goals.
- Secure electronic trading and e-commerce initiatives in the marketplace and set goals for entities involved.

6.11.4.5 Industry Sub-Directorate

- Create a coordinating body, parallel to the ANA, to promote electronic trading at industry levels. It will represent the interests of the various industry-sectors and aggressively promote their interests to act as a catalyst for action on behalf of the EDI industry. It will work with the various industry-sector forums to promote EDI diffusion.
- Launch industry specific networks, promoting a staged systematic approach to the introduction of EDI, based on knowledge, integration with core business activity and continuous monitoring of changing business and technical requirements. The concept of electronic trading should be adopted at its wider sense and not confined to commercial trading applications.

- Coordinate industry specific events to utilize the influence of existing industry specific forums to engage interest in EDI use and build confidence in implementation of a solution tailored to industry requirements.

6.11.4.6 Organization-Level Sub-Directorate

- Prepare a special consultancy packages with industry modernization and privatization programs to address large organizations requirements.
- Select a model organization applying successful EDI operations to be used as a showcase to promote EDI adoption.
- Promote integrating EDI with core business application to maximize potential benefits through setting specialized technical awareness programs targeting IT and EDI managers. Special awareness seminars should be held to emphasize business transformation through EDI technology along the lessons learned from the HMSO experience. Develop a showcase of an impressive number of success stories, possibly from mature countries, but well-described to allow the reader to relate to their own operations.
- Encourage SME's to adapt to the emerging electronic trading culture through the provision of national financial incentives and encouraging banks to provide low cost project related financing.

6.11.5. EDI Monitoring and Evaluation Directorate (EDIMD)

This directorate will be responsible for institutionalizing systems and procedures to monitor EDI progress and practices. Obviously, this directorate will be established after the national EDI industry has been established adequately. The main duties of this directorate will be to:

- Develop and maintain comprehensive industry statistics and databank.
- Institutionalize monitoring and follow-up mechanisms at the national, industry-sector and organization levels to be used for such purposes.
- Review performance across various industry groups to measure the extent of EDI diffusion and volume of electronic trading across various industry-sectors.
- Review changes in light of business community and specific industry-sector requirements and consider different solutions.
- Monitor developments at CEA and the impact on financial performance.

- Benchmark performance against international experience and well-developed models to ensure continuity in technology transfer with respect to service provision and the extent of EDI use.
- Evaluate the impact of electronic trading at the national, industry-sector and organizational levels and the respective performance indicators through systematic assessment of the trade volumes, numbers and frequency of transactions, etc. The specialized technical committees can be tasked with identifying enhancements at a number of levels. Benchmark performance of different industrial and commercial sectors; possibly at later stages benchmark the nation's performance against counties of the region at similar or comparable stages of EDI development.

6.11.6. EDI Expansion Directorate (EDIED)

- Establish an EDI Forum, an independent, non-profit organization to monitor the initiation and development of the EDI industry. The Forum's charter would aim to bridge the gap between the national need for a developed EDI industry and the extensive knowledge base of experience in developed countries through regular survey or recent research output and country experience. The Forum will regularly document findings and lessons learnt, extrapolate transferable lessons and propose implementation initiatives appropriate to Egypt through dissemination of cutting edge research output, policy notes and publications.
- Investigating through a specialized technical committee the latest and expected advances in telecommunications and networking technologies.
- Investigating through another specialized technical committee the latest and expected changes in electronic trading and EDI.
- Hold regular seminars and meetings with all actors of the EDI environment including interested researchers. The aim is to carefully assess requirements versus capabilities of the demand side and the supply side, respectively.
- Determine the required actions to expand the existing EDI industry at the national, industry and organization levels.
- Expansion of infrastructure.
- Expansion of organizations and industry in each sector.
- Integrate knowledge with education to build a reservoir of human resource expertise to cater for the continuous changes in technology and business requirements. Curriculum taught at the higher educational levels should not be confined to

technology, but rather incorporate an overview of the various industry requirements and government regulations.

- Maintain favorable policies and laws to facilitate foreign investment and expansion in the field of electronic trading.
- Develop a web-enabled knowledge base to retain relevant information and experiences.
- Secure funding from international sources towards monitoring the needs for change and expansion policies.

6.11.7. EDI Initiative

- The Ministerial Committee should form a permanent national initiative to take care of creating and sustaining the EDI culture among the trading community and to help Egyptian firms exploit the business benefits of EDI.
- The EDI Initiative is to be headed by a well-known respected personality and have membership from both sides of the trading and business communities, the public and the private.
- It should report directly to the Ministerial Committee and thus gain a prestigious and powerful image and authority.
- A special budget is to be allocated to the EDI initiative so that it can perform its duties efficiently and independently from any commercial or political pressures.
- Many outcomes can be pursued by the EDI initiative to fulfill its objectives. These include, for example,
  - Initiating a national business awareness campaign aimed at encouraging business to take full advantage of EDI through conducting business lecture series and roundtables meetings bringing policy and decision makers together to discuss issues of relevance to EDI adoption and expansion and propagate the use of EDI as a reliable technology in order to create public interest and confidence in electronic trading.
  - Working with the various industry forums to enhance their knowledge of EDI and to solicit their input through interviews and industry specific awareness sessions to cater for the interests and requirements of the various industry-sectors. Implement a strategy of awareness and training through periodic seminars and study days on EDI across industry forums and business associations.

- Organizing an annual conference with the industry leaders to bring the latest developments in the technology to the attention of practitioners and decision-makers.
- Scheduling a program of events around Egypt to demonstrate benefits of EDI.
- Providing advice and support services to help organizations incorporate EDI in their businesses.
- Producing special EDI publications series to disseminate information and results of recent research output and market trends regularly.
- Establishing an EDI documentation center and databank.
- Establishing a web based EDI knowledge reservoir and a participatory work place to host online discussion groups.

It should be noted that major emphasis is placed on the role of government in establishing the EDI industry in Egypt. Although this suggestion may not necessarily apply as a generic recommendation for other nations in the early stages of EDI adoption, it is particularly pertinent to the case of Egypt due to the political privileges inherent in government related social processes. First, the government has the power to mobilize resources to alter regulations in favour of electronic trading as discussed earlier. Second, bearing in mind the cultural inhibitors typical of developing countries in terms of resistance to change, the government has the capacity to create the enabling environment both in terms of infrastructure as well as instituting business incentives. Third, from a political perspective, the government has the capacity to mandate or strongly encourage the use of EDI inline with national economic development goals to secure rapid diffusion of the technology.

