e-Procurement in Automotive Supply Chain of Iran

Afshin Afsharipour
Atefe Afshari
Laila Sahaf

Social Science and Business Administration Programmes
Department of Business Administration and Social Sciences
Division of Industrial Marketing and e-Commerce

CONTINUATION COURSES
Supervisor: Esmail Salehi Sangari
Acknowledgements

This thesis is written as our Master of Science in Industrial Marketing Program of Industrials economics and social sciences department at the Division of Industrial Marketing at Lulea University of Technology. The masters thesis was written during a fifteen months period from September 2004 to January 2006. The work during this time has provided us to gain a better understanding of how can e-procurement development in SAPCO (the biggest supplier of automotive parts in Iran) and its suppliers be described as case studies.

First of all we would like to appreciate our encourager and supervisor Professor Salehi Sangari whom without his continues support, deep guidance and comments this research could not be done; furthermore, we want to thank Professor Abili who provided us valuable advices especially in Methodology chapter. Also, it is needless to show our sincere gratitude to SAPCO Deputies and Departments who participate in our research by their openness in discussion, sharing valuable time and introducing us to suppliers and those suppliers who attended in our interview and help us to develop our research study.

Finally we would like to express our greatest thanks to our families who cope with us all those days in our research. Without their support, encouragement and patient this research would not have been possible.

Lulea University of Technology
December 2005,

Afshin Afsharipour
Atfe Afshari
Laila Sahaf Amin
Abstract

Being an important and money-spinning industry for many decades, automotive industry is now facing with several challenges supplemented by global fierce competition. In these circumstances, reducing cost and increasing production development and delivery speed have been identified as practical strategies for survival and growth. Whereas, e-business in general and e-procurement specifically has shown innovative methods and new horizons for implementing those strategies, some developing countries are less prepared for the adoption.

Thanks to protectionism, Iranian automotive industry is still enjoying a rather closed market, though sooner or later the latent global challenges will be felt by the market players. In this respect, this thesis is aimed to find out how e-procurement is being used in Iranian automotive supply chain and what benefits and barriers are associated with its implementation. To this end a qualitative approach was used and multiple case studies were conducted. Our finding shows that Iranian automotive supply chain can gain a lot through implementing an integrated and standard e-procurement solution. While, some chronic impediments like technology infrastructure, culture and legal system have to be changed considerably before any pragmatic endeavor.
# Table of Content

1. Introduction ......................................................................................................................... 1  
   1-1. Background ................................................................................................................... 1  
      1-1-1. The importance of automotive industry in the world and Iran ......................... 1  
      1-1-2. Trends and drivers of change in the automotive industry ................................. 2  
      1-1-3. Role and Importance of procurement .......................................................... 6  
      1-1-4. The Internet & e-business .................................................................................... 7  
   1-2. Problem Area .............................................................................................................. 8  
      1-2-1. e-procurement ..................................................................................................... 8  
      1-2-2. e-procurement adoption in the automotive industry ...................................... 10  
      1-2-3. e-procurement benefits & barriers ................................................................... 10  
      1-2-4. e-procurement implementation ........................................................................ 11  
      1-2-5. e-procurement interludes ............................................................................... 13  
   1-3. Aim of Study and research questions ........................................................................ 14  
   1-4. Delimitations ............................................................................................................. 15  
   1-5. Outline ...................................................................................................................... 16  

2. Literature review .............................................................................................................. 17  
   2-1. Procurement .............................................................................................................. 17  
      2-1-1. General procurement issues and definitions ..................................................... 17  
      2-1-2. The importance of procurement ....................................................................... 17  
      2-1-3. Why procurement is important ...................................................................... 18  
      2-1-4. Procurement and the Value Chain ................................................................ 18  
      2-1-5. Purchasing, Procurement & supply chain management .................................... 21  
      2-1-6. Direct and Indirect Procurement ................................................................. 23  
      2-1-7. Purchasing methods ......................................................................................... 26  
      2-1-8. Purchasing & Procurement functions .............................................................. 27  
      2-1-9. Purchasing & procurement process and activities ........................................... 29  
   2-2. e-Procurement ........................................................................................................... 33  
      2-2-1. General e-procurement issue and definitions ............................................... 33  
      2-2-2. Impact of e-procurement on procurement work ........................................... 34  
      2-2-3. e-business, e-commerce & e-procurement ..................................................... 36  
      2-2-4. e-procurement definition .............................................................................. 37  
      2-2-5. e-procurement benefits ............................................................................... 38  
      2-2-6. e-Procurement barriers ............................................................................... 45  
      2-2-7. e-procurement models .................................................................................. 51  
      2-2-8. e-procurement Systems & Applications ....................................................... 54  
      2-2-9. e-procurement process ............................................................................... 59  
      2-2-10. e-technologies in Supply chain management ............................................. 62  
      2-2-11. e-procurement and Supply chain management ........................................ 63
2-2-12. e-technologies in the automotive industry ..................................................... 64
2-2-13. e-procurement adoption ............................................................................... 66

3. Conceptualization and frame of reference ................................................. 69

3-1. Conceptualization .................................................................................... 69
3-2. Frame of reference .................................................................................... 74

4. Methodology .................................................................................................... 75

4-1. Research Purpose ....................................................................................... 75
4-2. Research approach ...................................................................................... 76
4-3. Research strategy ....................................................................................... 77
4-4. Sample selection ......................................................................................... 78
4-5. Data collection method ............................................................................... 81
4-6. Data analysis ............................................................................................... 83
4-7. Quality standards ....................................................................................... 84

5. Empirical Data ................................................................................................... 86

5-1. SAPCO ......................................................................................................... 86

5-1-1. Systems & Computer Department .......................................................... 87
5-1-1-1. Software management section ......................................................... 88
5-1-1-2. ERP Project ....................................................................................... 91
5-1-2. Planning Division .................................................................................... 94
5-1-2-1. Planning Department ........................................................................ 94
5-1-2-2. Logistic Department ......................................................................... 96
5-1-3. Manufacturing Division ......................................................................... 98
5-1-3-1. Trim Department ............................................................................ 99
5-1-3-2. Polymer Department ................................................................. 100
5-1-4. Commercial Division ........................................................................... 101
5-1-4-1. Domestic production purchasing department .................................. 102
5-1-5 Financial and Economic Division ............................................................ 103
5-1-5-1. Parts purchasing and contracts accounting ..................................... 104
5-1-5-2. Specialized commercial department ............................................... 106

5-2. Suppliers ..................................................................................................... 108

5-2-1. MehrCamPars Co. ............................................................................... 108
5-2-2. Mehvarsazan Iran Khodro Co. ............................................................... 111
5-2-3. Sanden Iranian Co. .............................................................................. 113
5-2-4. Shetab Kar Co. ..................................................................................... 115
5-2-5. Majmoee Sazi Tous (MST) Co. ............................................................. 116
6. Data Analysis .................................................................118

   6-1. RQ1: How e-procurement is being used for acquisition of parts and components between SAPCO and its suppliers? ................................................................. 118
       6-1-1. SAPCO within Case .......................................................................................... 118
       6-1-1-1. e-Procurement model .............................................................................. 118
       6-1-1-2. e-Procurement system .............................................................................. 119
       6-1-1-3. e-Procurement process ............................................................................. 119
       6-1-1-4. e-Procurement Applications in SAPCO .................................................. 120
       6-1-2. SAPCO and Its Suppliers-Cross Case ............................................................ 123
       6-1-2-1. e-Procurement model .............................................................................. 123
       6-1-2-2. e-Procurement system .............................................................................. 123
       6-1-2-3. e-Procurement process ............................................................................. 123
       6-1-2-4. e-Procurement Applications in SAPCO .................................................. 124

