

**ROLE OF INFORMATION TECHNOLOGY IN LOGISTICS & SUPPLY
CHAIN MANAGEMENT:
“E-PROCUREMENT”**

**Dissertation submitted to College of Management & Economic Studies for the
partial fulfillment of the degree of**

MBA (LOGISTICS AND SUPPLY CHAIN MANAGEMENT)

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April 2014

CERTIFICATE

TO WHOMSOEVER IT MAY CONCERN

This is to certify that the dissertation report on “**Role of Information technology in logistics & Supply chain: E-procurement**” completed and submitted to University of Petroleum and Energy Studies, Dehradun by Meetika Vij in partial fulfillment of the provisions and requirements for the award of degree of MASTER OF BUSINESS ADMINISTRATION (LOGISTICS AND SUPPLY CHAIN MANAGEMENT), 2013-15 is a bonafide work carried by the scholar under my supervision and guidance.

To the best of my knowledge and belief the work has been based on investigation made, data collected and analyzed by the scholar, and this work has not been submitted anywhere else for any other university or institution for the award of any degree.

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Dated.....

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CHAPTER-1

1. INTRODUCTION

1.1 INTRODUCTION:

From the late 1990s a number of independent e-procurement mechanisms were launched which offered potential benefits such as increased order accuracy, transaction efficiency and greater integration between trading partners. At the outset of this program of research, e-procurement was therefore an emerging phenomenon with little academic research and presented an opportunity to investigate a largely unexplored area. Edmondson and McManus (2007) suggest that for nascent, as opposed to mature areas of research, where few formal constructs or measures exist, an exploratory, qualitative approach is required. This research followed such an approach through the use of case studies, involving observation, participation and interviews with key organizational actors. Each paper makes use of several cases in order to compare and contrast results from different organizations and to draw conclusions from multi-case analysis.

The published articles focus on the impact of core applications within e-procurement, including online reverse auctions, electronic marketplaces, online catalogue sites, and buying systems covering the 'requisition to pay' cycle. The findings from the papers address a number of core themes in purchasing management. In considering buyer-supplier relationships, it was observed that such dyads are driven by traditional buyer negotiation factors such as segmentation, power and price and that use of e-procurement applications tended to enforce such traditional behaviors. In relation to the potential for integration, the study found that integration between firms was barely affected, as the concept of integration was neither an objective nor a business case driver for e-procurement adoption. This situation reflects the finding that procurement managers pursue functional targets rather than supply chain-level objectives.

However, other significant effects from e-procurement adoption were noted such as the tendency by buyers to reduce supplier numbers and a move to re-engineer the procurement function in buying firms, through automating transactional processes.

The research finds that e-procurement does not have a deterministic impact on purchasing management, and that it acts as an enabler to more effective management of the function though the way its different mechanisms are deployed.

The exposition establishes that e-procurement is used in relation to supply conditions which are characterized by both 'markets' and 'hierarchies', but that it is the predefined purchasing strategy of the firm, rather than available technology solutions, which

determines when markets and hierarchies are used. Additionally, an original model is introduced, focusing on developing an e-procurement policy which can support strategic purchasing goals. This model extrapolates findings from stages in the research, and marries together elements from various papers and frameworks there in, to produce some guidelines for adoption of this technology.

1.2 BACKGROUND:

The function of the Purchasing department is to obtain, without favor or prejudice, the proper amount of the suitable product, at the best possible price, & to have it available when it is needed. Each order shall be placed on the basis of quality, safety, price, delivery, & with fast service being a factor. The Purchasing department will conduct all procurement transactions in accordance with & the rules & regulations of the company, & as approved by the company board of directors.

The impact of the internet on the business world has occurred with astonishing speed. In a handful of years the web has become a means of mass communication, a global sales channel, a platform for collaboration and a core feature of business strategy.

The 'virtual organization' which sheds assets and uses technology to bind together a dispersed network of suppliers, manufacturers and distributors has become a reality.

The beginning of this revolution in electronic commerce initially influenced person-to-person, or peer-to-peer communication. From the late 1990s onwards, the business community increasingly embraced the internet as a medium for trading, transacting and collaborating. The rapid, and often competing, developments in web applications and software presented opportunities in many areas of business practice in terms of advancements in efficiency, improving global customer reach, lowering operational costs and re-engineering business processes. Internet e-commerce has had an impact in many areas of organizational life, with the private and public sectors as well as government seeking greater efficiency through technology deployment.

Supply chain management (SCM) has been affected by this revolution through a number of initiatives. Within retailing, availability and exchange of electronic point-of-sale data has been used to improve demand profiling and product availability tagging and RFID technology have enabled firms to identify and track product movements and improve security (White *et al*, 2008). Similarly, enhanced information exchange allows firms to reduce inventory, through better planning and forecasting based on real time demand data (Lambert, 2004). These new technologies potentially enable information to be deployed as a more strategic asset, allowing firms to achieve more effective management of the increasingly global and complex supply chain of today.

Much of this new technology replaced earlier, less sophisticated systems such as electronic data interchange. EDI was based on the exchange of data through area networks, which

usually were established between communities within an industry, or sponsored by a manufacturer to enable communication exchange with its suppliers. The global and virtually cost-free nature of web communication made these networks redundant and led firms to explore wider opportunities for information exchange. Within supply chain management these opportunities are plentiful, as looking both upstream and down-stream, firms deploy information to improve management of the channels.

This exposition explores the interaction between industrial buyers and suppliers, through electronic procurement (e-procurement) mechanisms. Firms use suppliers and supplier networks as an alternative to ownership or vertical integration. Since the 1980s there has been a movement away from diversified and integrated industrial firms characterized by ownership, towards focus on core activities and the outsourcing of secondary activities.

1.2.1 METHODS FOR PURCHASING/PROCUREMENT:

Procurement methods are many. Most, with few exceptions, generally fall into the following types as defined in the UNCITRAL Model Law on Public Procurement.

- Open Tendering,
- Restricted Tendering,
- Request for Proposals,
- Request for Quotations, and
- Single-source Procurement.

Open tender:

A bidding process that is open to all qualified bidders and where the sealed bids are opened in public for scrutiny and are chosen on the basis of price and quality. Also called competitive tender or public tender. A bidding process that is open to all qualified bidders and where the sealed bids are opened in public for scrutiny and are chosen on the basis of price and quality. Also, called competitive tender or public tender.

Restricted tendering:

Invitation to bid (ITB) sent only to selected contractors, sellers, or vendors who have been pre-qualified through a screening process. Also, called restricted bidding.

Request for proposal:

It is a solicitation, often made through a bidding process, by an agency or company interested in procurement of a commodity, service or valuable asset, to potential suppliers to submit business **proposals**.

Request for Quotation:

It is a standard business process whose purpose is to invite suppliers into a bidding process to bid on specific products or services. It generally means the same thing as IFB. An **RFQ** typically involves more than the price per item.

Single source Procurement:

Choosing a specific company and bypassing the competition refers to single sourcing. Different suppliers and distributors typically produce and sell similar merchandise. This is advantageous to companies that purchase supplies because they can choose among various companies. However, after a thorough analysis of possible suppliers, company heads, managers or owners may choose to sign with a single company and pass up the opportunity to work with other suppliers. This decision could be based on price or the quality of products.

1.2.2 BIDS/ QUOTATION PROTESTS:

When bidders have any objections related to bids or quotation process, there are some procedures which are followed.

A. Objections to award recommendation.

Any bidder objecting purchasing department's recommendation for award must also protest to the department's action by formally notifying in written, the Executive director of Fiscal Services 5 days prior to award being made during the next scheduled board meeting.

1.2.3 VENDER SELECTION & REVIEW:

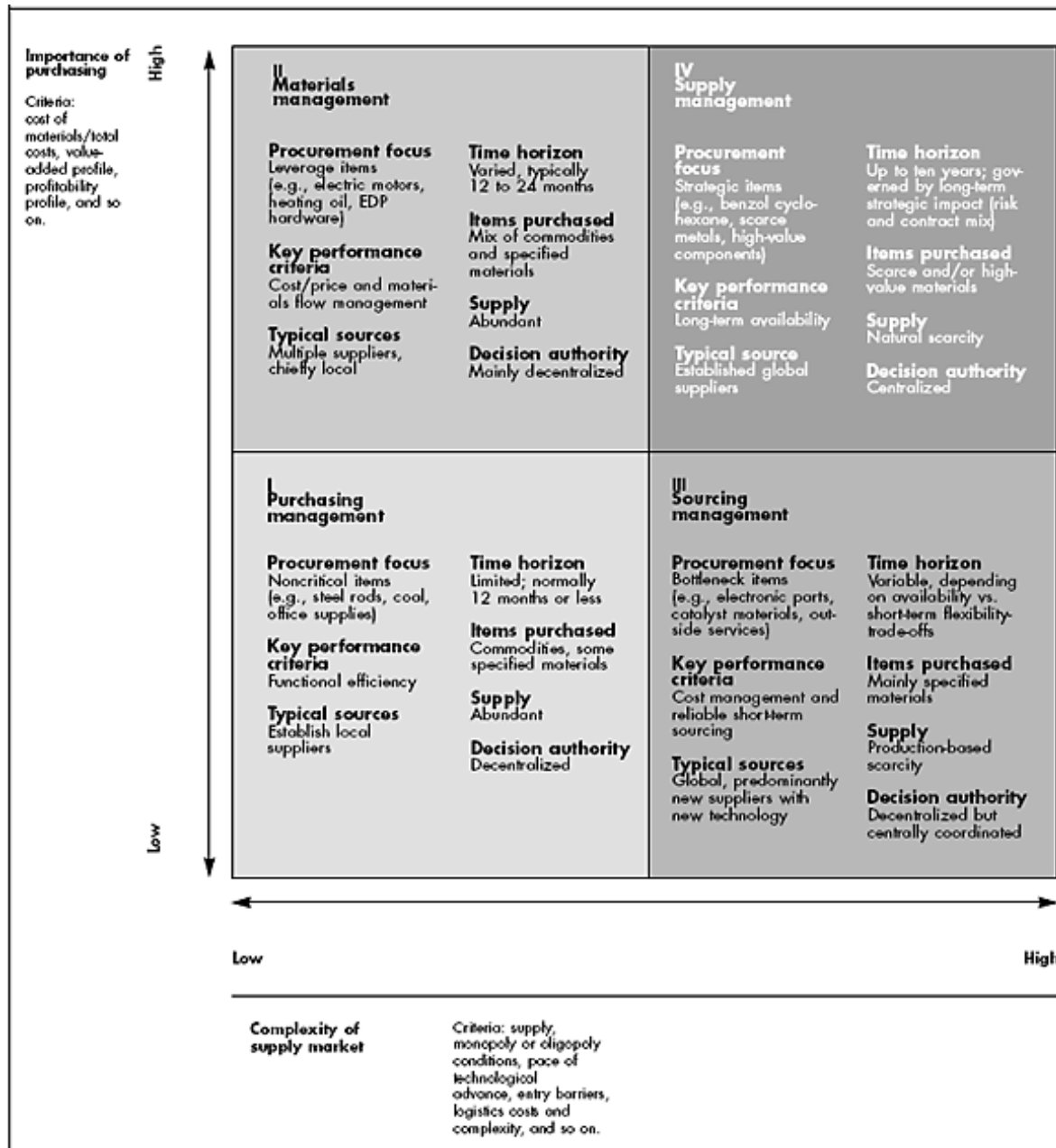
The vendor selection process has undergone significant changes during the past twenty years. These include increased quality guidelines, improved computer communications, and increased technical capabilities. In response to the increased interest in Just-In-Time (JIT) manufacturing strategies, and analysis of JIT's impact on vendor selection is also presented. Finally, conclusions and potential areas for future research are presented.