6.12 CHAPTER CONTRIBUTION

This chapter summarized the lessons learned from the current research. The transferable lessons have been interpreted in terms of success determinants and policy recommendations for Egypt. The provision of these recommendations contributes to a better understanding of the issues involved in EDI implementation. Both the policy and business decision-making communities can benefit from the policy recommendations put forward in this chapter in terms of developing a national EDI strategy and planning the industry implementation or corporate specific policies respectively. Practitioners in the field will also benefit from interpreting the success determinants discussed within their implementation environment.

Furthermore, the research findings will also be of benefit to the international donor community interested in promoting EDI through the provision of access to capital, technology and managerial know-how. The GOE is urged to pursue national and regional initiatives with corresponding efforts to define inter-firm cooperation opportunities, training staff and financial assistance as well as information services requirements to promote an electronic trading environment in Egypt. Current international cooperation schemes in developing countries and economies are keen to address the requirements of modern production quality control and promoting JIT production techniques. Requirement for EDI may be articulated at the organization level within these frameworks to benefit from the support extended through these international cooperation schemes. Furthermore, technical assistance can be called upon to better articulate national objectives, focus on trust building processes amongst the trading parties involved and developing activities designed to promote electronic trading. This research contributes a cornerstone in bridging the gap between the developed technical know-how offered by international organizations and the need for articulating the requirement of the recipient country in process of developing its national EDI strategy. This research contributes guidelines to establish best practice measures, to develop criteria and checklists for conditions, capacities and attitudes to provide advice to the GOE in creating an appropriate electronic trading policy environment, addressing the needs of the country.

CHAPTER 7

CONCLUSIONS

7.1 INTRODUCTION

The chapter starts by listing the main research conclusions. It then addresses some methodological and theory relevant issues. This is followed by a brief account of the study limitations and directions for future research. Finally, the main contributions of the thesis are summarized.

7.2 Main Conclusions

The main conclusions of this thesis can be grouped under the following headings as setout below.

- Conclusions related to EDI knowledge and policy.
- Conclusions related to flexibility and transferability of EDI.
- Conclusions related specifically to introducing EDI in Egypt.
- Conclusions related to the adopted methodology.

These conclusions are briefly outlined hereinafter.

<u>Group A - Conclusions related to EDI knowledge and policy</u>

- In developing an EDI industry, it is necessary to complement the technical knowledge with the contextual aspects of EDI implementation.
- When introducing an EDI industry to a new market, effort should be made to change the mind set of the different actors in order to accept the technical and procedural knowledge involved.
- The development of electronic trading industry depends mainly on government policies related to *why?* and *how?* this is going to be promoted.
- The pace of electronic trading community development relies heavily on the levels of determination, participation and support of the policy and decision making bodies.

Other conclusions specific to the UK experience can be traced in Chapter 4.

Group B - Conclusions related to EDI flexibility and transferability

- EDI is technically flexible and open to future change. Hence, through featuring its capacity to change within the CIC framework, renders support for dynamic changes in business and technology.
- The North/South dialogue on the transfer of EDI technology is useful to both parties if it can be realised in a healthy environment.

  - For the developing country, it can: a) demonstrate the gains of EDI to policymakers and industry managers, b) help in overcoming the local constraints, and c) assist to leapfrog to the latest state of the art in technology implementation and adoption.
  - For the developed country, the dialogue leads to: a) identification of new markets that are open to EDI that will boost trade facilitation with the developing countries, b) identification of the technical assistance that should be offered to developing countries.

Other conclusions specifically related to lessons learned and transferability criteria and output can be found in Chapter 6.

Group C- Conclusions related specifically to introducing EDI in Egypt

Figure 7.1 shows a mechanism of introducing EDI to Egypt based on the research findings discussed in this thesis. Due attention is given to stimulating awareness and active participation of both policy and decision makers using the CIC framework to ensure incorporating both the context and infrastructure-related requirements. Consideration is also given to the potential role of the Internet and the temptation to utilize it as the electronic trading platform. The importance of continuous monitoring and capacity to absorb change is illustrated by the feedback loops to sustain both informed awareness and active participation.