   6-2. RQ2: What are the benefits of applying e-procurement for SAPCO and its suppliers? ................................................................. 126
       6-2-1. SAPCO within Case .......................................................................................... 126
       6-2-2. Suppliers within Case ...................................................................................... 127
       6-2-3. SAPCO and Its Suppliers-Cross Case ............................................................ 127

   6-3. RQ3: What are the barriers of applying e-procurement for SAPCO and its suppliers? ................................................................. 131
       6-3-1. SAPCO within Case .......................................................................................... 131
       6-3-2. Suppliers within Case ...................................................................................... 132
       6-3-3. SAPCO and Its Suppliers-Cross Case ............................................................ 133

7. Finding, Conclusions and Implications ...........................................137

   7-1. Findings and Conclusions ................................................................................. 137
   7-2. Implications for Management ........................................................................... 140
   7-3. Further Research ............................................................................................. 140
List of Tables

Table 2.1: Most important differences between direct and indirect purchases ................................................................. 26
Table 2-2: Three purchasing processes from the literature and a compilation of them .................................................. 32
Table 2-3: E-procurement Impact (Average Performance) ......................................................... 35
Table 2-4: Major barriers to adoption of E-Procurement ..................................................... 45
Table 2-5: Assessment of the procurement model alternative for buyers ................................................................. 52
Table 2-6: Characteristics of structured and unstructured procurements ............................................................... 60
Table 2-7: Major e-business infrastructure deployment areas in supply chain management ........................................ 63
Table 4-1: Relevant Situations for Different Research Strategies ......................................................... 77
Table 4-2: Selected departments for the interviews ............................................................................. 80
Table 4-3: Strengths and weaknesses of the different sources ........................................................................... 82
Table 6-1: Explanation of coding ................................................................................................. 118
Table 6-2: Identified SAPCO e-procurement applications based on Knudsen theory-Within-case .............................................. 122
Table 6-3: Identified SAPCO e-procurement applications based on Knudsen theory-Cross case .............................................................................. 125
Table 6-4: Identified SAPCO e-procurement benefits based on theory-Within case ................................................................. 126
Table 6-5: Identified SAPCO’s suppliers e-procurement benefits based on theory-Within case ................................................................. 127
Table 6-6: Identified SAPCO e-procurement barriers based on theory-Within case ................................................................. 131
Table 6-7: Identified SAPCO’s suppliers e-procurement barriers based on theory-Within case ................................................................. 132
List of Figures

Figure 1-1: Top ten brands - light Vehicle Assembly (2012)-Iran .......................... 2
Figure 1-2: Iran vehicle assembly forecast .......................................................... 2
Figure 1-3: Car industry outlook ................................................................. 4
Figure 2-1: Purchasing and the value chain (Redrawn from Porter, 1985) .............. 19
Figure 2-2: Core supply chain activities including procurement ......................... 22
Figure 2-3: Key procurement activities within an organization ......................... 27
Figure 2-4: Purchasing process model and some related concepts ...................... 28
Figure 2-5: The relationship of purchasing/procurement/supply management activities – with materials management and the flow of materials decisions through a firm ........................................ 31
Figure 2-6: Effects of e-procurement ............................................................... 39
Figure 2-7: Shift from managing transaction to managing suppliers .................. 40
Figure 2-8: Savings potential of e-procurement ............................................. 41
Figure 2-9: The three main e-procurement model alternatives for buyers .................. 51
Figure 2-10: Classification of e-marketplaces ................................................. 53
Figure 2-11: ICT solutions used for e-procurement ........................................ 54
Figure 2-12: Use of different information systems for different aspects of the fulfillment cycle .......................................................... 56
Figure 2-13: Integration between e-procurement systems and catalogue data ........ 57
Figure 2-14: Traditional view of a material requisition process ....................... 61
Figure 2-15: e-Process management perspective ............................................ 61
Figure 2-16: A typical supply chain (an example from the B2B Company) .......... 64

Figure 3-1: Frame of reference ................................................................. 74
Appendix

Appendix [I]: SAPCO organizational chart
Appendix [II]: list of suppliers involved in electronic KANBAN
Appendix [III]: SAPCO IT department interview guide
Appendix [IV]: SAPCO functional department interview guide
Appendix [V]: Suppliers interview guide
1. Introduction

This chapter points towards introducing the reader to the background and different aspects of investigated area as well as giving some understandings of why and how we investigate it. In this respect, several issues like global environmental factors, which are forcing automotive industry players to adopt new technologies and benefits and barriers, associated with those technologies will be explored. At the end of the chapter, the overall aim of the study and its organization is outlined.

1-1. Background

1-1-1. The importance of automotive industry in the world and Iran

The automotive industry is one of the largest industrial sectors in the world. The automotive sector contributes from 4% to 8% of the GDP and accounts for 2% to 4% of the labor force in the Organization for Economic Co-operation and Development (OECD) countries. Today, nearly 700 million motor vehicles are registered worldwide with over 550 million vehicles (75% passenger cars) registered in OECD countries.

This industry leads all other industries in research and development (R&D) investments and its level of productivity is well above average. It is generally recognized that one qualified job in the automotive industry indirectly creates seven to ten qualified jobs in related industry sectors. Today’s global automobile manufacturers have a direct impact on a variety of other industries ranging from raw material and component suppliers, to machine manufacturers, research and technology institutes, car repair shops, retailers, driving schools and financial institutions.

Vehicle manufacturers worldwide are among the largest customers of aluminum, copper, iron, plastics, rubber, textiles, steel and computer chips. Thus, they contribute enormously to the economies of many different countries. (United Nations Environment Programme (UNEP))

The Iranian automotive industry first developed in the 1960s with the arrival of foreign vehicle manufacturers. Today, the industry is growing year-by-year and has become one of Iran's key economic activities, after oil production.

Besides, according to Autofact (2005-Q3) the growth of Iranian vehicle assembly and production has been and will be exceptional in the region in the future years (see Figure1-1 and 1-2).

In Iranian automotive industry, most production takes place in partnership with the two state-controlled automotive giants, Iran Khodro—which accounted for about 60% of the market for passenger cars and light commercial vehicles in 2003—and Saipa (about 35% of the market in 2003). Until recently, imports of built-up vehicles were banned and domestic manufacturers enjoyed an entirely controlled market, though the number of imports is still very low. However, Foreign companies—mostly European
and Asian—have started to enter the Iranian market in joint ventures, and to assemble vehicles imported in completely knocked down CKD (Complete Knock Down) kits.

**Figure 1-1- Top ten brands - light Vehicle Assembly (2012)-Iran**

Source: Autofacts, 2005 Q3

**Figure 1-2- Iran vehicle assembly forecast**

Source: Autofacts, 2005 Q3

1-1-2. Trends and drivers of change in the automotive industry

Competition in many industries has intensified all over the world in just a few years. The reasons why this has happened are many. They mostly relate to:

- Deregulation in many industries (such as energy supply and airlines);
Intercultural homogenization and the resulting homogenization of customer preferences;
- The forming of trade regions (GATT, NAFTA, EEC) in some areas in the world;
- Improved transportation facilities;
- The more sophisticated information and communications technology, which has become available. (Weele, 2002:P5)

According to Van Weele (2002), modern information technology would change traditional borders, not only between nations but also between organizations. The predictions indicate that the world increasingly will become one 'global village'.