1.2.4 REQUISITION PROCEDURES:

The Purchase Requisition is used by a department to instruct the Purchasing Office to acquire needed goods and services. Correspondence to vendors affecting price or model changes or substitutions should be copied and sent to the accounts payable department. Forms of contractual agreement shall be as follows:

1. Standard Purchase Orders for Fixed amounts
2. Open Purchase Order
3. Blanket Purchase Order
4. Approved Emergency Requisitions

1.2.5 PURCHASING PORTFOLIO MATRIX:



*Figure: 1

Source- Peter Kraljic (1983)

This matrix was given by Peter Kraljic which shows the importance of purchasing with stages of its sophistication. It provides an insight about nature of items to be procured & selection criteria to be focused upon two variables “Importance of Purchasing” & “stages of purchasing sophistication”

1.3 PROBLEM STATEMENT

With the coming up of internet, the entire business scenario turned into E-business. Today, as we speak the use of technology is increasing to enhance the efficiency of supply chain as a whole. There are a number of e-business technologies available that address the need of e-procurement technologies that aims at improving & streamlining the procurement function. Hence, the question comes that what is exactly E-procurement? DE Lima exists in correctly defining the term. Usually the terms e-procurement & e-purchasing have been used synonymously in many jurisdictions in an attempt to prove their involvement in the e-commerce resolution (MacManus, 2002), the term purchasing has a narrower scope. Purchasing's operating objectives are basically to buy materials of the right quality, at right competitive price, in right quantities, at right time & from reliable sources. It is commonly understood as a process from origination to fulfillment of needs (Baily, 1987). The 'central purchasing' in government & service industries, 'material management' in manufacturing industries & 'international buying offices' of multinational corporations have thus emerged as organizational solution for the required trade off analyses. This purchasing has become vast in terms of volume & concentration of business. Hence, the purchasing/procurement department needs to be strongly coordinated with production, sales, finance & engineering as well. So, the decision is to be taken that what is to be purchased, in what quantity, at what time, or whether it is to be made in plant or purchased outside if it is not feasible to procure efficiently since, effective inventory control location of proper sources & negotiations with them regarding price & delivery.

Thus, e-procurement provides the use of internet-based information which is integrated & also communication technologies (ICT's) to carry out all stages of procurement process, which includes searching, sourcing, negotiation, ordering, receipt, & post-purchase services & reviews.

E-procurement can be viewed more broadly as an end to end solution that integrates & streamlines many procurement processes throughout the organizations, but there are various forms of e-procurement that concentrate on one or many stages of the procurement process such as e-Tendering, e-Marketplace, e-Auction/Reverse auction, & e-Catalogue/Purchasing etc.

However, from the past 2 decade e-procurement systems have attracted a fair share of attention. It has emerged as a collaborative tool. Internet has acted as a collaborative tool between purchasing organizations & their suppliers. For ex- Electronic Data Interchange has been providing automated purchasing transactions between buyers & their suppliers since it was launched in 1960s. ERP (Enterprise Resource Planning followed in the 1970's

& then came the commercial use of the Internet in 1980s. It was only in 1990s that the world-wide-web the multimedia capability of the internet became widely enabled & provided the essential resource for the automation of procurement (OGC, 2002).

There are advantages of e-procurement systems include:

1. Better coordination with suppliers
2. A higher flexibility
3. Lower costs
4. Quicker transaction time
5. Better supplier integration

(Source: Essig & Arnold, 2001; Pressuti, 2003).

There are many benefits to e-procurement system, but implementing & integrating it with several levels of functionality is a difficult task. These systems are large scale system that can involve business within the firm & numerous trading partners across the supply chain, which makes the integration process complex. Moreover these systems require a huge amount of investment in terms of acquisition, implementation, training, integration & maintenance, which place tremendous pressure on company's resources. Therefore, many firms often acquire & install in several steps.

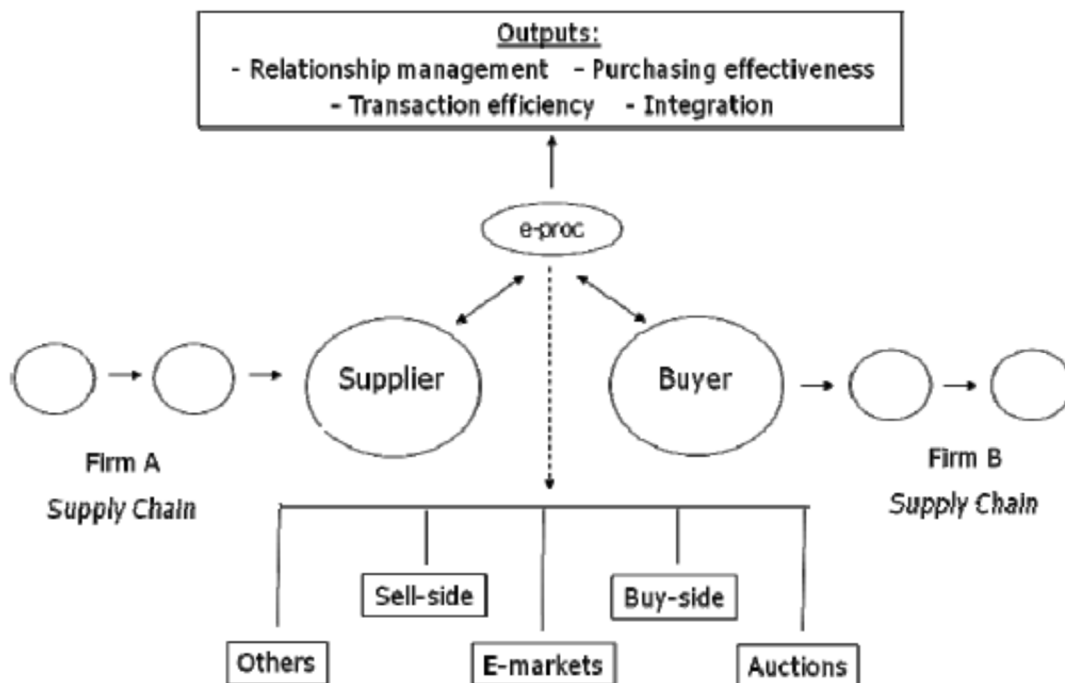


Figure 2: Conceptual framework for the research

1.4 PURPOSE OF THE STUDY

It is to identify CSFs (Critical Success Factors) that help in the successful implementation of e-procurement in Indian firms through case methods.

1.5 RESEARCH OBJECTIVES

1. To identify most important CSFs in Indian firms.
2. To identify & examine the extent CSFs behind successful implementation of e-procurement in the Indian firms.

CHAPTER-2 LITERATURE REVIEW

2.1 INTRODUCTION

PUBLICATION	ABSTRACT	INFERENCE
<p>1. Smart, A. & Harrison, A. (2002), Reverse Auctions As A Support Mechanism In Flexible Supply Chains, <i>International Journal of Logistics: Research & Applications</i>, Vol. 5, No. 3, pp. 275-284</p>	<p><i>The Internet offers buyers a number of solutions for automating purchasing activity through e-procurement mechanisms. Some of these solutions have yet to prove their worth, requiring long lead times to implement and achieve payback benefits. Online reverse auctions are a tool which can be rapidly adopted and which are producing price reductions for direct and indirect purchases. They also offer process benefits to participating buyers and suppliers.</i></p> <p><i>As supply chains learn to become more flexible and responsive in the face of shorter product life cycles and faster-changing markets, auctions offer a viable mechanism for situations where there are many suppliers and product complexity is low. They also offer an early payback for electronic marketplaces and exchanges.</i></p>	<ol style="list-style-type: none"> 1. Identified position of reverse auctions in relation to 2. other e-procurement mechanisms 3. Established impact on price and partnerships of reverse auctions 4. Proposed auctions as part of an overall relationship strategy 5. Developed segmentation model of how and where auctions can fit within a segmented E-procurement approach 6. Auctions shown to support an agile supply chain strategy
<p>2. Smart, A. & Harrison, A. (2003), Online Reverse Auctions and their Role in Buyer-Supplier Relationships, <i>European Journal of Purchasing & Supply Management</i>, Vol. 9, pp. 257-268</p>	<p><i>Despite the move in recent years towards supplier partnerships, buying firms need at times to make use of competitive procurement strategies for certain purchases. This study examines the impact of reverse auctions on buyer-supplier relationships through six case studies, analyzing primarily the supplier perspective through participant interviews. The authors identify that there are potential benefits for both parties in a reverse auction, which can</i></p>	<ol style="list-style-type: none"> 1. Illustrated conditions for success in industrial reverse auctions 2. Empirical evidence of time compression through the online bidding process 3. Introduced extended list of benefits and disadvantages of reverse auctions

	<p><i>offer tendering and transactional cost advantages. For buyers, it offers a competitive procurement process. The effect on relationships will depend on the extent to which buyers employ the auction as a price weapon, or whether it is used primarily as a process improvement tool.</i></p>	<ol style="list-style-type: none"> 4. Provided evidence of role of auctions in providing price transparency and exposing market price levels 5. Evidence of impact of auctions on buyer-supplier relationship 6. Model of how some categories will move away from partnership approach to more arms-length negotiations with suppliers
<p>3. Smart, A. (2005), Exploring supply chain opportunities in the UK utilities sector and the supporting role of e-Marketplaces, <i>Supply Chain Management: An International Journal</i>, Vol. 10, No. 4, pp. 264-271</p>	<p><i>Purpose – Since the privatization of UK utilities, few studies have examined supply chain management (SCM) in the sector. This paper aims to investigate the state of development of the SCM concept and the role of the emerging internet-based electronic market places in supporting this.</i></p> <p><i>Design/methodology/approach – Using a case study method, interviews were conducted with managers in seven UK electricity & water utilities. Areas explored are the firms’ supply chain priorities, how e-Marketplaces can support their supply chain goals and the barriers to adoption of e-Business solutions.</i></p> <p><i>Findings – The research reveals a strong orientation in both the electricity and water industry firms towards controlling cost inputs. Consequently, their focus is on managing procurement as the primary supply chain activity. The key barriers to e-Business adoption identified are the problem of providing genuine benefits to suppliers, and the technical difficulties of marketplace implementation. Research limitations/implications – This is an</i></p>	<ol style="list-style-type: none"> 1. Explored limitations of the e-marketplace model Demonstrated that industry/market maturity has significant impact on feasibility of e-marketplaces as providers of SCM functionality 2. Provided list of factors which inhibit e-business adoption 3. Explored buyer requirements of e-procurement systems 4. Showed that e-procurement mechanisms can operate as stand-alone entities and are not dependent on wider supply chain integration