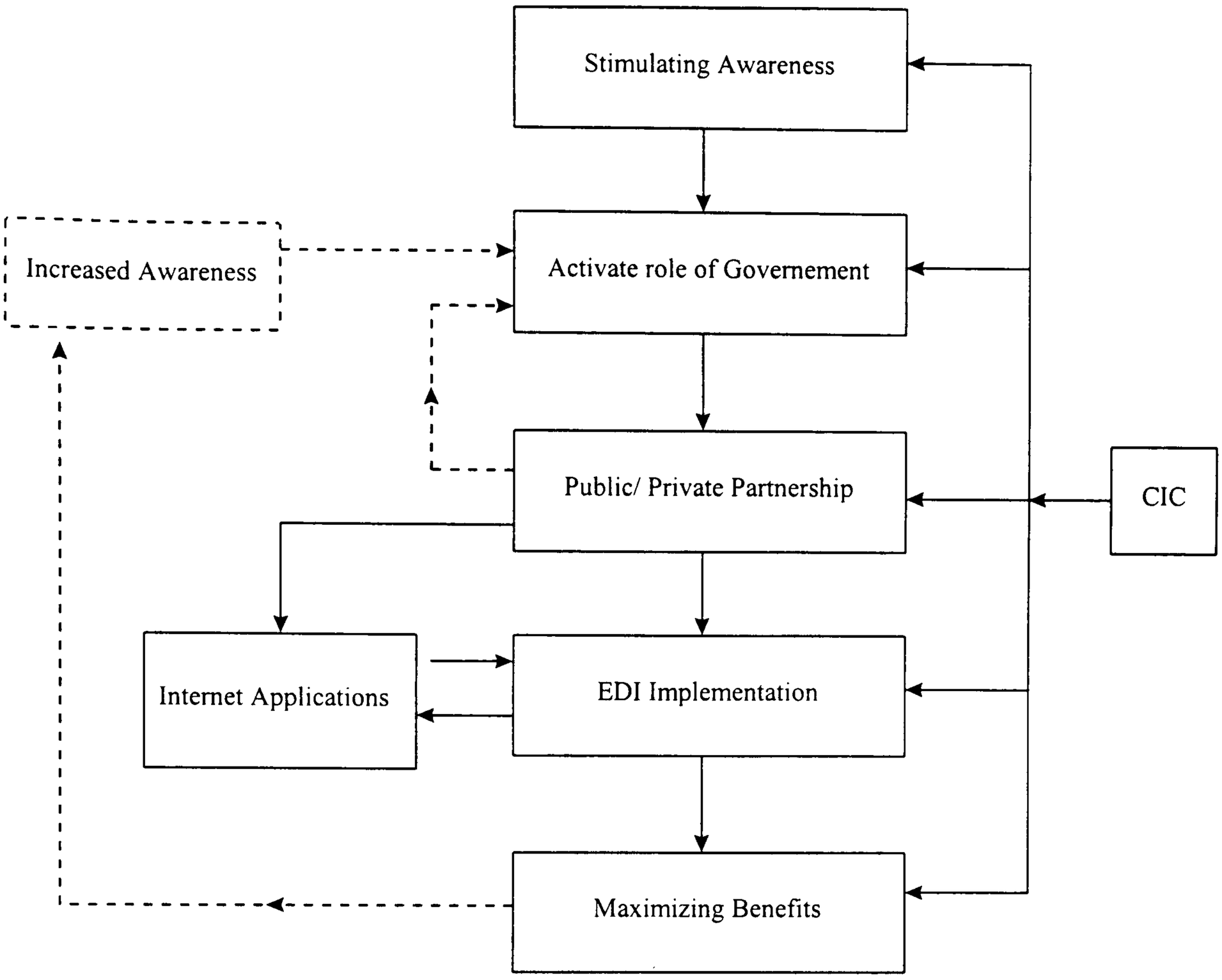


Figure 7.1 A mechanism of introducing EDI to Egypt

Conclusions related specifically to introducing EDI in Egypt are stated below.

- Due to a general lack of knowledge of EDI potentials, it is essential to stimulate awareness of these potentials among policymakers and senior management as a priori.
- Establishing a sound national EDI industry requires strategic alliance and public/private partnership amongst regulatory and coordinating bodies and service providers.
- The irresistible drive of using the Internet-based electronic trading applications is to be taken as an inevitable reality. However, this should not be taken as to replace proper and conventional EDI technology, unless future technological innovations prove otherwise.
- Integration of EDI context, infrastructure and capacity to change (i.e. the CIC framework) maximizes the gains. This should be utilized as a continuous means of keeping the momentum of policymakers awareness on the matter. Hence, expansion of EDI use can be guaranteed.

Other conclusions specific to Egypt are given in Section 5.8.

Group D - Conclusions related to the adopted methodology

- Both the adopted pluralist approach and the developed analysis procedure have proved to be most appropriate to combine the breadth of the quantitative techniques and the depth of the qualitative analysis in the investigation to fulfill the objectives of this thesis.
- The empirical side of the investigation contributed not only to supplementing the EDI literature, but also to support/negate previous research findings and theoretical ideas with practical evidence from market practice. The gathered data and information about EDI are also very useful in demonstrating to potential users its merits and capacity.
- Conducting the fieldwork in the UK and Egypt, catered for addressing transferability requirements and enhancing the knowledge of policymakers in both countries.
- The analysis procedure developed in the current work proved to be very useful in differentiating between three levels of analysis (the national, the industry and the organization) and in distinguishing at the same time between context and infrastructure factors relevant to each level. This allowed for a systematic in-depth investigation and thus contributed to increasing the understanding of the issues involved in developing a national EDI strategy.

Having summarized the main conclusions of the thesis, it is felt necessary to briefly discuss some methodological and theory relevant issues. These are given in Sections 7.3 and 7.4, respectively.

7.3 METHODOLOGICAL ISSUES

The underlying concepts, relevant to the thesis objectives, are integrated into the CIC framework. Consequently, the analysis and recommendations are systematically addressed within this framework.

It is also worth noting that the contextual factors examined in this research are studied independently from the infrastructure ones. Taking into consideration the weakness in the contextual approach raised by Madon (1991), regarding the ambiguity between *context* and *process*, it was felt that this independence contributes to the coherence of the analysis procedure. This *complementary* but *independent* perspective towards treating the EDI *context* and *infrastructure* within the scope of the study contributed to the clarity of understanding of the issues under investigation.

On the other hand, adopting the above perspective did not lend itself to assessing the degree of interdependence between the factors identified. As a result, it was difficult to quantify to what extent one variable dominates the outcome. However, there is an opportunity for future research to focus on a particular aspect within a confined implementation setting to examine the degree of interdependence. This can be practical in an experimental environment where the results may be useful in developing educational tools. For example, it would contribute towards providing the information necessary to enable the use of computer-based strategic modelling software to draw various simulation scenarios of the extent of benefit achieved as a result of a particular variable change. However, it should be noted that such technique emphasizes the relations between particular factors, but does not encompass the wider complex contextual phenomena.

Another methodological consideration is related to data collection. This research relied heavily on empirical evidence. Questionnaire design, sampling, survey authorization, survey management, data collection, filtering, processing and extracting conclusions were certainly not easy. In addition, the fieldwork which included a series of lengthy semi-structured interviews which were carried out with informants from the UK and Egypt, HMSO officials and CEA top management, respectively were particularly challenging in soliciting information given the confidentiality considerations. However, it was necessary to conduct both the questionnaire survey and the case studies to allow for a very wide perspective of the EDI practice in the UK and its potential for application in Egypt.

The questionnaire was designed in order to achieve two main objectives. One is to allow a comparative analysis with the previous work carried out in the UK (Reekers and Smithson, 1994), Germany (Reekers, 1994) and the USA (Banerjee and Golhar, 1991). The second objective is to allow for gathering further detailed information about EDI and some industry and organization specific issues. Therefore, additional specific questions were included in the form, in order to cater for the latter goal.

The results of this extensive survey were classified by seven industry-sectors to draw industry specific lessons. In some instances, the industry sample size was fairly small. Despite this limitation, appropriate statistical measures were applied to ensure validity of the responses and indeed the achieved results were indicative of the prevailing trends. If sufficient awareness of EDI prevailed in Egypt, it would have been

interesting to conduct a similar survey to that of the UK, across potentially candidate industries in Egypt, such as manufacturing and pharmaceuticals. In the case of developed countries, if industry sector specific strategies are pursued, resources should be focused on complementing the postal questionnaire with personal interviews to capture the wider contextual issues that are likely to affect the pace and extent of EDI implementation.

Another important issue, regarding data collection, is the fact that the responses received were mainly from large organizations. This provides credibility to the results as it reflects on a sound well-rooted experience with EDI implementation. Nonetheless, for future research, it would be interesting to consider EDI use and potential for small and medium enterprises. For the purpose of this research, such limitation did not hinder the progress as in initiating an EDI industry in a national setting, it is mainly the large organizations that lead the adoption process and as such these are the organizations typically pursued at the early stages of EDI development.

Gathering data and soliciting background information for CEA was particularly arduous. CEA informants were initially reluctant to disclose any potentially confidential organization-specific information. Therefore, it was necessary to focus only on the business processes and count on external sources to complement the necessary background information. To pursue first hand facts, interviews were not confined to CEA staff, but also included external Consultants who were directly engaged in technical consultancy assignments to CEA. In fact, greater cooperation from CEA was observed upon relaying the responsibility of validating the knowledge of the organization-specific culture and constraints on the primary informant. Recognizing such organizational barriers, conducting further work under an official government umbrella would greatly facilitate the research process especially if the information pursued involved financial performance, corporate culture, reengineering of traditional business processes or implicating political or social change.