Global competition, pricing pressures, and finicky financial markets are forcing organizations to develop new strategies for achieving year over year improvements in productivity and costs. As a result, the ability to control costs and coordinate activities across the supply chain is dramatically emerging as a primary source of competitive differentiation within every industry. (Aberdeen Group, 2001)

In fact, in an environment of global competition, all business, no matter what they produce, will have to embrace and master new and emerging technologies to survive (Ernst & Young, 2001). The survivors of the resulting shakeout should enjoy a concentration of expertise and scale, offering a chance at higher sustainable returns and a restructured competitive set. (PricewaterhouseCoopers, 2004)

Today's global automotive industry is a troubled sector, beset by structural overcapacity, a global price war and a general inability to return its cost of capital (PricewaterhouseCoopers, n.d.: P5). The growth rate of the European car market is near zero and the world's most important economy, North America, has been hit massively by the worldwide economic downturn after the end of the dot-com hype and because of 9/11/01. In the 1930s, there were approximately 300 independent car manufacturers; by the end of the 1990s seven independent manufacturers remained.

In the light vehicle market, the five largest manufactures (General Motors, Ford, DaimlerChrysler, Volkswagen, and Toyota) have a market share of about 70 per cent (Klein and Helmut, 2005). According to Autofacts (2005), (see Figure 1-3), the car industry is operating with an increasing overcapacity. Vehicle sales in the NAFTA region have decreased and the car market in Western Europe is stagnant. Furthermore, customers demand better service and faster delivery. Market transparency has increased with the advent of the Internet. As demand is volatile, manufacturers are driven to cut costs (e.g. by economies of scale), maximize flexibility and foster customer loyalty. (Klein and Helmut, 2005)
The latest fortune 500 results make this point with depressing clarity, as the auto sector ranked at or near the bottom of all 47 industries in return on assets return on revenue, return on equity and all other metrics. Similarly, the S&P 500 highlighted automotive as having the worst results of any other industry, with a net margin of 1.6 percent and a return on invested capital of -4.7 percent. (PricewaterhouseCoopers, n.d.)

According to PRICEWATERHOUSECOOPERS, today automotive industry faces with number of negative industry drivers and influences, including:

- Structural excess capacity;
- Increased competition and a lack of competitive "open space";
- Record capital requirements;
- Increasing regulatory pressures;
- A deflationary pricing environment;
- Razor-thin margins;
- Burdensome legacy costs;
- Commodity price inflation.

The overarching industry dynamic is a prolonged, global price war, which has fundamentally changed the way the industry operates, and caused extreme pressure on margins throughout the value chain. (PricewaterhouseCoopers, n.d.: 5)

The reason for this price war is simple: increased competition. It had been hoped that the globalization trend of the last 10 years would result in new opportunities and a healthier industry, but the reality is that the increased competition resulting from globalization has more than outweighed the benefits. (PricewaterhouseCoopers, 2004)

Cars, systems and components should be manufactured at low cost, with no waste, at high and consistent quality levels and at short and reliable cycle times. Because of fierce international competition, manufacturing companies need to investigate and
pursue all the possibilities for cost reduction, quality improvement and efficiency improvement (Weele, 2002). Managements are becoming increasingly aware that the largest part of their end products’ costs is related to the materials and services purchased from suppliers. (Weele, 2002: P4)

The automotive industry has historically used very large supply chains. Even during the industry’s earliest days, Original Equipment Manufacturers (OEMs) purchased the bulk of the parts used in their products from suppliers, rather than making them in-house (Morell, Swiecki, 2001). Today most OEMs create only some 30 to 35 percent of value internally and delegate the rest to their supplier (Dietz, 2004:13). Today, manufacturers now purchase entire subassemblies, such as doors, power trains, and electronics from suppliers. The desire to work with partners to outsource subassemblies is leading to a radically new infrastructure to support the design, procurement, and logistics processes of the manufacturers. (Benko and McFarlan, 2003)

Moreover, although the industry's externalization of core processes appears to have slowed or even stopped, the fact is that major part of automotive production happen at the supplier level. (Dietz, 2004)

Over the last decade, the relationship between most automotive OEMs and their supplier has centered on a relentless drive for lower prices. A global analysis of OEMs' negotiations with their tier-one suppliers demonstrates that since the mid-1990s, annual price reductions in the industry have averaged around 3% (Dietz at al, 2004).

At the time being customers change: they now tell manufacturers what they want, when they want it, how they want it and what they are willing to pay. They demand products and services designed for their unique and particular needs. As a result many manufacturers of customer products (ranging from fast moving consumer goods to cars and furniture) need constantly to look for opportunities to reduce costs and improve efficiency. At the same time however, they need to constantly innovate and develop their product and service offerings. (Weele, 2002)

Increased competitiveness means that businesses must be able to react even faster and more specifically to individual customer demands to win customer loyalty for as long as possible. The highly interlinked system of OEMs, system and parts suppliers, development partners, and customers must be organized and optimized globally so companies can react specifically to regional and individual requirements. The usage of innovative techniques and concepts of information processing is the foundation for handling this challenge. (PricewaterhouseCoopers, n.d.)

The question that every member of the automotive industry faces is not only how to survive, but also how to produce a return to shareholders that justifies the capital employed. (PricewaterhouseCoopers, n.d.)

According to PricewaterhouseCoopers, today's car manufacturers have three options: they can resist change and hope for the best, leave the industry for a higher margin alternative, or grow and flourish. (PricewaterhouseCoopers, n.d.)
Clearly, the most successful players in the future will be those that can harvest information to capitalize on their core competencies and to offer a powerful value proposition to their customers in the form of shorter development cycles, better relationship management and trouble-free contract fulfillment.

1-1-3. Role and importance of procurement

Changes in the economic and competitive environments over the last twenty years have resulted in new ways of thinking within companies, in their search for competitive advantage. Many changes have occurred in the way that firms view the function of Purchasing. The movement away from the philosophies of mass production has led to new approaches to the traditionally operational task of purchasing; this has resulted in the concept of purchasing as a part of the strategic function of ‘supply chain management’, which is aligned to the overall corporate strategy. (Finch, 2004)

According to (Knudsen, 2003), increased global scope of operations, increased usage of outsourcing, and the buyers’ increased dependence on suppliers’ capabilities, make procurement work a vital undertaking for corporations to master.

Within the last ten years, the lowly, back-end procurement process has been transformed into a strategic resource. Procurement is now seen not only as a strategic player in the value chain, but as a major driver in the extended supply chain. There are many reasons for its popularity. Specific drivers may be traced to such areas as trends in global sourcing, emphasis on time to market, product quality based competition, customer uncertainty and the need to improve bottom-line costs. (Kalakota & Robinson, 2001)

According to (Kalakota et al, 2001), the purchase of goods and services represents the single largest cost item for any given enterprise. It is estimated that for each dollar a company earns on the sale of a product, it spends about $0.50 to $0.60 on goods and services.

Most organizations spend more than 30% of their income on purchasing goods and services (Gebauer, and A. Segev, 1998). It is even possible that about 20% of an organization’s purchases constitute 80% of the total purchase value. (Nam, 1998)

(Mattsson, 2000: 224) refers to a study made by AT. Kearney on European and North American manufacturers where it was found that in 1985, 30% of the total manufacturing cost stemmed from purchased material and services. In 1995, the figure rose to 55% and for 2005 it was estimated to rise to 85%.