	<p><i>exploratory study of the domain and further work in this area needs to focus on how utilities will develop their supply chain competences and how e-Business solutions can support them.</i></p> <p><i>Originality/value – The research concludes that operators of electronic marketplaces have not yet delivered a convincing case for wider participation in management of the supply chain online. A stronger SCM orientation will need to emerge in utility firms before that can occur.</i></p>	
<p>4. Smart, A. (2008), e-Business & supply chain integration, <i>Journal of Enterprise Information Management</i>, Vol. 21, No. 3, pp. 227-246</p>	<p><i>Purpose – The purpose of this study is to examine how four large organizations have approached the implementation of new e-Business mechanisms: namely online order processing, e-Procurement, reverse auctions, and a private exchange. The objectives are to establish whether supply chain integration is an identified goal for the firms involved and to evaluate the extent of integration achieved through these projects.</i></p> <p><i>Design/methodology/approach – A case study approach is used, with four separate cases being examined, leading to cross-case analysis and conclusions. The primary form of data collection was interviews with managers participating in the implementations. In order to measure the degree of supply chain integration pertaining in the examples, two frameworks from the literature are used.</i></p> <p><i>Findings – In three of the cases it is established that there is very little, or nil integration at supply chain level and only in one case is there evidence of a supply chain perspective contributing to the project. Three of the firms did not consider the supply chain implications of implementing their e-Business applications.</i></p>	<ul style="list-style-type: none"> • Demonstrated how different e-procurement mechanisms are adopted according to buyer or supplier drivers. • Provided evidence that the case for e-procurement is based on internal factors only Illustrated where benefits accrue in e-procurement Implementations. • An orchestrating firm is required in order to structure e-commerce adoption across the supply chain of multiple firms. • Automation of process, not inter-firm integration, is the objective of e-procurement projects.

	<p><i>Research limitations/implications – The article builds on previous studies and illustrates the problems of achieving integration in the supply chain. Further research is needed to establish common attributes relating to supply chain integration.</i></p> <p><i>Practical implications – Three of the projects examined here were based predominantly on a business case for the implementing firm only. Firms need to be aware that IT projects by their trading partners may have supply chain cost implications for their own business.</i></p> <p><i>Originality/value – Whilst much of the literature propounds the need for integration, leading to extension of the supply chain concept, firms are pursuing IT implementations which are premised solely on internal benefits. The research illustrates that, if the new e-Business mechanisms are to support wider supply chain goals, then the focal firms involved must take a more holistic view of how and why such solutions are implemented.</i></p>	
<p>5. Smart, A. (2010a), Exploring the business case for eprocurement, <i>International Journal of Physical Distribution and Logistics Management</i>, Vol. 40, No. 3, pp.181-201</p>	<p><i>Purpose – Although e-procurement has been adopted in many industries, the business case for this technology has only partially been explored in the literature. This article investigates, through a case study approach, how a business case for e-procurement adoption was developed in three implementations.</i></p> <p><i>Design/Methodology/Approach – The paper employs a case study method and examines three industrial firms through in-depth interviews with managers involved in the projects. The cases are presented and explored individually, followed by identification of relevant drivers and problem factors.</i></p> <p><i>Findings – The research identifies eighteen drivers which can form the</i></p>	<ol style="list-style-type: none"> 1. Typology of different e-procurement mechanisms 2. Detailed case histories on how these mechanisms used in three case firms 3. Table of drivers of the business case for e-procurement in buying firms 4. Documented militating factors in e-procurement project success 5. Hierarchical model of business case for

	<p><i>basis of a business case for e-procurement. A further 17 problem factors are presented, which have the potential to militate the original case. It is apparent that the firms involved only developed a limited case for adoption and that there is a significant element of faith that the eventual results will justify the investment.</i></p> <p><i>Practical implications – A framework of the business drivers for e-procurement is introduced, in the form of a hierarchy. This framework can assist managers to classify relevant issues in assessing and developing the case for e-procurement adoption.</i></p> <p><i>Originality/value of paper – Whilst the literature offers theoretical benefits for e-procurement, the paper provides managers and a researcher with empirical evidence of the drivers for this technology and of the problems encountered in implementation, and establishes a basis for further research in the domain.</i></p>	<p>e-procurement</p> <p>6. Definition of five Criteria categories, for consideration in e-procurement project evaluation.</p>
<p>6. Smart, A. (2010b), E-procurement and its impact on supply management - evidence from industrial case studies, <i>International Journal of Logistics: Research & Applications</i>, Vol. 13, No. 6, pp. 1-18.</p>	<p><i>Many buying firms have adopted e-procurement systems, yet the impact of these applications is still being assessed by both academics and practitioners alike. This article examines the use of E-procurement within four multinational firms, to establish the impact of these mechanisms on their approach to the supply market, using thematic parameters derived from the literature. The results indicate that the firms established a clear supply market strategy based on a segmentation model: e-procurement tools were used as tactical means to implement and extend that strategy towards the supply base. In addition, it was observed that tactics within defined segments are developing, as buying firms use e-</i></p>	<p>1. Analysis of the role of e-procurement in 4 firms, in relation to supply market strategy.</p> <p>2. Identified e-procurement as a tactical tool to support strategic purchasing decisions.</p> <p>3. Relationship model indicating interdependence between three key variables in the e-procurement decision.</p> <p>4. Defined the impact</p>

	<p><i>procurement tools both to reduce supplier numbers and to leverage their volumes in price-competitive markets. Some propositions are offered on the key themes, summarizing the findings in the paper and providing further indications for research.</i></p>	<p>of e-procurement on purchasing roles and productivity.</p> <p>5. Theoretical propositions in relation to seven key themes in the buyer-supplier interface.</p>
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2.2 E-procurement themes

A number of articles addressing e-procurement in a broad sense have appeared since 1999, which have moved forward the subject and identified areas for research.

The core literature themes on e-procurement technologies have been:

- Adoption (Batenburg, 2007; Gunesekeran and Ngai, 2008; Pearcy & Guinipero, 2008);
- Success factors (Puschmann & Alt, 2005; Angeles & Nath, 2007; Smeltzer & Carter, 2001)

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- Implementation (Shakir *et al*, 2007; Croom & Brandon-Jones, 2007);
- Barriers (Angeles & Nath, 2007; Hawking *et al*, 2004; Tanner *et al*, 2008);
- Supplier issues (Deeter-Schmelz *et al*, 2001; Davila *et al*, 2003);
- Integration (Shakir *et al*, 2007; Angeles & Nath, 2007).

The potential benefits of e-procurement have been well documented, covering issues such as process improvement, price reduction, shorter purchasing cycles and compliance to contract (Tatsis *et al*, 2006; Ash and Burn, 2003; Lancioni *et al*, 2003, Presutti, 2003). Whilst this literature continues to develop, most of the evidence comes from conceptual papers or from surveys, with little qualitative or case evidence being put forward.

A weakness of many of these articles is that they consider a range of mechanisms under the e-procurement heading, without dealing necessarily with the role and impact of those individual applications. Frequently, e-procurement is treated as a generic subject and as shown in section 2.4 above this has led to some weak or confusing definitions of the technology. In the contributing papers and in this exposition itself, it is shown that these mechanisms do indeed impact on the organization in different ways. In particular, reverse auctions and e-marketplaces have defined streams of research and these are discussed in more detail in subsequent sections of this chapter.

In consideration of the factors which influence buyer-supplier interaction, paper 6 provided a detailed review of relevant literature and identified seven core buyer-supplier themes. These are: Communication; Integration; Compliance; Price; Supplier numbers; Supplier resistance; Relationships (Smart, 2010b). For a detailed discussion of these themes, the reader is referred to paper 6, pages 424-428. These themes are examined further where the findings and conclusions from the research are evaluated under thematic headings.

CHAPTER-3

RESEARCH METHODOLOGY

3.1 Framework for research

The research reported here evolved over time and was based on a number of separate or discrete projects, within the overall theme of e-procurement. Methods used in the initial enquiry were developed or expanded upon in subsequent field research, as discoveries led to further ideas and possible research questions. The Framework in Figure 2 below illustrates the approach taken and is based on a model from Edmondson and Mcmanus (2007), who suggest that field research is an iterative and cyclical process, where the subject is constantly re-visited.

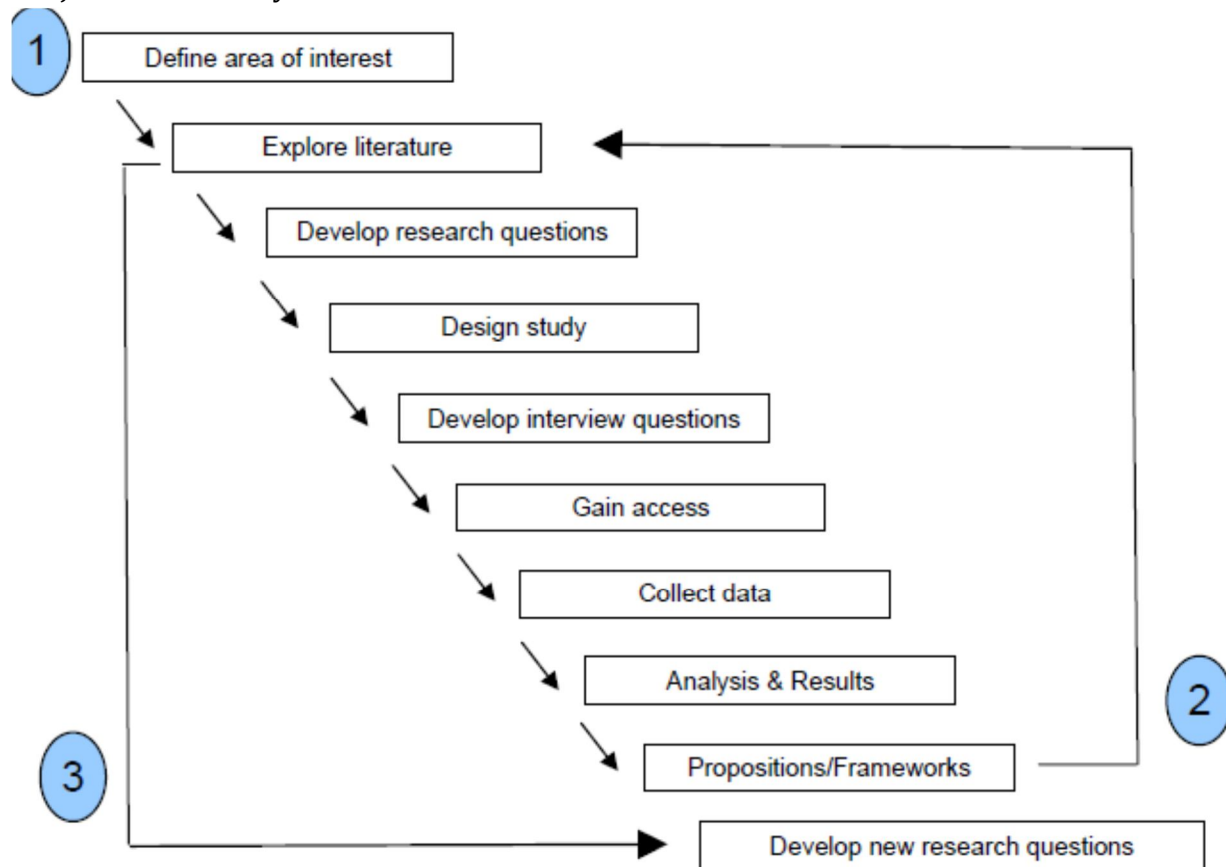


Figure3- Framework for case study research (adapted from Edmondson & McManus, 2007)