7.4 THEORY RELEVANT ISSUES

The current research argues for a demand-driven approach to EDI adoption which entails considering both the internal and external setups. This is in contrast to the attempts of a supply-based approach which provides the technology in absence of markets' genuine desire. In that former direction, i.e. demand-driven, the body of contextualist literature proved essential in providing a structured approach to

investigation, a means of knowledge synchronization and guidance in interpreting the social related issues inherent in EDI implementation.

The strength of the contextual approach lies in bringing the social context and process to center stage. Relevant literature and analysis invariably focus on issues related to human resource development, infrastructure and resource management. This is evident in Walsham's (1993) analytical interpretation of information systems in organizations. Based on the above mentioned school of thought and relevant theoretical work (Kling and Scacchi, 1982, Pettigrew, 1985) and the current research findings, HMSO and CEA case studies results, showed that indeed the social (human) element is of a vital importance for the healthy adoption of EDI in developing countries. This applies to all levels of human resources involved.

In contrast, there is little explicit mention of the economic context and its impact on EDI adoption. The current study revealed that market dynamics, competitive pressures and corporate economic performance play an instrumental role in driving EDI adoption and implementation. Current investigation of factors underlying success in a mature EDI market (the UK) and potential for introducing the technology to Egypt reveals that the impact of the economic pressures should not be overlooked or underestimated. In fact, research findings endorse the need for proactive identification of these factors to account for in the process of planning and strategy formulation.

The Walsham philosophy stems from his analysis of metaphors and information systems. His approach focused heavily on organizations as cultures and political systems as opposed to organizations as machines and/ or organisms (Walsham, 1993). This focus limited, to an extent, the consideration of the economic variables in the analysis. The use of the 'organizations as machines' where attention is directed towards optimizing performance and maximizing efficiency is particularly relevant to the study of EDI. This is supported by the fieldwork results discussed throughout the course of this work. There is an opportunity for future research to complement the Walsham (1993) analytical framework with an explicit structured economic component based on the above. Organization performance is fundamental to corporate success and it would be most useful to systematically investigate the economic dimension within a theoretical framework. This would facilitate engaging decision-makers interest in practice.

Another area in need for due attention within a theoretical framework is *inter-organizational relationships.* Typically the above mentioned school of thought is focused on organizational issues. Where social relations are considered, attention is directed primarily towards *intra-organizational* management and staff relations. EDI, as a subset of IOS, entails by definition *inter-organizations* relations involving external relations with trading partners, customers and suppliers. As shown from the current work, industry network structure and trading partner requirements affect EDI adoption. It can be argued that such elements can be absorbed, for analysis purposes, under the *social relations* element in the Walsham (1993) framework. This would only secure a loose definition as traditionally the focus is on social relations implicated in the organizational management relations as mentioned above. Given the specific nature of EDI, it is believed that its *inter-organizational* feature warrants due attention. Future applications can possibly benefit from complementing the Walsham framework on that front with relevant work on network approaches in management research.

From a different analytical perspective, it is also noted that, although the framework aims to deal with change, it does not provide means of dealing with opportunities and challenges arising from the analysis of the social context. As a result, historical events are captured in a structured manner, whereas futuristic elements captured from the analysis are at best presented in a narrative form. It is acknowledged that devising an analytical mechanism to capture such dynamics may be virtually impossible in the interpretive tradition to the extent possible in the positivist tradition based on forecasting instruments. However, it is necessary to allow for some structured methodology to capture such outcomes. Strategic modelling software may be possibly utilized to build different scenarios based on captured organizational change and opportunities arising thereof. In the current research, the EDI competency and capacity to change resolved the predicament (see Chapter 4). It was possible to focus on this feature in addressing and accommodating future change. It should be acknowledged that such approach is not necessarily applicable in the wider area of information systems and different mechanism may need to be applied to address future change.

The above stated limitations had to be taken into account in the research design and use of theory in the current work. The above mentioned theoretical literature was primarily used to draw analogies and synthesize some of the research findings. However, the work was not strictly bound to only the social context and process, but

involved the contextual factors that influence/are influenced by EDI adoption at large. These included the political and economic issues where applicable.

Taking into consideration the parameters of the Walsham (1993) analytical framework and its applicability at the organization level proved to be both opportune and challenging. The use of the framework stressed the prominence of the cultural and political perspectives. This was very useful not only in identifying relevant aspects of pertinence to HMSO, but also in supporting the call for creating awareness and changing the trading culture when developing a national EDI industry in Egypt. This is of particular relevance to developing countries as found in the current work, where it is not easy to change the mindset of people who get used to a traditional trading environment for long. It should be noted, however, that applying the Walsham (1993) analytical framework to the case of HMSO also revealed difficulty in subjecting culture and political perspective to assessment. In practice, these elements are more complicated and diverse than theoretically portrayed. A criticism of the above mentioned analytical framework is the simplistic assumption that these perspectives may be easily detected and documented. These are particularly sensitive issues and typically confidential. More so in the case of developing countries where research into culture, power, politics, ethics are typically resistant to measurable variables. It is rather a simplistic assumption that cultural diversity and/ or political conflict in organizations can be easily revealed for examination especially at times of crisis.

A similar difficulty was also detected in examining the context and process linkage using the structuration theory. It should be noted that the process of analysis and the revealed results are most valuable and most intriguing. The proposed concept provides an engaging tool to interpreting organizational change. In fact, it can very well be also used to interpret organizational performance in light of organizational behavior in future work. Yet, necessary analytical and validation resources need to be secured to achieve reliable results. The model components, dealing with intricately related structures, modalities and modes of interaction, although may be analytically separable, they are intractably integrated in reality which presents major difficulty in undertaking the research analysis in practice. Madon (1991) and Walsham (1993) also raised this concern. The above represent challenging opportunities for future research to devise practical mechanisms based on theoretical background so as to resolve these limitations.