Therefore, the function of procurement has gained an increasingly greater importance especially in manufacturing organizations. The reason for this is that in general purchased materials and services take up the largest part of the cost of goods sold. It has been proven on numerous occasions that even small savings on purchasing related expenditure can have a significant affect on the total cost. (Van Weele, 2000)
Procurement encompasses all activities involved in obtaining goods and services and managing their inflow into an organization (Segev et al, 1998). Traditionally the corporate function of procurement is separated into strategic and operational tasks. Whereas the strategic tasks include sourcing activities, supplier management, and design and implementation of buying procedures, operative tasks embrace all transaction-oriented activities such as the excitement of purchase orders. (Hoppen, Fricke, König, Pfitzer, 2002)

Businesses buy a diverse set of products and services and the purchases can be classified into many manufacturing inputs and operating inputs. Purchasing can be classified into direct material and indirect material. Manufacturing (direct material) inputs are the raw materials and components that go directly into a product or process. (Kaplan and Sawhney, 2000)

Direct procurement refers to the purchasing of goods and services that immediately enter a manufacturing process, such as the parts that are assembled into an automobile. (Gebauer and Segev, 2001)

Compared to direct goods and services, the procurement of indirect items covers a wider range of products, typically contains a larger number of buyers (possibly every employee), and is much less predictable with respect to buying volume and frequency. (Hoppen et al, 2002)

1-1-4. The Internet & e-business

According to Chaffey (2004), technology has enabled the introduction of faster, more responsive and flexible ordering, manufacturing and distribution systems, which has diminished even further the need for warehouses to be located near to markets that they serve.

Just as desktop computing in the 1980s and 1990s served as catalyst to the re-engineering movement, the Internet and WWW can be considered as the catalyst for the radical change in business context and business process viewpoint – what Keen and McDonald term the “e-process” perspective. (Kim & Ramkaran, 2004)

When a company uses the Internet to shorten order-to-delivery times, improve reliability, and broaden product choice, its customers respond, increasing price realization, market share, or both (Christodouleas, 2001: 5). BMW, for example, currently requires about 12 days. In the near future, they plan to reduce further order-to-delivery time to ten days. Today, instead of taking more than four years to design a new model, manufacturers take less than 18 months. GM, for example, plans to roll out one new model every 27 days. (Benko and McFarlan, 2003)

General Motors, Ford, DaimlerChrysler, Renault-Nissan and Peugeot-Citroën launched their online procurement company, Covisint, at the height of the dotcom boom. This was seen as a way to conduct auctions for parts, organize a global purchasing network and return a profit. However, the results have been less than expected and suppliers have resisted putting sensitive information online. Nevertheless, the system, and other
similar ventures, remains as an information channel and a facility enabling co-design of parts. (European Monitoring Centre of Change (EMCC), 2004)

Based on Deutsche Bank (2002), the impact of the Internet on the automotive industry is a theme that will dominate corporate and investment thinking in the foreseeable future. Business-to-business (B2B) initiatives have the potential to change forever the supply-chain structures that are currently in place and improve the efficiency and information flows that currently exist in this industry.

According to Backer (2001), the term "e-business" can be characterized as the support of the several distinct phases of a business transaction through information systems that use the Internet as a communication medium. E-business plays a key role in the function of today’s automotive industry. As an increasing number of transactions are carried out online and relationships among industry participants like OEMs and suppliers grow ever more complex with increased interaction between participants of different tiers, E-business is emerging as a necessary tool and enabler of this new business paradigm. For companies in the automotive supply chain, future business success requires a readiness to adapt to the e-business climate and co-evolve with it.

1-2. Problem Area

1-2-1. e-Procurement

One of the most important challenges that have affected traditional purchasing strategies and organization are the solutions, which are provided by modern information technology and the Internet. In just a few years manufacturing companies have invested millions of Euros in setting up electronic market places (such as Covisint in the car manufacturing industry, WorldWideRetailExchange in the retail sector, and PaperXchange by the paper industry).

The rapid improvement of technology and its application by business seems to be accompanied by similarly rapid changes in terminology. The use of the term 'electronic commerce' has been supplemented by additional terms such as e-business, e-marketing, e-commerce and more specialist terms such as e-CRM, e-tail and e-procurement. (Chaffey, 2004)

In the theme of e-business, e-procurement is regarded as having far greater potential for cost savings and business improvements than online retailing or enterprise resource planning systems. A survey of a new economy by the Economist proclaimed that the biggest savings from business-to-business e-commerce are likely to come in procurement. (Knudsen, 2002:P1)

The advents of e-procurement and developments in the procurement behaviors of the OEM's have altered the success equation for every automotive supplier. It will be vital that management quickly begin to focus on strategic sourcing of direct materials. By cutting the time and paperwork out of these transactions, suppliers can improve time-to-market on new products, production lead times and quality. (PricewaterhouseCoopers, n.d.)
For instance, Ford reengineered employee requisitioning processes in an attempt to save billions of dollars spent purchasing office supplies and filing expense reports. Ford spent an estimated $15.5 billion each year on non-production goods and services, making it one of the largest purchasers of such goods worldwide. Until recently, most global firms operated domestic accounts, such as payroll, procurement and logistics systems in every country in which they operated. The Internet has now enabled global firms to centralize these functions.

According to the Prime Consulting Group (2002), global firms are optimistic on the level of savings that can be achieved through full implementation of e-procurement strategies. The potential for savings is tremendous. For instance, General Electric reports that it believes that the firm has saved over $US 10 billion annually through its e-procurement activities.

Referring the Peoplesoft study (2001), e-Procurement is sometimes referred to as a magic bullet, where the early adopters are stating that the buying process can be improved. However, the new way of doing business demands a long-term serious effort and continuous improvements.

According to Davila (2002), new e-procurement technologies will become an important part of supply chain management and that the rate of adoption will accelerate as aggressive adopters share their experience and perceptions of low risk. The actual benefits and risks will determine the speed at which the technology moves from its development infancy to the adoption and the maturity stages. (Davila, 2002)

There are some fundamental things the purchasing company wants to achieve when it comes to purchasing. These include reducing the time employees spend looking for a product, service or suitable supplier, reducing the time and cost of administering purchases, reducing cycle times, increasing volume with a few preferred suppliers to get better pricing and other conditions, as well as limiting choices to only a number of pre-qualified suppliers to ensure quality. E-Procurement has a role to play in all of these areas, and the potential gains are huge.

Bakowski (2002) stated that much of the e-procurement attention so far has been directed toward purchasing indirect white-collar material such as office supplies and capital goods. The main vehicles for this have been the many marketplaces that are available for every industry (industry sponsored marketplaces). They offer a number of benefits, like the ability to find new suppliers, seek quotations for certain needs, and compare supplier catalogs. Other areas are project procurement and blue-collar indirect material. Further, a very large part of purchasing costs is typically the direct material used in production. If these purchases can be streamlined, resulting in smaller inventories, shorter cycle times, and less administration, huge benefits can be achieved.

E-Procurement is understood as the usage of Web-based functions and services (e.g. catalogue management, requisition, control and approval, receiving and exception processing, financials and payment processing and logistics and supply-chain management that allow employees of a buying organization to purchase goods and services and allow suppliers to manage and communicate the fulfillment of purchase
orders submitted (Thomson and Singh, 2001). In most cases, less special software (e.g. catalogue software) and hardware are needed to set up so that small and mid-sized enterprises can participate more easily in electronic processes. (Hoppen, 2002)

1-2-2. e-Procurement adoption in the automotive industry

The automotive equipment sector is an area of industry that has warmly embraced the use of the new information and communication technologies: “e-procurement” for buying, “e-design” for product development, “e-supply chain” for logistics. These new technologies are now developing rapidly and contribute to reducing costs, improving quality and shortening lead times. Co-design and data transfer systems are becoming the norm and are standardizing along the entire chain: the car makers, the large equipment manufacturers in charge of modules and components, and the other suppliers involved in an automotive project. (e-business Watch, 2005)

PricewaterhouseCoopers (2002) reported that, the existing landscape of the global automotive industry is a minefield of challenging issues. Declines in shareholder return and stock prices, too many e-business and quality management programs, and the lack of integration and standards as a basis for collaboration within the supply chain threaten the very survival of every supplier. OEM over-capacity and developing electronic procurement practices are rapidly spreading the pain of variable cost pricing of new automobiles to every part of the supply chain. e-procurement is here to stay, and it will drive a new period of rationalization.