3.2 Methods used in each article

Papers 1 & 2 – online reverse auctions Smart, A. & Harrison, A. (2002). Reverse Auctions As A Support Mechanism In Flexible Supply Chains. *International Journal of Logistics: Research & Applications*,

Vol. 5, No. 3, pp. 275-284 Smart, A. & Harrison, A. (2003). Online Reverse Auctions and their Role in Buyer-Supplier Relationships. *European Journal of Purchasing & Supply Management*, Vol. 9, pp. 257-268

As shown in chapter three, the literature on Online Reverse Auctions (ORA) was very sparse at the time the research set out in papers 1 and 2 was conducted. The literature on buyer-supplier relationships provided a context for this study, as one of the concerns expressed at this early stage in their development was the impact of ORAs on relationships between buyers and their suppliers. Hence research questions were created which considered elements of this relationship that could be influenced by ORA deployment.

This study was conducted early in the implementation of reverse auctions and the events used as the basis for analysis in these two papers were amongst some of the first ever held in the UK. Access was obtained through a consultancy which was setting up reverse auctions for some of its clients and which was interested in academic research to extend its own findings. The method used was a mix of participant observation, and interviews undertaken before and after events took place. Six discrete events were selected as units of analysis; these were auctions scheduled for specific times on behalf of buying firms, with a varying number of participating suppliers. Participation involved observing the auctions in real time from the moment the events were opened for bids from suppliers, collecting data during the events until the close of the auction. This participation allowed the presentation of data such as Table 2 in Paper 2, showing the bidding history in one of the events.

This evidence was important as no empirical examples of bidding history within industrial auctions had been published at this time. The second element of the research approach involved interviews with the buying firms placing the contracts, and with supplier firms who participated as bidders. For the interview process, pilots were conducted with both buyer and supplier representatives and once the validity of responses had been confirmed, the question set was used for the remainder of the interviews.

All the buying firms were interviewed: this was usually the procurement manager responsible for the category being auctioned. Information from these interviews was used to provide context and detail for the cases which were summarized in the second paper. Similarly, these interviews provided important data such as the savings in cost achieved by buyers against the historic price of the contract (as shown in Figure 7 in Paper 2).

Twenty two suppliers were interviewed before the events took place and then once again, after the events. This allowed a measure of their expectations before the event and any change in their opinion, once the event had taken place. The supplier responses were analyzed using response counting and tabulation techniques and presented in bar charts.

For example, responses were placed in categories to assist the presentation of the response statistics. The range of themes discussed in interviews allowed for the results to be distributed over two separate articles, each addressing different research questions, but within the overall theme of buyer-supplier relationships.

Paper 3 – electronic marketplace in the Utility industry

Smart, A. (2005). Exploring supply chain opportunities in the UK utilities sector and the supporting role of e-Marketplaces. *Supply Chain Management: An International Journal*, Vol. 10, No. 4, pp. 264-271

This article represents a discrete piece of research which was undertaken with the support of a procurement agency which specializes in public sector industries. The project sponsor had set up an e-marketplace specifically for the public sector and the users were primarily utility and energy firms in the UK. The main purpose of the marketplace, as a neutral third party, was to provide a transactional platform through which buyers could undertake purchases with suppliers. The aim of the research was to establish if the public sector users were ready to move beyond the e-procurement functionality of the marketplace towards managing more supply chain activities online.

Initially, participant observation and interviews were conducted with the e-marketplace operator to establish context for the subsequent interviews with users. A number of typical users were identified based on their purchasing transaction volume through the e-marketplace. The users in this case were the Utility firms acting as buyers through the web site. A literature review on e-marketplaces was conducted along with research into the functionality of other e-marketplace operators in other industries, who were purporting to develop 'supply chain' functionality. This produced a short list of nine service factors which could be measured as potential additional functions for the Utility marketplace. In-depth interviews were conducted with managers in seven UK water and electricity companies, with the subjects discussed being designed to support the three research questions articulated for this study. To measure the responses to the nine marketplace services, a 5 point Likert scale was used. These outputs, and other responses from within the interview process, led to the formulation of a set of barriers to adoption and implementation of further e-business initiatives, as shown in Table 2 in the article, and establishing the proposition that e-procurement is the principal component of e-marketplace functionality, with little opportunity for expanding into other supply chain activities.

Paper 4 – integration through e-procurement and e-business mechanisms

Smart, A. (2008). e-Business & supply chain integration. *Journal of Enterprise Information Management*, Vol. 21, No. 3, pp. 227-246

In this article the focus of research is on whether the uses of mechanisms such as e-procurement lead to supply chain integration. There is a body of literature propounding

the benefits of integration between firms in the supply chain. The emerging literature on IT use in supply chain management supports this view and in broad terms, proposes information technology as a means to advance such supplychain integration. This research arose from exploratory discussions with two firms who were using e-procurement and where the initial evidence suggested that there was in fact little integration taking place. The units of analysis here were the four different mechanisms as shown in Table 1 of the paper – sales order processing (or sell-side e-procurement); buy-side e-procurement; reverse auction; private exchange (The Cisco ‘ecosystem’).

The method used here was twofold. Firstly, interviews were conducted with three managers from within each firm (twelve in total), covering the range of questions shown on page 231 of the paper. Results were extrapolated and case examples were presented, summarizing the findings in relation to each unit of analysis.

Subsequently, a measure was made of the extent of integration being achieved in each of the four cases. To establish common standards for comparison, two frameworks from the literature were used. These were taken from widely-cited articles by Frohlich & Westbrook (2001), and Bagchi & Skjoett-Larsen (see pages 233-234 in paper4 for illustrations of the two frameworks). Application of these frameworks led to the conclusion that only one of the mechanisms in use involved any real element of supply chain integration and that additionally, in the three e-procurement implementations, integration was never an identified driver or target within the project specification.

Paper 5 – e-procurement and defining the business case

Smart, A. (2010a). Exploring the business case for e-procurement. *International Journal of Physical Distribution and Logistics Management*, Vol. 40, No. 3, pp.181-201

The idea for this research emerged from the work completed in article 4 and became a logical extension of that investigation. The issue of the business case had emerged as an important theme in the analysis of several e-procurement implementations.

However a review of the literature revealed that it had only partially been addressed in the academic literature and the evidence was at best, fragmented. The review also revealed that there was virtually no grounded evidence of the origins of the business case for e-procurement and that theoretical propositions had largely been cited from one paper to the next without verification. Therefore this research was designed to address a specific gap in the literature.

Three firms were selected through contact made in previous stages of the PhD research. In one case I was able to return to a firm I had examined in one of the previous papers. The firms were chosen as they offered similar units for analysis – the e-procurement projects were at similar levels of advancement i.e. between 2 and 3 years, they were all large multinationals and had deployed similar technologies.

The research was informed by a similar project undertaken by Tatsis *et al* (2006) in the Greek food industry, although their article focused mainly on e-procurement adoption barriers. The interview question set was formulated after examples from Tatsis *et al* (2006) and other recent articles (Angeles & Nath, 2007; Puschmann & Alt, 2005). typically three to four interviewees were identified in each buying firm. After coding of the interview transcripts, the cases were presented sequentially, followed by synthesis, to address the specific research questions. Two sets of variables were identified from this process: 1) 18 drivers which form a business case for e-procurement; 2) 17 problem factors which militate the case. The 18 drivers were then categorized into five Criteria, with input from the respondents. Finally, a theoretical model is introduced, in the form of a hierarchy, as a means of structuring the process of developing a business case for e-procurement. The hierarchy is based on an example from the literature, developed originally by Min (1994).

Paper 6 – e-procurement and supply management

Smart, A. (2010b). E-procurement and its impact on supply management – evidence from industrial case studies, accepted by *International Journal of Logistics: Research & Applications*, Vol. 13, No. 10, (CJOL 486760 – for publication December 2010).

This article is based on four case studies of e-procurement implementation. Three of the case firms were used in paper 5 and a further firm was added, where the business met the criteria for the research. Here, the focus is on the relationship between e-procurement use and supply strategy. A detailed review of the literature identified seven key themes in relation to supply and supplier management. These are not the only themes examined in the e-procurement literature but they specifically relate to the buyer-supplier interaction, as opposed to other factors such as IT type, firm size, rates of adoption etc, and which have largely been analyzed within survey instruments.

The approach used was in-depth interviews, where the identified literature themes formed part of the question set. Several respondents were interviewed in each firm to ensure the issues were explored in full. After summarizing the case findings, the research question are addressed individually. The findings here came from detailed coding and content analysis of the interviews and led to two separate outputs. The first output consists of a model showing the inter-dependent relationship operating between three variables – compliance, price and supplier numbers (Figure 1 in the paper). The second output is a set of theoretical propositions derived inductively from the cases, which relate to the seven core themes identified from the literature. These are described in table 5 of paper 6 and extend hypotheses from the literature, forming the basis for additional research in the field.

In summary, this section demonstrates a progress in both research design and process of data collection and evaluation. Edmondson & MacManus (2007: 1174) have stated “once data are collected, an effective researcher employs analytic 39 techniques that match the nature and amount of data. The process of writing up the results of the analyses may trigger additional questions for the researcher, or suggest investigating alternative explanations during data analysis”. This statement summarizes much of my personal experience as a researcher. The original investigation into auctions was triggered by a research opportunity; however the subsequent projects largely grew from ideas which crystallized during the writing up process for each paper. Similarly as the emergent literature on e-procurement developed alongside my own studies, clear gaps and interesting research questions ensued. Even after ten years of research into e-procurement there are significant knowledge gaps within the domain, and the case approach will continue to offer opportunities for exploratory research design.

CHAPTER-4

FINDINGS

The structure is to present the results, frameworks and contributions from the research, using a thematic approach, allowing for synthesis of concepts and findings across the different research projects and which consequently references one or more of the papers included in this exposition.

4.1 BUYER- SUPPLIER RELATIONSHIP BUILDING

The buyer-supplier relationship as a key component of purchasing management and a number of separate but related themes.

Looking first at online reverse auctions, as discussed in papers 1 and 2, the ORA is designed to replace the traditional quotation process in which suppliers respond to an invitation to tender and submit bids by mail, fax or email. Those tender responses must then be compared and evaluated, which can be a lengthy and inefficient activity, often taking weeks. Hence there is a potential process benefit in using ORAs, which can lead to time compression of this tendering procedure for both buyer and supplier.