Over the past few years, researchers in information technology management called for the need to consider the context in information systems research. Yet, a few studies have proved useful in applying the contextual school of thought stemming from analysing real experience and practice in mature EDI markets. Furthermore, in developing countries, where the context of information systems is substantially different from the industrialized world in terms of constraints imposed by the social, political, economic setup and resources limitation, there are even fewer attempts to investigate context related factors and how they influence technology adoption. This study provides a contribution in this direction. It should be noted that effort was geared towards catering for the requirements of developing countries, or more specifically to those of Egypt. Accordingly, it was necessary to examine the lessons learned from a mature EDI market both at the abstractual and practical levels. This entailed accounting for the likelihood of resistance to technology adoption as well as a host of relevant transferability impediments. This effort complements the broader guidelines set forward by the contextualist school of thought. Such understanding of the EDI context, specific to a mature EDI market versus that of a potential emerging one, together with an understanding of factors inherent in the transferability process then serves as an input to developing a national EDI strategy for Egypt.

Towards theoretical development and insight, the field of EDI research could benefit from future research based on one of two approaches. First, to consider an integrated approach as mentioned earlier which would systematically address the context and process at the multi-levels. This could build on the current research by providing further theoretical definitions of the factors implicated in each of the framework components (see Section 4.7.1). Second, to adopt a multi-tier approach where relevant theoretical work is applied at each of the three levels of the analysis. At the national level, it is possible to call on economics theory to investigate the potential impact of EDI on manufacturing performance and trade transactions. At the industry level, theories implicating network approaches and coordination structures may be employed. At the organization level, transaction cost or resource dependency theories may be considered.

The above suggestions are put forward to address the area of future theoretical development. However, it should be noted that theory is ideally used to cater for research objectives. It is a means to an end, unless the research focus is set to achieve theoretical development as an end in its own right.

The recommended topics for future research given above stem from the exercise of matching the Walsham (1993) and the practical results of the HMSO (see Section 4.5.4) in addition to reviewing the CEA case findings (see Section 5.8) in view of the basic elements of the above framework. Section 7.5 includes more topics for further research that are based on the thesis findings, limitations and recommendations.

7.5 LIMITATIONS OF CURRENT RESEARCH AND DIRECTIONS FOR FUTURE RESEARCH

Three main limitations were faced in the current research. Each limitation has implications for further work in the field.

First, the current research focused on traditional EDI. Recently, however, there is a tendency to give more attention to e-commerce as one of the main products of information and telecommunications technologies that offers a promise of significant economic growth. Many public and private sector agencies, therefore, give precedence to the development of e-commerce. It is seen as a new way of conducting business that has the potential to radically alter economic activities and the social environment, especially in sectors such as the retail, manufacturing and finance, and possibly in the health and education areas (OECD, 1999). However, it is believed that although the wider e-commerce applications are particularly valuable in customer-to-business electronic trading, EDI has always been the backbone of the business-to-business and the business-to-government electronic trading applications. This is also emphasized by Schware and Kimberley (1995b, page 84) who indicate that "*EDI is the "senior" technique in electronic commerce, involving a specific business information transfer from computer to computer application.*" Therefore, the role of EDI should not be minimized or underestimated.

EDI and e-commerce have been subject to rigorous debate and speculation as to whether they compete or complement. It is believed that, to-date, e-commerce is not a replacement of EDI. It is rather largely dependent on it. This sentiment is also supported in recent publications. For example, Kilbane (1999b) asserts that EDI and e-commerce experts affirm that although some companies may use Internet for consumer oriented communications, they will continue to use EDI for trading with first tier business partners. Similarly, Zuckerman and McLymont (1999) conduct a series of interviews with a number of purchasing managers from major companies and producers of e-commerce technology who reflect on their use of EDI applications and

their plans for expansion. The findings assert their continued use and benefit from EDI. The authors also refer to IBM work on extending the reach of EDI by sending transactions over the Internet, especially to companies that are not EDI-enabled. Hickey (1999) argues that although more and more business data is being shared over the Internet, e-commerce is not ready to supplant EDI. Instead, EDI is moving towards the Internet. In the same direction, McGahee (1999) illustrates how traditional EDI gets competition and compatibility from the Net by providing lower setup and maintenance cost options than those offered by VANS. Sullivan (1999) indicates that both forms of EDI, one over the traditional VANS, the other over the Internet, act as a sub-set within the general term e-commerce. The key distinction is the Internet EDI may soon become the only form of EDI in practice as the Internet progresses into a more perfect network technology. Suri (1998) argues that the Internet extends the enterprise and takes EDI into the future. The author illustrates how classic EDI can be enhanced through integrating Inter-Enterprise Connectivity (IEC) solutions, emerging as a bridge technology, into existing systems and EDI. Whilst, the above argue in favour of Internet EDI, others are skeptical of the future of EDI. For example, Schenecker *et al.* (1998) surveyed a number of e-commerce solutions and investigated their potential to substitute for the use of EDI. They expressed uncertainty as to the future ability of EDI to compete against the surveyed products.

In light of these controversies, three potential areas for future research emerge. First, to undertake a comparative analysis of the technical capacity, security and audit facilities provided by Internet EDI those offered by specialised VANs. Second, to investigate *if* and *how* Internet EDI may be likely to provide an alternative to establishing a national EDI industry. More specifically, to address how the role of VANS can be possibly substituted for. Third, to study the potential value and impact of Internet EDI on small and medium enterprise electronic trading activities and businesses. Fourth, it would also be interesting to investigate the changing information exchange habits within the framework of the emerging electronic trading technologies.

Another limitation is that only the current work only examined the Customs and Excise Authority of Egypt. A natural extension to this research work would be to compare the proposed CEA EDI application within a trade facilitation framework to that of comparable initiatives in the region. Lebanon and Tunisia are potential countries to investigate where radical reforms are currently gathering momentum to prepare for integrating in the global economy. This would help to identify common patterns

arising from the context and implementation interaction particularly with respect to streamlining business processes within a defined industry parameter. It would be most interesting to extend the study to these countries to emphasize transferable lessons and identify cross-cultural differences. Further research is also needed to build frameworks to address commonalities in the various contexts. This can later be substantiated with case studies once implementation is complete and EDI service is in operation. Furthermore, there are a number of related areas for potential research. These, primarily, include research into the potential impact of EDI on national variables such as economic development and trade performance which would be extremely valuable to nations in the early stages of EDI industry development.

Finally, it was extremely difficult to deal with issues of EDI legislation and financing of implementation. Electronic trading and EDI legislation vary extensively from one country to another. It is therefore necessary to investigate the country-specific requirements of change in existing legislation of relevance. Furthermore, in the context of EDI legal administration, many different culture-specific considerations and the role of the many agencies involved in institutionalizing EDI in a national setting must be accounted for. Similarly, with respect to financing of implementation, various financing modalities, including national (private/public funds) and international donor support resources may be tapped into. However, financial planning tools, expertise and knowledge of local markets are required to undertake such assessment in order to propose implementation scenarios. It is believed that these particular aspects of EDI implementation require further research and specialized expertise.