The electronic capabilities of suppliers increasingly will determine whether they will be able to survive in a specific customer relationship. It is expected that manufacturers will increasingly shun suppliers for future business who do not offer electronic linkages, or who have incompatible information systems. (Weele, 2002:7)

1-2-3. e-Procurement benefits & barriers

The potential benefits and characteristics of e-procurement, especially for indirect goods and services, are described and proved in a huge number of articles and studies.

According to Hoppen et al (2002), the main results are that e-procurement decentralizes operative tasks and centralizes strategic procurement processes. This eliminates the so-called maverick buying and reduces transaction costs (e.g. decreasing process time and media discontinuities or reducing personnel expenditures) and purchasing costs (e.g. through grouping effects and/or a reduction of the number of their suppliers).

However, according to one study on procurement practices in the automotive industry, online procurement has improved efficiency through catalogue systems and auctions. Furthermore, companies realized that new practices introduced together with e-sourcing had positive effects on communication along the supply chain and quality of their purchasing processes, and increased transparency. Contrary to initial expectations, these were more significant benefits than direct material cost reduction or the bundling of purchases. (Croom, 2005)
According to Kalakota and Robinson (2001), e-procurement’s benefits fall into two major categories: efficiency and effectiveness. E-procurement’s efficiency benefits include lower procurement costs, faster cycle times, reduce maverick or unauthorized buying well organized reporting information, and tighter integration of the procurement functions with key back-office systems. E-procurement’s effectiveness benefits include in the increased control over the supply chain, proactive management of the key data, and higher-quality purchasing decision within organizations.

Nevertheless, not everyone is finding e-procurement to be that simple a shot. In terms of the status of procurement in Croom’s examination of supply chain strategy, less than 40 per cent of respondents saw e-procurement as a strategic issue – i.e. one with a potential to influence competitive advantage. Centralizing the procurement function was seen as desirable, achievable and necessary for e-procurement adoption. Some companies that have taken tentative steps to begin buying over the Internet find themselves struggling against resistance from their suppliers, as well as from their own procurement or engineering departments. In addition, many others are saying they want to get into the game but do not know how to begin. (Andrew, 2001; Croom, 2005)

In addition to the technology risks, there are risks associated with the integration of these technologies with existing information systems, with the business models that these technologies impose on supplier-customer relations and with the security and control mechanisms required to insure their appropriate use (Davila, 2002). Ironically although the e-commerce and e-procurement are inherently global, many of its limitations come from the geographic, cultural and organizational limitation of the underlying businesses they serve. (Avery, 2002)

1-2-4. e-Procurement implementation

e-Procurement can take place in an e-marketplace (defined as “marketplaces implemented by use of telematics, which means mechanisms of market-typical exchange of goods and services, which support all phases of the transaction” (Schmidt, 1993) or directly between two organizations and the software automates the purchasing process using Internet technologies. Requisitioners can access the system via a standard browser where they are routed to company approved catalogues either internal or external. (Bu’rca, Fynes and Marshall, 2005)

Enterprise resource planning (ERP) systems and electronic data interchange (EDI) were for a long time the primary source of connecting manufactures and suppliers electronically, most in a bilateral way (Wirtz 2001). EDI-based designs increasingly fail when confronted with globalize networks of partners and customers, because of the variety of different, often industry-specific, business process scenarios and EDI standards. Caused by high implementation and operating costs the integration of small and mid-sized enterprises is difficult. Internet enabled capabilities (e.g. procurement) are discussed as an approach solving these problems. (Hoppen et al, 2002)
While much of the promotional literature surrounding electronic commerce would suggest that e-procurement has universal application and that one day all procurement will be supported electronically, it is clear from the literature that the extent of its adoption varies particularly by industry. It is more likely to be used in a production environment, be it manufacturing or in production-like service environments such as in aspects of hospital management. (Tonkin, 2003)

In addition, currently research is seldom focused on a specific industry and direct goods and services. As stated before, EDI is used for a long time to support inter-organizational cooperation's. Therefore an analysis if and how Internet-enabled capabilities are used for bilateral supplier-customer (point-to-point) relations instead of EDI and there role in the future becomes interesting.

e-Procurement was initially aimed at indirect goods and services only and so less data about its usage for production-oriented items exist. Large software vendors like SAP have just started supporting Internet-based procurement of direct items. Previously the European automotive industry, predicted as progressive concerning the usage of IS, has not been systematically analyzed. Industry-specific studies offer a better comparability (e.g. cost reduction, procurement volume, used functions to support business processes etc.) because of the parity and similarity of business processes and business relations.

Today, many initiatives in e-procurement focus on MRO (Maintenance, Repair and Operations) items and it is also there that potential savings from reduced transaction costs and avoidance from Maverick buying are seen.

When it comes to direct material, the potential savings have not been as easy to identify as for MRO items. Instead, other value-added services might provide the rationale for using e-business tools for direct material. (Knudsen, 2002)

Accordingly, a detailed analysis of characteristics of direct procurement and its differences to indirect procurement including all the associated possible dimensions becomes essential. In particular, e-procurement is suitable for simple and standardized goods and services (e.g. office supplies). Most of these items can be characterized as being easily describable. Hence, it is believed that e-procurement of direct products in the automotive industry currently focuses on simple and standardized goods and services. (Hoppen et al, 2002: 424-425)

Following e-procurement implementation, relationships with suppliers continue to increase in strategic importance. Managing supplier perceptions is critical, as trust and common understanding in supplier relationships are essential for project success. Communication with suppliers should include project goals that reinforce the message that e-procurement is also designed to strengthen existing supplier relationships. This encourages suppliers to view initiatives as opportunities rather than threats. (Ernst & Young, 2001: 8)

While e-commerce employs technology, it is primarily a business issue. Consequently, new initiatives require dedicated analysis and planning to minimize associated risks and barriers. A risk area often overlooked and underestimated in e-commerce
initiatives is the impact on people within, and external to the organization. Outside of the organization, awareness and stakeholder management assumes tremendous importance. If suppliers cannot handle electronic orders then organizations should consider each alternative and its effect on potential economic returns. (Ernst & Young, 2001)

1-2-5. e-Procurement interludes

The slower-than-anticipated adoption of e-procurement has surprised many observers; in fact, only a relatively small share of parts can be sourced easily through online bidding, and even for these the process is far from smooth. (Dietz, 2004: 6)

The automotive industry saw the Internet as a panacea, rather than a medium to exchange information in real time. Many subsequently found that the efficiency and cost savings promised could not be obtained by simply creating interfaces between the many disparate systems shared between the OEMs and suppliers. Without integration and significant changes in culture, savings could not be obtained. The very complicated task of developing a number of Internet and process standards should not be underestimated. (Morell and Swiecki, 2001)

From the very beginning of the e-business age, electronic procurement was identified as one of the most important e-business applications in the automotive industry. Promising significant reduction of transaction costs and increased transparency of market operations, sourcing sparked OEMs’ enthusiasm, on the one hand, and raised concerns to suppliers, on the other. They feared that online procurement would accelerate product commoditization, erode profits, and destroy traditional links between suppliers and OEMs. In addition, nearly every automaker launched its own online exchange driving up implementation costs for suppliers. The development of electronic marketplaces for the automotive industry took longer than predicted. Many expectations were not fulfilled, the most prominent relevant example being Covisint, a famous e-business venture in the automotive industry, which failed to become an industry-wide marketplace. (e-business Watch, 2005)

Croom (2005) indicated that, one of the main paradoxes from his analysis was to find that while a large number of organizations were involved with the adoption of e-procurement, less than half of those believed that procurement had a strategic function. The cost benefits of e-procurement were widely accepted, but there seemed to be limited evidence that there is a clear understanding of the nature of the mechanisms required to achieve such cost saving. (Croom, 2005)