The initial contribution of this research was in providing the first documented evidence in an academic study of the conduct of reverse auctions and demonstrating this time compression in practice. Table 2 in paper 2 illustrates the bidding history, bid by bid, in one of the six auctions examined. This demonstrated the dynamic nature of these events, with 34 individual bids being placed in a period of 48 minutes. This swift and effective bidding process replaces a traditional set of individual supplier quotations or tender responses. Observation of the tender process during the data collection phase also revealed that the this process could be compressed by using online or electronic documentation (this data was not presented in the actual published articles). Consequently the paper confirmed propositions on reverse auctions by Emiliani (2000) and Jap (2002) concerning potential process improvement, versus traditional, paper-based approaches.

The research conducted for paper 3 addressed process aspects of electronic marketplaces. The firms experimenting with buy-side e-procurement via the utility industry e-marketplace were experiencing problems with the transactional reliability of the system in use. It was apparent that the e-marketplace, through using sophisticated technology which was still at a developmental stage, was not delivering the robust solution the users had envisaged. This situation led to the conservative approach most of the utility firms had taken towards extending use of the e-marketplace into managing other supply chain functions. Here, process efficiency was not being guaranteed and it became a pre-requisite

for this challenge to be solved before further more complex solutions would be accepted. It is evident that applications failing to deliver the expected process functionality can be a barrier to adoption of this technology.

Through examination of cases in auctions, buy and sell-side technology usage, and a private e-marketplace, paper 4 considered the process issue in four focal firms. The auction example demonstrated some process benefits, although in this case the firm was more concerned with price reduction. In both the sell-side and buy-side exS, the focal firm (implementing the e-procurement application) effectively gained all the process benefits, as there was little evidence of integration of process with those firms' trading partners. Indeed, it was shown that sell and buy-side applications are posited only on benefits for the focal firm implementing the technology. In such cases, the process improvement comes through integrating *internally* the order to payment cycle.

The Cisco ecosystem example however revealed that wider levels of process improvement, perhaps even optimization, are possible where the benefits of an ecommerce system are distributed amongst the participants. In this instance, suppliers and customers benefit in a number of ways, through information-sharing in real time.

The Cisco case stands as a contradiction to the e-marketplace discussed in paper 3, where the lack of adequate functionality and conservatism of the users blocked supply chain integration. Supply chain, as opposed to local, process improvement is directly related to the degree of integration of processes achieved by trading partners using these technologies.

Paper 5 took a broader overview of process, examining the implementation of e-procurement mechanisms by three case study buying firms. The findings in that study relate primarily to the introduction of buy-side/RTP systems, and again identified process benefits for buyers. In addition, significant problem factors were highlighted which militated the original case for deploying e-procurement. Included in the list of 17 factors are several which is process related (see Table 6 below).

Firstly, poor legacy systems and data can inhibit a successful transfer to the new process. Second, user adoption may be undermined by poor training or weak change/project management. The roles and tasks undertaken by procurement personnel will adapt and these need to be clearly defined to enable transfer to the new procedures of e-procurement. The paper moreover identified process as one of the five key criteria in developing a business case for e-procurement. In particular, the participating firms cited standardization and visibility as key drivers in their e-procurement projects. This was due to an absence of these factors in their existing purchasing operations. The paper demonstrated that e-procurement implementations need to focus on process improvement as a means to provide consistency and standardization across the business, particularly in large, widely-dispersed organizations.

It was concluded that within all the e-procurement options, there are potential process benefits, however these benefits are not guaranteed and are themselves contingent on contextual factors. Factors such as effectiveness of implementation, state of legacy systems, levels of integration achievable, functionality of software will determine the feasible level of process improvement. However, process improvement is a key driver for e-procurement adoption as it can benefit both parties in the relationship and should be situated in a fully developed business case.

4.2 IMPACT ON PRICE

The impact of e-procurement applications on price and price-related factors was initially explored in papers 1 and 2, in relation to ORAs. The study explored the issue of price within auction events through observation and interviews with participants.

An interesting early finding was that both buyers and suppliers were still exploring the price impact of this mechanism. For suppliers, the interview response counting showed that the majority (two thirds of respondents) prepared in a systematic way and participated in the events using a consistent, structured approach. These same suppliers were also shown to be the most likely to succeed in gaining business in the events through competitive pricing. The research demonstrated that ORAs require the same preparation as traditional tenders and that supplier who understand their cost structure and fix in advance lower limits for their pricing will be successful. There was no evidence of the 'gambling' concept suggested by some authors, who see

ORAs as a mechanism which encourages suppliers on a dangerous path of buying business at unaffordable prices (Emiliani, 2004)

Moreover, from paper 2 shows that supplier does not necessarily have to bid their lowest price in an auction, in order to be the winner (lowest price bidder); they only have to bid the lowest price that wins the event. One supplier revealed in interview that he had not quoted the lowest price he could offer as he was not required to - he had already won the bid with a higher price. This illustrates that whilst auctions may provide price transparency, they do not provide any guarantee of price reductions. (This particular research finding demonstrates the advantage of impartial, academic investigations, as the interviewee did not disclose this information either to the buyer in this event, nor the organizer of the auction i.e. the sponsoring consultancy firm).

Other case examples examined in this study revealed that there were numerous influences which decided the price outcome of the events. In case 1, the contract had been with the same supplier for ten years, operating on a rolling contract, with no recent testing of market price. In case 2, there was little competition in the supply market and the suppliers effectively ignored the ORA as a competitive event and bid their usual prices. In case 3, extra dynamics were introduced such as new market sources, joint bidding by buyers, and multiple, combined contracts. Hence the research made a further important contribution through identifying that reverse auction price outcomes are influenced by many factors such as: number of supplier participants, previous contract price levels, supply and demand fluctuation, new market entrants, contract history. These factors, both internal and external, play a role in determining the ORA outcome.

This result is important because Emiliani (2004, 2005) in particular has attempted to prove that reverse auctions are always detrimental and do not produce acceptable outcomes for suppliers, even for those that have won the events. However paper 2 showed that suppliers

are responsible for the outcome of ORAs through the level of professional preparation they undertake and by establishing a bottom line price for the contract being offered. Similarly, Emiliani (2004, 2005) has suggested that auctions can have detrimental outcomes for buyers and suppliers through unsustainable pricing and its resultant impact on quality and business continuity. In truth, bad practices can operate both within and outside of auctions and the fact that they exist in auctions does not make the mechanism intrinsically detrimental.

Consequently, the study was able to assert that it is not the ORA mechanism itself which determines results, but *how it is used*, supported by the market factors which pertain in each auction. In effect, each ORA is a discrete event with its own prevailing conditions, where the mix of factors will provide a context for the eventual outcome.

Buyers and suppliers are both responsible for conducting the auction under appropriate conditions, just as in any other contractual interaction.

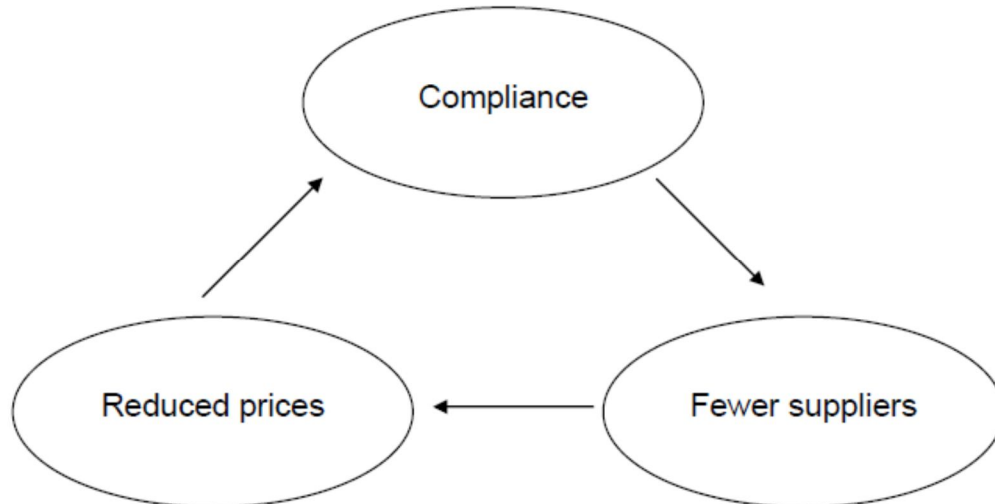


Figure 4: Virtuous circle between Compliance, Price and Supplier numbers in e-procurement (Smart, 2010b)

The impact on price within e-procurement implementations in a more general sense was considered in paper 6. Price was identified as one of seven key issues in the article's literature review and was one of the central items discussed with the case firms during this investigation. The research identified a significant relationship between price, compliance and number of suppliers used by buying firms.

Compliance refers to the ability of the buyer to ensure that employees adhere to company guidelines and use the preferred suppliers for specific categories of purchase. The finding was that where firms achieve compliance, this will lead to the use of preferred, namely

fewer, supplier firms, which in turn leads to reduced prices through leverage with those suppliers. This structure was expressed in a relationship model as shown in Figure 4. Further to this finding, some propositions were made in relation to these 3 correlated factors, as shown in paper 6 (Smart, 2010b). The core observation here is that spend leverage can be gained through following the above model; when adopting RTP applications, firms can effectively only reduce supplier prices where they reduce the number of suppliers and drive internal compliance. At the same time, the study demonstrated that reverse auctions are used by buyers as the principal mechanism for driving down supplier prices. In the ORA model, it is a combination of price transparency created by auctions, matched with external factors such as market competition and adequate supply sources, which produce appropriate conditions for price leverage. This finding suggests that ORAs do have a specific role within segments of the overall supply for the firm. This was illustrated through the formulation of a segmentation matrix for e-procurement applications in paper 1, shown in Figure 5.