7.6 REITERATING THE RESEARCH CONTRIBUTION

The first contribution of this thesis is to improve understanding of the EDI context and implementation in developing a national EDI strategy. The second is the augmentation of the EDI body of knowledge with empirical data. The third is the provision of a conceptual framework and a set of policy recommendations to aid policymakers in establishing a national EDI industry in Egypt. Finally, the thesis contributes an example of how developing countries can benefit from the experience of a mature EDI market in the developed world.

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ANNEX I – EDI QUESTIONNAIRE AND INDUSTRY FACT SHEETS

THE
MANAGEMENT SCHOOL
IMPERIAL COLLEGE

EDI Questionnaire – Summer 1993

EDI, Electronic Data Interchange, the electronic exchange of business documents has been adopted on a large scale by British Industries over the past few years.

The objective of this survey is to establish the extent to which British Industries succeeded in exploiting the potential opportunities offered by EDI.

Please fill in the questionnaire by only TICKING (✓), unless otherwise requested

EDI Users: Please complete all sections of the questionnaire by filling in the requested information, or by indicating (✓) to the most appropriate response.

Non EDI Users: Your input will contribute towards establishing the position of EDI within the British Industries. Please complete all sections **except** those marked For EDI Users Only.

If you are interested in receiving the Executive Summary of the Survey Results, please indicate:

☐ YES ☐ NO

1. ***Please answer the following general questions about your company:***

a) Approximately how many people are employed by your company? _____

b) What is the approximate annual turnover (or budget)? _____

c) Which industry sector is your organisation in (eg. Retail, Utilities)? _____

d) What is the primary function of your department (eg. EDI or IT)? _____

e) What is your job title? _____

2. ***Please answer the following questions about the use of EDI in your company:***

a) Has EDI been considered in your company? Please indicate:

☐ YES, since 19__ ☐ NO, not yet ☐ EDI is unknown

b) Has EDI been implemented yet?

☐ YES, in 19__
☐ NO, possibly in 19__
☐ NO, decision against using it currently

c) Is there a team within your department dedicated to implementing EDI?

☐ YES – How Many ? _____ ☐ NO

c) **FOR EDI USERS ONLY:**

Please answer the following questions concerning your trading partners:

a) **Approximately how many trading partners do you have currently?** _____

b) **Approximately how many of the above are you trading with using EDI?** _____

c) **What approximate percentage of your trade volume is carried out using EDI?**
(eg. 10% Incoming, 70% Outgoing)

Incoming _____ Outgoing _____

d) **How many trading partners were added:**

before 1990: _____ 1990 : _____ 1991: _____ 1992: _____ 1993: _____

e) **How many trading partners are expected to be added in:**

1993: _____ 1994: _____ 1995: _____ later: _____

f) **Is your electronic trading focused on:**

☐ 1-2 Major Trading Partners ☐ Community of Trading Partners

g) **Is there a need to reduce the number of Trading Partners trading electronically?**

☐ YES (please indicate reason)_____
☐ NO
☐ Possible (please indicate reason)_____

h) **Which of the following best describes your use of EDI?**

☐ Buyer (Ordering) ☐ Seller (Invoicing) ☐ Both
☐ Others (please specify)_____

i) **Which of the following best describes the industry sectors you trade electronically with? Please tick and complete details in percentage terms (eg. 50% of partners are from same industry, 25% different industry, 25% international)**

i). Same Industry ☐ Percentage Traffic: _____

ii). Different (across)Industry ☐ Percentage Traffic: _____

iii). International ☐ Percentage Traffic: _____

j) **What document standards do you use in EDI? Please tick (✓)**

Standard	**Current**	**Planned**
TRADACOMS		
EDIFACT/ Subset		
Other (eg Odette)		
Industry Specific/ Proprietary (specify)		
None		

) **Which of the following EDI Business Applications do you use? please tick (✓)**

EDI Application	Current	Planned
Orders		
Invoices		
Other (specify):		
None		

List the four documents most frequently transmitted by EDI. (eg. Orders, Invoices,etc.)

1)	2)
3)	4)

List the two documents most frequently received by EDI (eg. Orders, Invoices,etc)

1)	2)

Are the applications listed above directly related to your core business?

☐ YES ☐ NO

) Considering the extent of EDI, how would you position your company in comparison with your competitors?

☐ Well advanced ☐ Advanced ☐ Same ☐ Behind ☐ Well behind

FOR EDI USERS ONLY: ***Please tick (✓) the most appropriate response***
Please answer the following questions about the EDI implementation in your company:

) Which type of communication do you use for EDI? Please tick (✓)

Communications Method	Current	Planned
DIRECT		
USE OF VAN		
X.400		
Others(specify)		

b) What is the hardware platform used for EDI? Please tick (✓)

Hardware Type	Current	Planned
PC		
Mini (Unix – AS400)		
Mainframe		
others:		

c) EDI Software Application: ***Please tick (✓) the most appropriate response***

For EDI users: **Please indicate your satisfaction with the following attributes of your EDI software.**

For non users: **Please rate the importance of these characteristics to you for using EDI.**

	Very Dis-satisfied	Dis-satisfied	Satisfied	Very Satisfied	Extremely Satisfied
Ease of handling different formats of data transmitted					
Use of User friendly EDI terminology					
Reliability of the software					
Ease of accommodating growth in the volume of data					
Compatibility of current system to future enhancements					
Protection/ Security of data transmitted via EDI					
Ease of using EDI with existing software					
Ease of integrating software within inhouse applications					
Software ability to cater to your own specific business requirements					
Audit facilities of transactions					
Ease of increasing number of trading partners					
Ease of connecting to different VANS					
Ease of access to electronic mail					
Ease of tracing the delivery of document to trading partner					
Software vendor ability to respond to technical support requirements					
Others:					

d) FOR EDI USERS ONLY:
Please indicate the level of integration of the EDI software in your business processes by ticking (✓) the most appropriate response:

A). EDI data is processed separately and re keying is the norm ☐

B). Incoming EDI data is usually adjusted by employees before further electronic processing takes place ☐

C). Outgoing data is processed on a different machine, then the data generated requires adjustment before transmission ☐

D). Incoming data is transferred electronically without human intervention ☐

E). Outgoing data is transferred electronically without human intervention ☐

e) FOR EDI USERS ONLY: **Please tick (✓) the most appropriate response**

Please indicate how easy/ difficult the EDI implementation process has been.