In addition, numerous initiatives aiming at establishing industry-wide standards for e-business practices failed. Contrary to initial expectations, online marketplaces did not gain wide acceptance among firms in the automotive industry. Main reasons included suppliers’ security concerns, a “battle of power” among customers, suppliers and operators of e-marketplaces, and a preference of carmakers for proprietary systems over industry wide platforms. Consequently, electronic marketplaces were scarcely used in this sector. Many firms either preferred their established suppliers or else used the Internet to operate their own e-procurement system. Besides, as reported in one of
the previous studies, large suppliers and system integrators, similar to OEMs, established online procurement platforms for their suppliers, typically small and medium-sized enterprises. Larger companies exert pressure on their suppliers to participate in these initiatives and to adopt their processes and e-business practices. Thus, companies at the base of the supply chain are basically forced to implement IT solutions and practices of their customers. One implication of this trend is that SMEs face the dilemma to adopt several systems and bear the costs and workload or risk losing a customer. However, contrary to Covisint and Supply On, private platforms are fee-free. Thus, it is not clear whether it is more beneficial for SMEs to use a few free of charge customer platforms and to bear the resulting costs of coordination of numerous applications, or to subscribe to a marketplace that facilitates transactions with all customers and to pay regular fees. (e-business Watch, 2005)

General Motors, Ford, DaimlerChrysler, Renault-Nissan and Peugeot-Citroën launched their online procurement company, Covisint, at the height of the dotcom boom. This was seen as a way to conduct auctions for parts, organize a global purchasing network and return a profit. However, the results have been less than expected and suppliers have resisted putting sensitive information online. Nevertheless, the system, and other similar ventures, remains as an information channel and a facility enabling co-design of parts. (EMCC, 2004)

1-3. Aim of Study and research questions

Increasing in rivalry from foreign penetrators and complete openness of Iranian market due to future admission to WTO will eventually face domestic manufacturers with real and fierce global competition, which is prevalence in all major vehicle markets. Therefore, it is vital for Iranian manufacturers to follow industry leaders and rehearse their strategies and tactics to be able to overcome the pending competition before it becomes too late. One of these practices is e-procurement, which has gained a great deal of attention in automotive and other industries in the last years. In this respect, we aim to find out to what level e-procurement has being used in Iran Khodro, the country's leading vehicle manufacturer in the region (and possibly the biggest industrial conglomerate in the Middle East) through its procurement arm, Supplying Automotive Parts Co. (SAPCO), and to find out what benefits has or is foreseen to be gained by applying that system. Meanwhile, investigating major present and anticipated barriers of e-procurement implementation will help SAPCO's managers and other practitioners to develop accurate means and methods for transition from current to ideal position.

Therefore, the purpose of this research is "to describe the development of e-procurement in Iran Khodro's supply chain in business-to-business perspective (i.e. between SAPCO and its suppliers)". Accordingly, the main question, which this study focuses to answer, is:

How can e-procurement development in SAPCO and its suppliers be described?
To answer to above question, in this study we will deal with investigating how e-procurement is implemented by SAPCO and its local direct material suppliers for purchasing and also to explore the benefits and risks associated with implementation of their e-procurement system.

Therefore, the research questions we intend to answer are as follows:

**RQ1:** How e-procurement is being used for acquisition of parts and components between SAPCO and its suppliers?

**RQ2:** What are the benefits of applying e-procurement for SAPCO and its suppliers?

**RQ3:** What are the barriers of applying e-procurement for SAPCO and its suppliers?

### 1-4. Delimitations

We choose procurement, as the area of investigation and focus on e-procurement development as a new concept, which has gained a lot of attention in recent years. Moreover, we limit our subject to procurement of direct materials, which is believed as more important function in manufacturing organization. Our study is limited to Iranian automotive supply chain, though due to our limitations just one company which is the biggest purchasing companies in the industry and few numbers of its suppliers are investigated are considered as our units of analysis.

Why we choose procurement area for the main subject of the thesis is due to fact that the function of procurement has gained an increasingly greater importance especially in manufacturing organizations. At present, near to 80% of manufacturing cost come from purchased goods and materials. As a result, procurement has turned into a strategic issue for cost cutting and competency improvement, particularly for companies in global scale.

The reason for focusing on e-business and e-procurement is evident, concerning the key role of e-technologies in increasing the efficiency and effectiveness of organization’s processes and activities. We focus on e-procurement in automotive supply chain because likewise, supply chain management, relationship with customers, suppliers and intermediaries are based on a flow of information and the transactions between these parties. The area of our research is limited to development of e-procurement in automotive industry taking into consideration the rapid development of information technology in this sector and the advantages that are proclaimed by industry leaders.

Our investigation will narrow to direct procurement, because near to 80% of the purchasing value of manufacturing organization comes from direct items and it encompasses all items that are part of the finished products, such as raw material, parts and components. Therefore, direct procurement is more important to the core business due to its weight in running the production. In addition, our study focuses on supply chain, which is an area of business-to-business relationship with a large amount of interactions. Due to the reason that procurement process covers all area from ordering
to the delivery and suppliers have a significant involvement from the beginning of the chain, we will look into both sides of supply chain; buyer and sellers. The conceptualization of this delimitation is brought in chapter 3.

1-5. Outline

The structure of this master thesis is as follows:

Chapter 1 – Introduction

This chapter contains a short background description, a problem definition and the aim of the investigation, research questions as well as delimitations and outline. The chapter aims at introducing the reader to the area investigated as well as giving an understanding of why we investigate it.

Chapter 2 – Literature Review

In this chapter, we depict the literature that is the foundation of our empirical study. We discuss procurement in general and look at its significance, as ways of giving a background to the concept of procurement. Also the concept of e-Procurement and its applications, benefits and risks will come up ending with the concept of SCM. At last, we bring our conceptualizations and frame of reference extracted from literature, which will set as the foundation of our study.

Chapter 3 – Conceptualization

This chapter will concisely introduce the research questions, followed by the conceptualization that will provide a guide to answer the research questions.

Chapter 4 – Methodology

This chapter provides the methodology of the empirical study and gives the details concerning case study.

Chapter 5 – Empirical Data

This chapter will present the empirical findings, which consist of Companies background followed by the gathered data.

Chapter 6 – Data Analysis

In this chapter, we integrate the theoretical and empirical material presented so far, and carry out an analysis about our findings. We also try to answer our research questions.

Chapter 7 – Finding, Conclusions and Implications

This chapter summarizes our findings and conclusions and we discuss how we have attained the objectives of our investigation. Furthermore, implications for management and future research are presented.
2. Literature Review

In this chapter, we describe the relevant literature surrounding our research problem, which takes part as foundation of our empirical study. We discuss procurement in general and then look at its significance and contribution in company and supply chain management. Moreover, as a way of providing a fundamental and necessary framework for our thesis, different terms and concepts like e-procurement process, models, benefits and barriers are developed and defined in this chapter.

2-1. Procurement

2-1-1. General procurement issues & definition

Procurement encompasses all activities involved in obtaining goods and services and managing their inflow into an organization (Segev, 1998). Traditionally the corporate function of procurement is divided into strategic and operational tasks. Whereas the strategic tasks include sourcing activities, supplier management, and design and implementation of buying procedures, operative tasks embrace all transaction-oriented activities such as the excitement of purchase orders. (Kaufmann, 1999; Gebauer and Segev, 2001)

Procurement is the term most commonly employed to refer to the purchasing of goods and services for the day-to-day operation of a business. Procurement is an essential part of any organization’s ability to function effectively and efficiently. (Steven R Leonard, 2000)

2-1-2. The importance of procurement

Through a well-managed procurement business function, organizations can gain numerous benefits. Johan Versendaal, Mark Beukers and Ronald Batenburg (2005) identified the strategic importance of the procurement business function.