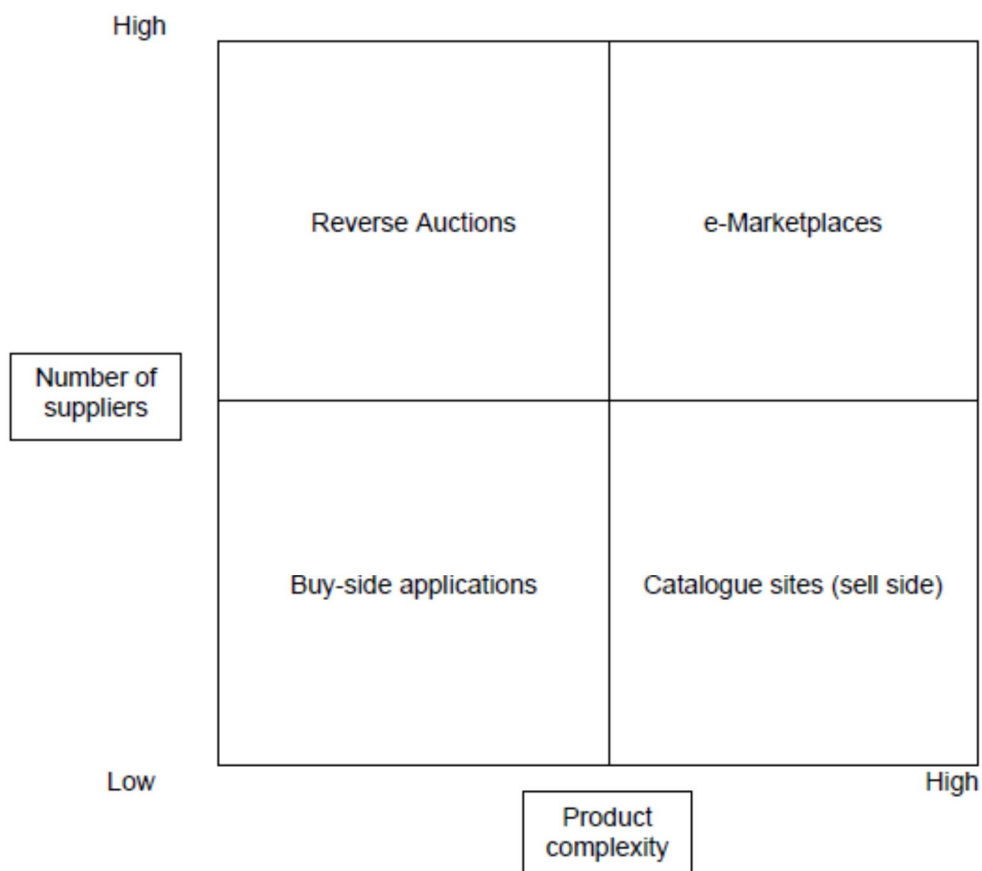


Figure 5: e-procurement segmentation matrix (Smart & Harrison, 2002)

In paper 2, this focus on price-based competition within specific segments led to the proposition that there would be greater commoditization of products in the low value segments of purchasing spend. This trend is illustrated in Figure 6 (Smart & Harrison, 2003) suggesting a move from partnerships, with few strategic suppliers, to arms-length relationships with more suppliers and a commoditized product. This matrix can be seen in the context of the debate in the literature over markets versus hierarchies, outlined by Malone *et al* (1987). The proposition in paper 2 is that ORAs create a tendency towards use of *market* mechanisms and hence supplier proliferation, with more frequent changes of supply. Paper 2 provided specific evidence of this trend, as the supplier was changed in five out of six auction events observed. Nevertheless it is important that buyers make decisions on pricing within an overall policy or framework for procurement and do not allow their relationships with suppliers to be driven solely by price concerns. This issue is addressed in more detail in the later section on purchasing strategy.

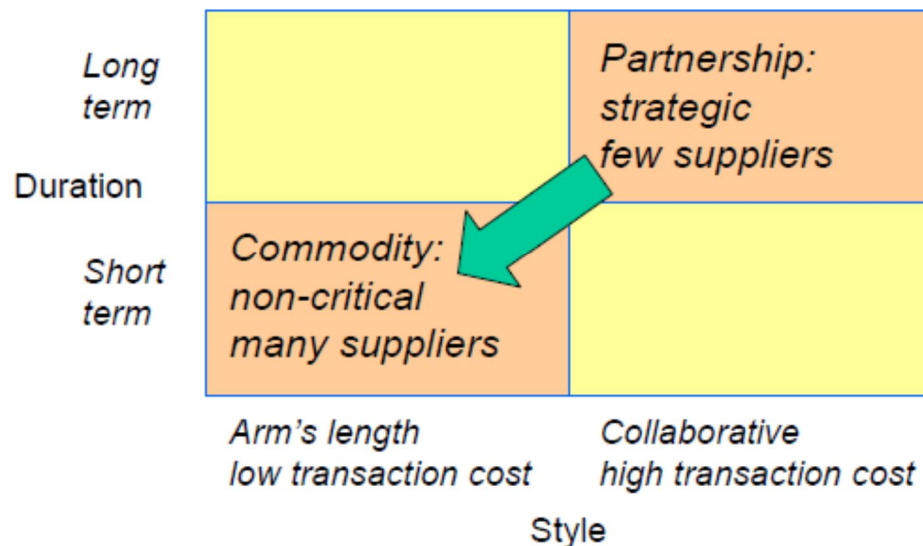


Figure 6: Trend initiated by reverse auctions in MRO (Smart & Harrison, 2003)

4.3 CONCLUSIONS

The papers have made a contribution to the important and ongoing debate on relationships within purchasing management. The first two papers have become a building block in this domain with, at the time of writing, paper 1 having 25 citations and paper 2 having over 50 citations. Furthermore, findings from paper 2 were used by Caniels and van Raaij (2009) as a basis for their survey investigation on supplier attitudes to auctions. Articles 1 and 2 are today a core part of the reverse auctions literature and are cited in the majority of studies

now being published. In this sense, the papers helped to formulate the agenda for ORA studies and to define future research questions and interests.

The papers also demonstrate the continuing relevance of the ideas of Cox in relation to power deployment by buyers and suppliers. Demand and supply within markets have a determining influence on firms' attitude to power and it was shown that power remains a facet of the relationship within e-procurement usage. In turn, this factor influences how and where firms develop partnerships. The research provided empirical evidence that power and partnership issues remain relevant and become more complex where e-procurement is initiated.

4.4 PURCHASING STRATEGY

Purchasing strategy has been explored in the literature over two decades or more, with the emergence of the function from a mainly supporting role to a core activity within the supply chain. Moving away from Porter's original value chain model (Porter, 2004), which saw purchasing as a support activity to the primary business of the firm, the development of the SCOR framework places purchasing squarely within SCM as a critical process (SCC, 2003). The early papers in the e-procurement literature barely explored the relationship between strategy and e-procurement and indeed this was identified as a significant gap in chapter 2.

The research in papers 1 and 2 on ORAs began to address questions of purchasing strategy through discussion of the impact on price and partnerships. Selection of appropriate relations with the supply base is a core strategic decision and is implemented through a segmentation approach to the market. (The risk/value matrix of Kraljic (1983) or a variant of this model, as discussed in chapter 2, is used widely by procurement managers and was found to be the standard approach in all of the cases explored in this research programme). The suggestion in paper 2 that products would begin to be moved around in categories was exemplified through the framework shown in Figure 5 above. This finding supports the proposition of Bakos &

Brynjolfsson (1993) that firms will use more suppliers, or make more frequent supply changes, through some forms of electronic markets.

In paper 2, the discussion focused on MRO items which are often not seen as 'strategic' purchases and are therefore less critical to the firm. Nevertheless this research provides evidence that buyer strategy would potentially be influenced by the availability of e-procurement tools, although at this early stage, it was unclear how that impact would play out. Similarly, in paper 1, a segmentation matrix for e-procurement applications was proposed (Figure 5). This model suggested a contextual role for the mechanisms, based on factors such as product complexity and supply availability. An alternative matrix has been proposed by van Weele (2007), using the axes of financial impact and supply risk. At that

time, these proposed matrices were work in progress, as there was in effect insufficient empirical evidence of e-procurement implementations to verify their validity.

As this issue had barely been addressed in the literature, the cause and effect relationship between purchasing strategy and e-procurement deployment remained uncertain. This situation suggested new research questions and paper 6 examined strategy in relation to e-procurement in much greater detail, through four cases. That study set out specifically to provide evidence of how buyers establish e-procurement usage and its relationship to overall supply market strategy.

The key finding from paper 6 is that buying firms set out their purchasing strategy according to legacy issues in the business and using a mix of factors such as outsourcing, supply segmentation, and decisions on global to local sourcing. These factors determine the direction and policy to be pursued, once the function has set its alignment with strategic business directives such as the degree of investment in internal production capacity and decisions on use of subsidiaries. The remaining spend which is not directed at internal sources of supply is then subject to this strategic analysis. Consequently, the cause and effect relationship between the two elements was clarified: e-procurement mechanisms can be defined as tactical tools to support strategic decision-making. As stated in the paper: “Ellram and Zsidisin

(2001) suggest that buyer-supplier relationships strongly influence the use of IT. This research goes further, and postulates that relationship modes, defined within a strategic procurement framework, directly influence how e-procurement tools should be deployed by the buying firm” (Smart, 2010b :14). This relationship is illustrated in Figure 7.

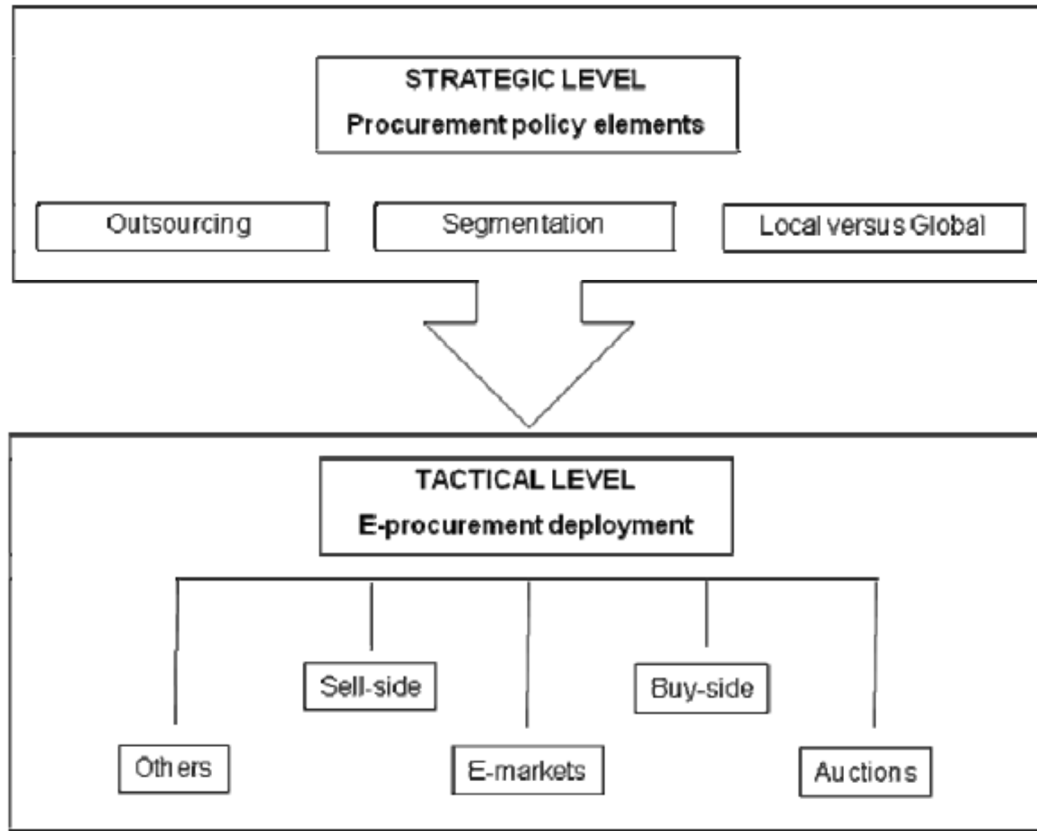


Figure 7: Relationship between procurement strategy and e-procurement Mechanisms

It was established through this research that e-procurement does not have a strategic dimension of its own, nor should it be considered separately from the procurement strategy of the firm. Its role is to support strategic sourcing, by facilitating the achievement of its goals, determined by factors such as outsourcing, segmentation and local versus global sourcing.