	Very Easy	Easy	Moderate	Difficult	Very Difficult
Selecting communications method					
Selecting the VAN					
Selecting the software					
Selecting the document standard					
Sorting out legal requirements					
Meeting different partners trading requirements					
Access to technical support					
Introducing EDI to new partners					
Integrating the EDI software into inhouse applications					
Planning the implementation with Trading Partner					
Adapting traditional business processes to incorporate EDI					
Cost Justification					
Others:					

5. ***Please tick (✓) the most appropriate response***

For EDI Users: **Please indicate to what extent the following factors played any role to influence you to implement EDI.**

For Non EDI Users: **Please indicate the extent to which the following factors are likely to influence your decision to implement EDI.**

	not at all	minor	moderate	major	extreme
Request of Trading Partner					
Organisation's strategy					
Reducing costs					
Reducing Inventory/ stock					
Improved Ordering					
Increase efficiency					
Increase turnover					
Reduced paperwork					
Reduce number of employees					
Better internal processes					
Implementing Just in Time (JIT)					
Trading Partner requirement for further business					
Better communications with Trading Partner					
Increase accuracy of data					
Quick response & access to information					
Improved Delivery					
Better partner co-operation, closer relationship					
Improve business planning					
Remaining competitive					
Meeting industry standards					
Improve customer services					
Increase productivity					
Improve product quality					
Others (specify):					

5. **Please tick (✓) the most appropriate response**

For Non EDI Users: **Please indicate to what extent the following reasons played any role in the decision not to use EDI.**

For EDI Users: **Please express the extent the following aspects contributed to the difficulty of adopting EDI.**

	not at all	minor	moderate	major	extreme
Organisation has not considered EDI					
Trading Partner not considered EDI					
Lack of awareness of EDI					
Not expected to be cost effective					
Budgetary limitations					
Lack of top management support					
Trading partners do not use EDI					
EDI not related to core business					
Competitors do not use EDI					
Technological difficulty					
Change in traditional business process					
Lack of signatures on documents					
Security of Data					
Concerns over legality					
Implementation complexity					

7. FOR EDI USERS ONLY: ***Please tick (✓) the most appropriate response:*** To

To what extent have the following benefits been realised due to use of EDI.

	not at all	minor	moderate	major	extreme
Improved speed of communications					
Reduced clerical error					
Decreased administrative costs					
Decreased inventory costs					
Improved data sharing					
Increased internal efficiency					
Improved internal processing					
Improved focus on core business					
Improved co-operation with T. Partner					
Increased sales					
Gained competitive advantage					
Improved customer loyalty					
Improved vendor relationship					
Improved customer service					

8. **What, in your view, are the critical issues in EDI implementation and operation?**

9. **What would you recommend to improve the use of EDI?**

10. **Please provide any additional comments that you may have on EDI:**

Thank you for your time and attention in filling out this questionnaire.

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RETAIL

Number of Respondents: 15 Trading-community: 4904
Turnover: 40–800 mn/annum Workforce:100-90,000
Structure: EDI leading pioneers. Coherent supply chain, dominant hub-spoke structure.

Technical profile: Initiated early 1973, most implementations in late 1980s. Majority depend on dedicated EDI implementation teams. Industry heavily reliant on TRADACOMS (at time of survey), but seriously planning for EDIFACT.

Significant drivers: Improve ordering; reduce cost; increase accuracy of data; reduce paperwork; increase efficiency; streamline business processes; better customer service.

Significant benefits: Improved speed of communications; reduced clerical error; increased internal efficiency and improved trading partner cooperation.

Significant barriers: None.

Significant difficulties: None.

Retail Characteristics: EDI applications highly integrated with core business activity, typically sending orders, receiving invoices and exchanging forecasts, production planning schedules, electronic payments, receiving stock and price information. Trading primarily confined to the same industry. Retail is key to EDI development. EDI adoption in the manufacturing and distribution led by Retail.

CSF: Industry network structure; EDI integration with core business activity; continuous pursuit of new EDI applications; dedication of specialized resources.

MANUFACTURING

Number of Respondents: 21 Trading-community: 1231
Turnover: 25–681 mn/annum Workforce: 300-100,000
Structure: hub-spoke structure, 19 representing hubs.

Technical profile: EDI introduced in 1982, most implementations late 1980s. 52% relied on dedicated EDI teams. Industry heavily reliant on TRADACOMS, for orders and invoices, but seriously planning for EDIFACT.

Significant drivers: Better communication and cooperation with trading partners; remaining competitive; increasing efficiency and accuracy of data and providing a better customer services. Adoption in response to Retail supply chain pressures.

Significant benefits: Improved speed of communications; reduced clerical error; and improved internal processes.

Significant barriers: Lack of awareness and budget constraints.

Significant difficulties: Introducing EDI to new trading partners and cost justification.

Manufacturing Characteristics: EDI applications are typically transmitting invoices and receiving orders. Dispatch confirmation, delivery forecasts and schedules, payment instructions, remittances advice, production plans, product and price files, freight orders and engineering drawings are transmitted whereas receipt is confined to orders, with a limited receipt of sales forecast and order acknowledgment. Industry well-aware of EDI business potential and implementation impediments.

CSF: Increased awareness of EDI business implications; industry network structure; EDI integration with core business activity.

DISTRIBUTION

Number of Respondents: 10
Turnover: 35–400 mn/annum
Structure: hub-spoke structure, 60% representing hubs, 40% spokes.

Trading-community: 977
Workforce: 106–4,000

Technical profile: Introduced in 1984, most implementations late 1980s. 60% relied on dedicated teams. 60% use TRADACOMS, 20% EDIFACT, 20% industry-specific.

Significant drivers: Increase efficiency, increase accuracy of data, enhance inter-organizational relations and improve customer service.

Significant benefits: Improved speed of communications; reduced clerical error; and improved trading partners relationships.

Significant barriers: None.

Significant difficulties: Introducing EDI to new trading partners.

Distribution Characteristics: EDI applications include transmitting: consignments, simple and complex orders, delivery instructions, invoice-self billing, purchase order, loading lists, intrastat customs forms, issues and claims acknowledgment, and receiving orders, consignments and loading lists.

CSF: Increased awareness of EDI business implications; supply chain pressures, requirement for high-levels of efficiency and exchange of business documents; EDI integration with core business activity.

GOVERNMENT

Number of Respondents: 8 Trading-community: 508
Turnover: 0.5–400 mn/annum Workforce: 12–10,000
Structure: Hub-spoke structure not applicable. Driven by government TQM programs to improve customer services and increase administrative efficiency. Maybe classified as a service-based industry.

Technical profile: Introduced in 1988, 75% allocated dedicated teams to implementation. 88% of the respondents reliant on EDIFACT.

Significant drivers: Enhance inter-organizational cooperation; improve delivery and reduce costs; increase efficiency and accuracy of data; provide better customer service.

Significant benefits: Improved speed of communications and reduced clerical error.

Significant barriers: None.

Significant difficulties: None.