A company’s competitiveness and profit is highly dependable on how procurement is handled within the company. There is a direct influence on the profit because procurement stands for such a large part of a company’s costs. There is also an indirect influence on the profit due to the large part of the internal costs affecting what happens in the interface between the company and its suppliers. (Gadde & Håkansson, 1998)

Purchasing represents a significant part of a company’s total costs. In a study by Håkansson it is stated that purchasing costs often stand for between 40 and 60 percent of a company’s turnover. This is an increase from earlier when purchasing did not have such a significant role. (Ibid)

With the idea that the procurement function has the ability to influence corporate profitability favorably, the functional development has been a topic of great interest. Departing from the passive, re-active clerical viewpoint of the 70’s the procurement
function has the ability to develop itself in a strategic pro-active function contributing, as much as other business functions, to the creation of (sustainable) competitive advantages (Versendaal et al, 2005). Many authors state this fact that such a significant advantage can be achieved. (Porter, 1985; Cavinato, 1991; Herberling, 1993)

2-1-3. Why procurement is important

According to Gadde & Håkansson (1998), there are a number of reasons why purchasing has become more significant and consists of a larger part of the turnover.

The first reason is that purchasing has gradually become more involved in larger parts of the company’s total activity and due to this; the purchasing department's capacity and competence have great consequences for the efficiency of the company. Purchasing is significant for the company’s profitability because of the large volume that it stands for. (Ibid)

A second reason why purchasing has become more important is that purchases directly influence the result. One cent less spent on purchasing is one cent extra added to the profit. This expression is often confused with the notion that one cent lower price leads to a higher profit. Nothing could be more wrong, due to the indirect cost associated with purchases. The acquired goods or services cannot be seen in isolation, but have to be seen in relation to the function they perform. (Ibid)

The third reason for the increased importance of purchasing is the insight that benefits can be made by having deeper and more long-term relationships with a supplier. These potential benefits concern flow of material, flow of information and cooperation in technical development. (Ibid)

A forth reason for the increased importance of purchasing is the increased complexity that purchasing involves. The more society develops, the larger the differentiation becomes and the more specialized units become. The increased specialization has lead to products that are more sophisticated and a more difficult purchasing process. International purchases have also increased which has lead to a number of new difficulties concerning the distance to suppliers, handling currencies and different legislations. (Ibid)

We can conclude by stating that the importance of procurement has gained an increasingly greater importance since organizations have turned their focus to lowering costs and increasing efficiency.

2-1-4. Procurement and the Value Chain

Harvard Business School professor Michael E. Porter, who describes the value chain as a tool for ascertaining a company's competitive advantage, popularized the concept of the value chain (SAP R/3, 1999). Value chain is a well-established concept for considering key activities that an organization can demonstrate or manage with the intention of adding value for the customer as products and services move from conception to delivery to the customer. (Chaffey, 2004)
According to Porter, every firm can be understood as a collection of activities that range from the design, marketing, delivery, and support of a product. The value chain breaks these activities down to strategically relevant categories "in order to understand the behavior of cost and the existing and potential sources of differentiation". By so considering each activity within a company in terms of the value chain, a firm can isolate potential sources of its competitive advantage. (SAP R/3, 1999)

Every industry player has a value chain, which in some parts may have some connections with others. Porter states that, suppliers have value chains that provide the purchased inputs to the firm's chain; channels have value chains through which the firm's product or service passes; buyers have value chains in which the firm's product or service is employed (Porter, 1985: P22). In the value chain context, an internal value chain within the boundaries of an organization and an external value chain where partners perform activities can be identified. (Chaffey, 2004)

The value chain in figure 2.1 is composed of value activities and a margin, which is achieved by these activities. Value activities can be divided into physically and technically groups of activities (Weele, 2002:P8). Michael Porter considers every firm basically as a collection of primary and supporting value activities that are performed to design, produce, market, deliver to the buyer and its support after sale and support products that are valuable for customers. (SAP R/3, 1999; Weele, 2002)

Figure 2-1. Purchasing and the value chain

Source: Porter, 1985
In figure 2.1 along the bottom are what Porter called primary activities and across the top are what he called support activities, which provide inputs or infrastructure that allow the primary activities to take place on an ongoing basis (Porter, 1985).

In this respect, the activities performed by a firm in any industry can be grouped into the nine generic categories shown. The labels may differ based on industry convention, but according to Porter, every firm performs these basic categories of activities in some way or another. (Ibid)

**Primary Activities**

Porter differentiates between five generic categories of primary activities (SAP R/3, 1999; Weele, 2002):

- Inbound logistics (inventory control, vehicle scheduling, returns to supplier, etc.)
- Outbound logistics (collecting, order processing, delivery vehicle operation, scheduling, etc.)
- Operations (machining, packaging, assembly, etc.)
- Marketing and sales (advertising, promotion, quoting, etc.)
- Service (installation, repair, training, etc.)

**Support Activities**

Support activities are grouped into four categories (Weele, 2002: P10-12):

- Procurement
- Technology development
- Human resources management
- Firm infrastructure

Support activities bolster the primary activities and each other to perform a given function. The first three can be associated with specific primary activities, or they can support the entire chain. Firm infrastructure obviously supports only the entire chain rather than a particular primary activity. (SAP R/3, 1999)

Porter regards procurement as a support activity. In the above classification, procurement relates to the function of purchasing inputs used in the firm's value chain. These may include raw materials, supplies, and other consumable items as well as assets such as machinery laboratory equipment, office equipment and buildings. These examples illustrate that purchased inputs may be related to primary activities as well as support activities. This is one reason why Porter classifies procurement as a support activity and not as a primary activity. (Weele, 2002: P10-12)

According to Porter, procurement is the obtaining of purchased inputs, such as raw materials, purchased services, machinery, and so on. Procurement stretches across the entire value chain because it supports every activity, that is, every activity uses purchased inputs of some kind. There are typically many different discrete procurement activities within a firm, often performed by different people (Porter, 1985). He uses the term procurement rather than purchasing since, as he argues, the
usual connotation of purchasing is too narrow among managers. The dispersion of the procurement function often obscures the magnitude of total purchases and means that many purchases receive little scrutiny. (Weele, 2002: P12)

Based on Porter's Value Chain model (Chaffey, 2004: 255), value can be added to the customer by reducing cost and adding value to customers:

- Within each element of the value chain such as procurement, manufacture, sales and distribution;
- At the interface between elements of the value chain such as between sales and distribution.

All activities need to be performed in such a way that the total value generated by the company is more than the sum of its costs. In Porter's terms, the total value of the company is determined by the whole of its sales value (Weele, 2002: P12). In this framework, electronic communications can be used to enhance the value chain by making value chain activities such as procurement more efficient and also enabling data integration between activities. (Chaffey, 2004: P255)

2-1-5. Purchasing, procurement & supply chain management

Purchasing and Procurement

The purchasing and procurement have been almost used interchangeably. However they differ significantly in their scope, purchasing refers to the buying material and all activities associated with the buying process. Electronic purchasing addresses only one relatively minor aspect of procurement problems companies face. Procurement on the other hand, is broadly defined to include a companies requisitioning purchasing, transportation, warehousing and in-bound receiving processes. Recent procurement strategies focus on restructuring the entire order-to-delivery process rather than on specific tasks within the process. The new procurement models leverage a nearly ideal combination of volume advantage, flexible contracts and valuable supplier's alliance, along with decentralized and user-responsive purchases. (Kalakota and Robinson, 2001)

Croom also distinguished between purchasing and procurement. In his article purchasing was classified as a supplier-facing, boundary spanning activity, and procurement defined as the total process involved in the identification, specification, co-ordination and determination of an organization's resource needs. Then, he classified the purchasing activity as a subset of supply chain procurement. Figure 2-2 below adopted from Croom, illustrates the core supply chain activities including procurement (Croom, 2001).
Purchasing and supply management

The concept of supply chain management (SCM) are not totally new to the body of management literature; credible research studies and articles on the topic can be found that are over 25 years old. However, during the past 5 to 10 years, the focus on SCM as a competitive weapon has increased due to the significant effects that supply chain activities have on all elements of a company’s or organization’s financial performance, including operation cost, revenue growth, and asset management.