Issue	*No. of mentions	Implications
Lack of integration into back-end systems	4	Workflow not optimised; few or no benefits in financial transactions; cost savings delayed
Few incentives for suppliers	4	Supplier resistance or hostility; suppliers need to be more involved at project outset
Concern over unreliability of new IT	3	Users need to experience deliverables first hand
Legacy systems/old IT	3	Difficult to integrate to e-Marketplaces; requires new investment
Some existing procurement methods are adequate e.g. email, EDI	2	Resistance to change; need to clearly prove benefits of new IT
e-procurement needs to be proven before moving to more complexity	2	Reluctance to consider supply chain opportunities; 'softly softly' approach
e-procurement savings have been hyped and are often not achievable	2	Users unconvinced of benefits; need to demonstrate value
Users not ready for new systems	2	Training required before adoption; need to build confidence in solutions available
Lack of funds for new IT investment	2	As above; new projects on hold
e-business failures have raised doubts at Board level over benefits	1	Difficult to make a business case for investment
Lack of standards across e-marketplaces	1	May lead to additional costs for users of more than one e-marketplace
Supplier systems may be better option e.g. RS Components	1	Users can benefit with little investment by the buying firm in e-procurement systems
Utilities sector conservative in its approach	1	Tendency to move slowly; follow rather than lead

Table 4: Barriers to e-marketplace adoption and implications

4.5 THE E-PROCUREMENT BUSINESS CASE: DRIVERS AND BARRIERS

	Firm A	Firm B	Firm C
Optimise strategic sourcing policy	X		
Support spend savings targets	X		X
Establish common processes	X	X	X
Standard platform for managing procurement spend	X		
Knowledge sharing between BUs	X		
Move procurement managers from transactional to strategic activities	X	X	X
Improving productivity of purchasing personnel	X		
Spend compliance	X	X	X
Visibility of global spend	X	X	X
Improved supplier management and selection	X		X
Integration with suppliers	X		X
Auditable spend management data		X	X
Achieve buying leverage		X	X
P.O. cost reduction	X	X	
Efficient payment & invoice settlement		X	X
Centralise control		X	
Reduce supplier numbers		X	X
Raise standards within procurement function			X

Table 5: Drivers for e-procurement in three case firms in paper 5

Paper 5 set out the first fully developed business case discussion in the literature.

The literature review for the research demonstrated that this subject had been only partially explored and that evidence from case studies of limiting factors from implementation projects was practically non-existent. Hence this paper provided the first empirical support for how a business case has been developed in buying firms and for the factors which inhibit the achievement of that case.

The paper revealed that the business case was created in a less than rigorous way and that the case in all three firms was speculative due to a number of factors, such as: poor legacy systems; incorrect data on spend; unrealistic expectations of what the technology could

deliver. “In all three cases, the firms developed a high level case for investment in e-procurement, based on overall savings exceeding cost

54 outlays. No evaluation was conducted on how much each application individually could contribute to those savings” (Smart, 2010a: 195). The paper made a specific contribution in establishing five main criteria for consideration when developing a business case, namely Control, Cost, Process, Roles and Suppliers. These categories can in turn assist organizations in establishing the areas of focus in an e-procurement project and enable a more coherent understanding of where resources should be applied to achieve a successful outcome. In total, 18 separate drivers were identified under these five categories. These are shown in Table 5 above.

	Firm A	Firm B	Firm C
Unclear original business case	X		X
Poor legacy systems and data	X	X	X
Visibility on spend not solved	X		
Need to use suppliers' systems to get best deals	X		X
Change management	X	X	
Training requirements	X	X	
Different accounting/reporting rules globally	X		
Misunderstanding of what the technology could deliver	X	X	
Finding new people with right skills		X	X
Integration to external platforms		X	
Wrong targets set initially		X	X
Re-defining task and roles	X	X	
Role of internal communications		X	X
Not possible to add all suppliers		X	
Buying systems not user-friendly	X		X
Software needs updating over time			X
Reducing supplier numbers proved difficult			X

Table 6: Problem factors affecting the project implementation and development

The drivers identified were used to create an original model for the business case, based on a hierarchical framework and developed from Min's (1994) earlier work on multiple attribute hierarchy utility theory (MAHU). The model shown below as Figure 8, contributes to the business case debate by structuring the identified drivers in to the five categories (or criteria). This model extends the use of MAHU into a new problem area. Moreover, it makes a contribution to practice by identifying for practitioners the key drivers to be considered in e-procurement adoption, together with the seventeen problem factors also identified in the research. It became apparent when conducting this piece of research that firms need a clearer definition of how the business case should be developed, and this research contributed some core guidelines. A fully developed approach to e-procurement adoption still needs to be established and this is considered more extensively in the final chapter of the exposition.

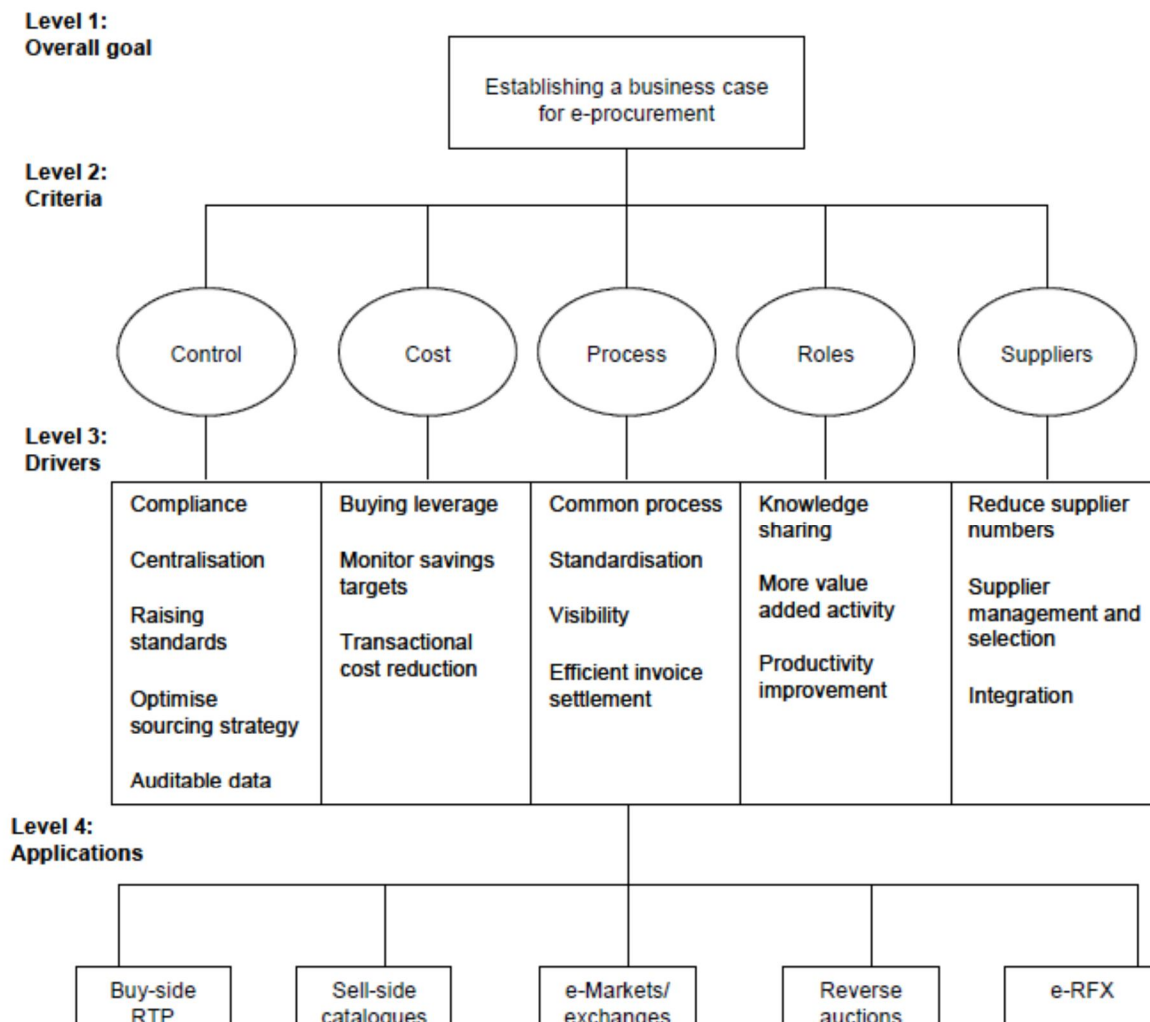


Figure 8: Hierarchical framework of drivers for e-procurement adoption

CHAPTER-5

CONCLUSION

The conclusion to this exposition summarizes the findings from the research and brings together themes, issues and lessons learned from the foregoing chapters and the papers presented. It outlines the contribution the research makes to both the academic and practitioner domains and identifies areas for further investigation, where gaps exist or where new themes have been identified and not fully explored.

5.1 THE ROLE OF E-PROCUREMENT IN PURCHASING MANAGEMENT

Table 7 summarizes the contributions of this exposition under specific themes, showing their relevance to theory and/or practice. Each of these themes is discussed further in the following sections.

Contribution	Type	Theory	Practice
E-procurement leads to improvement in process and price for buying firms	Confirming	✓	✓
Benefits realisation in e-procurement projects remains a problem area	Extending	✓	✓
E-procurement is used by buyers and suppliers as a means to channel dominance	Extending	✓	
E-procurement leads to automation of process, not supply chain integration	Extending	✓	✓
E-procurement is a tactical tool, subordinate to purchasing strategy	Discovering	✓	
Different e-procurement mechanisms result in use of markets <u>or</u> hierarchies	Discovering	✓	

Table 7: Summary of contributions to knowledge

5.2 PROCESS & PRICE

The discussion in section 4.1 on buyer-supplier relationships illustrated that in broad terms e-procurement mechanisms have a positive impact on both process and price for buying firms. Process benefits in reverse auctions were proposed early on by both Emiliani (2000) and Jap (2000), although their articles were theoretical rather than empirical in nature. My findings in papers 1 and 2 provided case study evidence of this process benefit. Similarly, in papers 5 and 6 case evidence demonstrated that process improvement could be obtained through the other e-procurement mechanisms, which reduce transaction cost, improve functional efficiency and enable time compression in handling orders with suppliers. However there was also evidence that such process benefits were often limited only to one party to the transaction. Hence, in buy-side applications these are captured by the buying firm, and with sell-side applications, suppliers are the beneficiaries of process improvement. This finding emphasizes the need to properly classify and interpret the

58 different e-procurement mechanisms and their impact, which the literature review demonstrated had been inaccurately handled in many previous articles.