Government Characteristics: Education, health and local authorities recognize potential EDI benefits. Applications typically include: count-hall information, teachers pension agency queries, exam-entries, results and statistical reviews, and limited transmission of orders, invoices and dispatch advice, and receiving teachers vacancy lists, information re county schools, school-marks, teacher-pension agency replies.

CSF: Increased government awareness of the potential EDI benefits and emphasis on sector-specific applications.

UTILITIES

Number of Respondents: 7 Trading-community: 168
Turnover: 15–505 mn/annum Workforce: 350–100,000
Structure: Technically a hub-spoke structure exists, yet power relations inherent in service industries are dominant.

Technical profile: Considered in early 1980, the first implementation in 1985. Majority implementations in early 1990s. 86% allocate dedicated EDI teams. Equally divided in

terms of the use of TRADACOMS and EDIFACT. Aggressive plans to adopt EDIFACT to ensure compatibility with European requirements.

Significant drivers: Increase efficiency. Sector witnessed increasing privatization initiatives forcing large corporations to adopt increased efficiency initiatives.

Significant benefits: Improved trading partners relationships.

Significant barriers: None.

Significant difficulties: Meeting trading partners requirements; integrating EDI software with in-house applications; adapting traditional business processes and cost justification.

Utilities Characteristics: EDI applications typically retail-oriented; .limited to exchanging orders, invoices, order acknowledgment and statements. Majority highlighted the intra- and inter industry-sector trading as well as international exchange of information.

CSF: Limited success attributed to low-levels of EDI integration with business processes and core business activities.

SERVICES

Number of Respondents: 8 Trading-community: 155
Turnover: 20–300 mn/annum Workforce: 64–2,000
Structure: A highly structured administrative-based infrastructure.

Technical profile: Introduced in 1985, most implementations late 1980s. 63% allocated dedicated teams to EDI implementation. EDIFACT standards are predominant.

Significant drivers: Increase productivity and efficiency; increase accuracy of data and facilitate quick response and access to information; enhance inter-organizational relationships in terms of better communications and cooperation with trading partners.

Significant benefits: None.

Significant barriers: None.

Significant difficulties: Introducing EDI to new trading partners; meeting trading partners requirements, sorting-out legal requirements and cost justification.

Services Characteristics: Applications exchanged include orders and invoices. Primary applications adopted are industry-specific: transmitted documents include intrastats, freight documents, master airway bills, house airway bills, asset registration, bookings, seaway bills, whereas received documents were mainly freight status messages, master airway bill, invoice, bookings, and acknowledgment documents.

CSF: Slow to adopt EDI given the diversity of applications within this sector and lack of power relations amongst organizations. Better understanding of trading partner requirements is crucial.

PHARMACEUTICALS

Number of Respondents: 7 Trading-community: 188
Turnover: 75–600 mn/annum Workforce: 1,400–13,000
Structure: Strong ties with Retail. Mixed hub-spoke representation.

Technical profile: EDI introduced in 1984/85. Most implementations in late 1980s. 25% relied on a dedicated team. Use of both trading standards, TRADACOMS (100%) and EDIFACT (57%). Strong commitment to EDIFACT use. Trading confined to intra-industry trading. Indication of EDI use in international trade.

Significant drivers: Enhance cooperation with trading partners; improve ordering; increase accuracy of data and provide a better customer service.

Significant benefits: None.

Significant barriers: Trading partner not using EDI.

Significant difficulties: Introducing trading partners to EDI and cost justification.

Pharmaceuticals Characteristics: Slow to adopt EDI; driven by retail industry trading requirements. Industry assessing EDI potential by engaging manufacturing aspects. EDI applications confined to retail exchanging orders and invoices. Limited use of sending export returns to HM Customs and Excise, undertaking payments via BACS and receiving monthly sales returned and some transport messages.

CSF: EDI integration with internal business processes is necessary but not sufficient to maximize business benefit. Pursuit of maximum business benefit sought through integration of core business activities.

ANNEX II - THE ANA AND INS INTERVIEWS

The interviews with ANA aimed at investigating its role in developing the national EDI trading standards and community. In August, 1994, a series of four and three semi-structured interviews were held with ANA and INS senior management, respectively to investigate the nature of the relationship between ANA and INS and its impact on developing the national EDI community.

The interviews with ANA focused on identifying the factors critical to coordinating bodies success in developing the EDI community. The write-up was reviewed and approved by S. Cronbach, Head TRADACOMS Department, ANA. Results are discussed in Chapter 4.

A series of interviews were conducted in July – September 1994 with senior INS management including L. M. Tate and J. P. Thorpe, senior staff members across various functional departments: marketing: C. Billinge and J. Jenkins, sales: M. Millar, human resources: S. Richards, international sales: G. Turner and T. Myles, business and technical consultants: T. Burton, A. Sank, D. Laws, S. Roberts. The interviews focused on investigating the role played by VANS in developing the EDI community and identifying factors critical to success based on the INS-experience. A special series of interviews were organized with senior international sales to identify factors critical to successful EDI development in nascent countries. These interviews focused on investigating the market requirements typically leading to establishing a national EDI service provider; depicting a typical service provider profile; examining implementation requirements for launching a national EDI service; and identifying the critical success factors. Results are discussed in Chapter 4.

ANNEX III - THE CASE OF EGYPT

The study of Egypt was initiated in 1996. The interviews covered the following:

The study of the 1995 attempt to develop the national EDI industry, involved interviewing the Director of IDSC-Cabinet of Ministers, two senior committee members who were involved in the negotiations with extensive experience in IT application and extensive knowledge of the Egyptian industry requirements. From the vendor side, senior management, international sales director and manager.

To study of the potential role of the FEI involved interviewing the Director, the IT Director and the Vice President of the FEI. The VP was specifically asked to reflect on the electronic trading requirements of the manufacturing industries.

To study the prevailing status quo and identify EDI challenges and potential, information was sought from the E-Commerce Advisor to IDSC, Managing Director of a private sector firm in the provision of IT and E-commerce solutions, representative from the US Embassy involved in electronic trading initiatives with Egypt, and two senior management representing the manufacturing and distribution industries.

The CEA study was conducted over two years 1996-1998. It required lengthy interviews and spending long-spells of time with the technical committee. Interviewed officials included senior officials from the information department, CEA executive office, and senior management and senior consultant CEA - Efficiency Development Program. For confidentiality and results integrity, the write-up was validated and approved by the primary informant H. Zorkani, Advisor IDSC and Consultant CEA Efficiency Programme. The proposed solution was reviewed by an international expert, P. Kimberley, Principal, PKA – Australia, to compare its practicality in comparison to similar applications.

The case study methodology is introduced in Chapter 3. The case study results and analysis are examined in Chapter 5.