The effect on price was explored across several articles which illustrated that price reductions were not guaranteed, and dependent on contextual factors. My findings challenged certain observations by Emiliani (2004, 2005), who suggests that e-procurement, especially through auctions, leads to detrimental outcomes for buyers and suppliers, such as non-viable pricing. Evidence from later papers indicated how the buy-side and marketplace solutions impacted on price. Paper 6 provided a model showing how reduced price is inter-linked with two other factors: supplier reduction and compliance. Hence the research confirmed and extended earlier propositions and advanced our knowledge of how these constructs interact through case study examples, which had been lacking from the body of literature.

5.3 E-PROCUREMENT AND SUPPLY CHAIN INTEGRATION

An issue identified in the literature review was the lack of coherent definitions of e-procurement applications. Certain authors, including Wang *et al* (2004) and Percy *et al* (2008) confused e-procurement with wider supply chain processes such as planning and scheduling or product design. Similarly there were suggestions in the literature that e-procurement mechanisms can be situated within a range of supply chain management applications (Garcia-Dastugue and Lambert, 2003). However an important finding throughout the research program was the general lack of consideration of a supply chain perspective by buyers when examining e-procurement usage and that supply chain integration was rarely on the agenda.

There was in fact evidence in each paper that supply chain factors were ignored or poorly understood by buyers. This demonstrates the predominance of narrow, functional thinking with the procurement profession and must be a concern for researchers and supply chain professionals alike. Whilst an integrated supply chain philosophy has been promoted by many senior supply chain personnel, and advanced through the SCOR model (SCC, 2003), parts of procurement practice remain isolated due to a silo mentality. This in turn prevents a more integrated approach to technology and its solutions. My research has clearly exposed the inability of e-procurement to address supply chain level integration and it can be concluded that at its present stage of development, e-procurement will not assist in any effective move towards such integration. Indeed the attempts by some of the first e-marketplace operators such as Covisint and Transora to develop integrated supply chain solutions were abandoned early on and have largely disappeared as aspirations within that industry. There are some isolated successes where e-marketplaces have facilitated physical logistics collaboration such as Elemica in the chemicals industry. However these examples are limited and it is clear that the e-marketplace model has not achieved its original ambitions. Indeed it is only where the proposition moves out of the procurement domain and into areas such as transport, planning and manufacturing that a supply chain solution becomes feasible.

Even within the current functional scope of e-procurement there continues to be debate on the extent of integration linkages. The research has shown that e-procurement solutions lead to automation of process, not supply chain integration.

There have been some examples of how technology integration can be extended, again through an e-marketplace. Case firm C in paper 5 had successfully linked its buy-side application with the chemicals marketplace (<http://www.hubwoo.com>) and was able to transact with core suppliers via this exchange. However the study on the public sector marketplace in paper 3 revealed there were considerable barriers to such technical

integration, even within the buying firms themselves. While e-procurement solutions remain the sole responsibility of purchasing, they will not contribute to supply chain level integration. Hence the research, particularly in paper 4, extended our understanding of this issue in relation to previous frameworks (Frohlich & Westbrook, 2001; Bagchi & Skjoett-Larsen, 2002) and provided case examples of the barriers to such integration. It is also an important finding for practice, as it is evident that e-procurement mechanisms need to be addressed within a more holistic context if they are to have any useful impact on broader management of the supply chain.

5.4 PURCHASING STRATEGY

A somewhat surprising finding from the literature discussion was that there were no existing, coherent explanations of the relationship between e-procurement and purchasing strategy. This theme was explored in the findings chapter (section 4.3) which led to the establishment of a model explaining the relationship between the two constructs (Figure 7). An important conclusion of the research therefore is that there are no fixed, pre-determined impacts on purchasing management as a result of e-procurement deployment. There exist important endogenous and exogenous factors, explored across several of the papers, which influence areas such as pricing, trading outcomes, roles and relationships. Therefore the role and impact of e-procurement mechanisms in purchasing management depends on *how they are used*, both by buying and supplying organisations. But for the buying firm, e-procurement tools are a means to enforce policy more effectively, through facilitating issues such as supplier reduction, compliance and price visibility (shown in Figure 4).

Thus e-procurement acts as an important enabler of purchasing strategy implementation. This is supported by the emerging evidence that e-procurement adoption allows the procurement function to redeploy key personnel to focus on identifying value-adding solutions from its supply base. In this sense, successful buying firms will develop a clearer strategic relationship with key suppliers. We should therefore be optimistic that over time this focus on the importance of value based relationships will facilitate a move towards a stronger supply chain orientation within the procurement function, as it becomes more interested in the longer term

SCM potential of its main suppliers. Although it should be recognized in the short term that most of the purchasing managers interviewed in this research program had a narrow, departmental perspective on e-procurement and saw it as a means to achieve their *functional* goals or targets. Thus it is clear that e-procurement supports purchasing, rather than supply chain strategy.

5.4. CONSTRUCTING THE MODEL

The figure shown below (Figure 9) is designed as a flow model with a number of steps, describing how an e-procurement solution could be developed, giving consideration to key, relevant issues. The starting point in this model is the relationship of e-procurement to strategic purchasing decisions. The discussion in section 4.3 clarified the cause and effect between these elements: e-procurement mechanisms are tactical tools to support strategic decision-making, and should follow from the organization's purchasing strategy. In that section, a model was introduced 66 (Figure 7) which illustrates this relationship

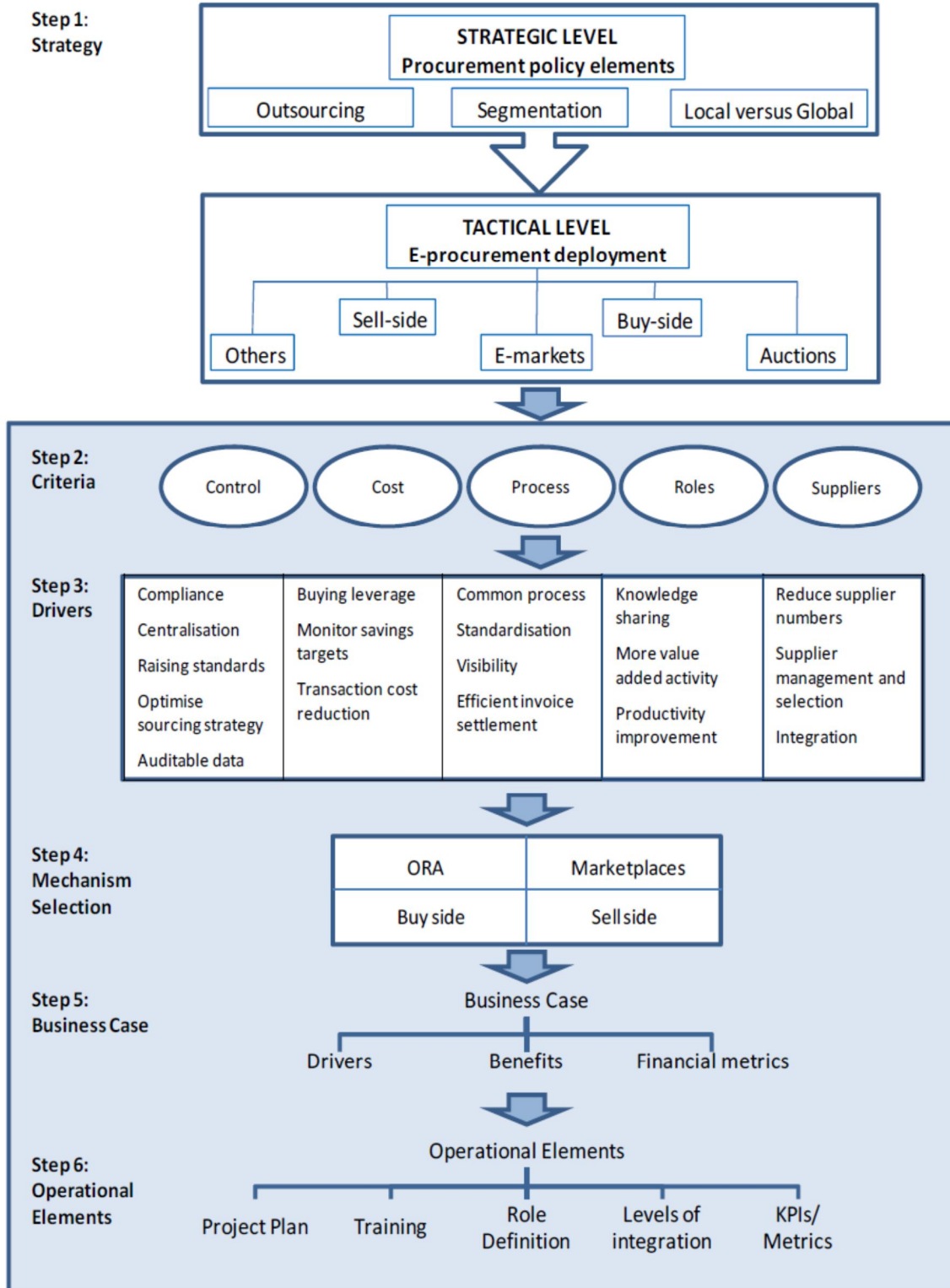


Figure 9: A model for e-procurement

5.5 FUTURE DIRECTIONS

In looking ahead to future research, there remains a question as to what extent e-procurement can still be seen as a 'nascent' area of knowledge (Edmondson and McManus, 2007). My research began when e-procurement was just appearing in the industrial arena as a viable solution. There has been a significant growth in research into this subject, however our understanding of its impact and role, in both purchasing management and the wider supply chain context, needs to evolve. This exposition and the papers presented within it have advanced our knowledge of elements of e-procurement but gaps relate to the longer term impact of this technology, the potential of rival technologies such as enterprise application connectivity (for example, SAP systems speaking to each other) and how, if at all it can support a genuine supply chain integration agenda. The latter issue is a major concern as the evidence presented here suggests that currently e-procurement does not support genuine integration between trading partners. Indeed the present method and process of deployment of this technology results in a focus on process automation, rather than supply chain integration.

This point was supported with the finding in several cases throughout the papers, that purchasing management is still dominated by silo-based thinking and that procurement personnel are often removed from the wider supply chain goals of the organization. This narrow, functional mentality leads to a business case which is based predominantly, or in some instances exclusively, on departmental metrics.

Hence examination of how the function can move from this narrow perspective to a broader participation in supply chains is worthy of further exploration.

Equally, the individual or human barriers to successful adoption of these new mechanisms need greater consideration. Recently, Stanley Fawcett and colleagues have outlined the problems of the individual or personal barriers created by people within organizations when addressing the introduction of technology in supply chain contexts (Fawcett *et al*, 2007). The human dimension and its impact on successful e-procurement implementation has partly been explored in my research, in relation to the changes that e-procurement initiates. However it is a key issue in many SCM projects and offers an important research agenda for the future. Similarly, the issues of roles and the changes in responsibilities of purchasing managers have been explored here, but remain critical for the procurement function as e-procurement becomes more widely established. A deeper evaluation of the impact of this technology on managers' roles and changes to their job profile would prove valuable to the profession itself.