Compared to the internal focus of traditional logistic approaches, SCM emphasizes the management of upstream and downstream relationships and the role of supply chain optimization to increase customer value at less cost. Examples of SCM initiatives are just in time, zero inventory, efficient consumer response, vendor-managed inventory or continuous replenishment. (Puschmann and Alt, 2005)

Chaffey defined supply chain management as the coordination of all supply activities of an organization from its suppliers and partners to its suppliers and partners and to its customers (Chaffey, 2004:P248). According to him, the key activities of upstream supply chain management are procurement and upstream logistics (Chaffey, 2004: P269).
According to Puschmann and Alt (2005), SCM involves three areas to deal with: order processing activities, physical activities, and order-related financial activities, which at least two of them are, related procurement function.

Mentzer (2001) defines the supply chain as: “a set of three or more entities directly involved in the upstream and downstream flows of products, services, finances and or information from a source to a customer.”

In developing a supply chain model, Mentzer (2001), includes purchasing, logistics and procurement as inherent supply chain processes.

The Mentzer research goes further by extolling the advantages of superior Supply chains as being:

- Enhanced cost control,
- Improved customer value, and
- Providing an avenue for competitive advantage.

Purchasing management is part of supply chain management. The latter concept can be described as the management of all activities, information, knowledge and financial resources associated with the flow and transformation of goods and services up from the raw materials suppliers, component suppliers and other suppliers in such a way that the expectations of the end users of the company are being met or surpassed. Supply chain management differs from purchasing in that it encompasses all logistics activities. Moreover it entails the management of relationships not only with first tier suppliers but also with lower tier suppliers. (Weele, 2002: P17)

Supply chain management encounter the planning and control of all tasks along the business value chain – from production planning to capital asset management. The goal of supply chain management is to decrease inventory levels, lower costs, hasten time to market, and ultimately to provide better customer service and satisfaction. In the past, companies tended to isolate each of their operations and analyze them without consideration of the causes that influenced them or the effects that would result from changing them. By introducing the supply chain, companies have a more comprehensive understanding of every thing that affects the delivery of goods and materials from the original supplier to the end users. (SAP R/3, 1999)

Supply chain management presented as an integrative philosophy to manage the total flow of a distribution channel from suppliers to the ultimate user. According to them successful SCM relies on forming strategic partnerships with trading partners along the supply chain, with one partner playing a key role in coordinating and overseeing the whole supply chain. (Weele, 2002)

2-1-6. Direct and Indirect procurement

Most purchasers and industrial marketing researchers support the notion that organizational buying activities vary according to the type of product bought.
According to Chaffey (2004), there are two broad categories of procurement: those that relate to manufacturing of products (production-related procurement) and operating or non-production-related procurement that supports the operations of the whole business and includes office supplies, furniture, information systems, maintenance, repair and operating (MRO) goods and a range of services from catering, buying travel, and professional services such as consulting and training.

According to Weele (2002: P22), purchased materials and services can be grouped into the following categories:

- Raw materials;
- Supplementary materials;
- Semi-manufactured materials;
- Components;
- Finished products;
- Investment goods or capital equipment;
- Maintenance, repair and operating materials (MRO items);
- Services.

In the above classification, components are manufactured goods which will not go through additional physical changes, but which will be incorporated in a system with which there is a functional relationship by joining it with other components. They are built into an end product. Examples are headlight units, lamps, batteries, engine parts, electronic parts and transmissions. A distinction can be made between specific components and standard components. Specific components are produced in according to design or specification of the customer, whereas, standard components are produced according to specification of the supplier. Most of these items can be characterized as being easily describable (Weele, 2002; Hoppen et al, 2002).

Weele (2002), states that the procurement function aimed at the support activities may be very different in character. Some of the purchases to be made are routine purchases (MRO-supplies) and may be repetitive and low in value. Other purchases may have a project character and may be unique and high valued (investment goods, capital equipment, buildings). In general, this type of purchases will be referred to as non-production buying or general expenses. They may be classified into: MRO-suppliers, investment goods and services. For maintenance, repair and operating (MRO) supplies, the internal processes of procurement are typically costly and poorly coordinated. (Croom, 2001; Weele, 2002)

Direct procurement addresses all components and raw materials that are used in the manufacturing process of a finished product to make the products that are core to the business, such as sheet metal, semiconductors, and petrochemicals, whereas indirect procurement focuses on products and services that are neither part of the end product nor resold directly. (Jaworski and Rayport, 2001; Puschmann and Alt, 2005)

Direct materials or manufacturing inputs vary by industry, company position in the supply chain, and types of products sold and is usually purchased from industry-specific or vertical suppliers and distributors. The goods also tend to require specialized logistics and fulfillment mechanisms. Direct procurement generally refers
to the purchasing of items that immediately enter a manufacturing process, such as the parts that are assembled into a car or computer. Non-productions or operating inputs are items that business needs to run day-to-day business operations. (Kaplan and Sawhney, 2000; Kalakota and Robinson, 2001; Jaworski and Rayport, 2001)

Indirect materials or operating goods tend not to be industry specific, most business need computers, paperclips and cleaning services. These products are purchased from horizontal suppliers, suppliers with a broad product program, and are more likely to be shipped through generalists. (Jaworski and Rayport, 2001; Puschmann and Alt, 2005)

Compared to direct goods and services, the procurement of indirect items encompasses a wider range of products, typically involves a wider number of buyers (possibly every employee), and is much less predictable with respect to buying volume and frequency. OR (Operational Resources) are items such as travel, office supplies, contract labor, cleaning supplies and services. Although expenditure on operational resources varies by industry and organization, on average these purchases account for 40 per cent of purchasing spend. (Bu’rca, Fynes and Marshall, 2005)

Because direct materials are important to the core business, very often the requirement for direct procurement are automatically generated by core planning and transaction systems, such as MRP systems in manufacturing. Delivery, receipt, and quality of direct materials are more closely monitored and managed to ensure that dependent manufacturing schedules are not compromised. In contrast, in most cases, the procurement of indirect materials is highly manual, involving an employee's submission of a purchase request or requisition to a purchasing department, where all requisitions are then aggregated into purchase orders and sent to contracted suppliers to fulfill. The indirect purchasing cycle tends to be drawn out by the control and approval process. (Jaworski and Rayport, 2001)

Table 2.1 Most important differences between direct and indirect purchases

<table>
<thead>
<tr>
<th></th>
<th>Direct Purchases</th>
<th>Indirect Purchases</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Items</strong></td>
<td>Production items: raw materials, components</td>
<td>Operation resources: offices and computer supplies, MRO supplies, travel</td>
</tr>
<tr>
<td><strong>Scheduled by</strong></td>
<td>Production runs</td>
<td>AD hoc, not scheduled</td>
</tr>
<tr>
<td><strong>Locus of operation</strong></td>
<td>Professional buyer's desktop</td>
<td>Employee desktop</td>
</tr>
<tr>
<td><strong>Approval</strong></td>
<td>Not required</td>
<td>Required</td>
</tr>
<tr>
<td><strong>Automation</strong></td>
<td>High degree</td>
<td>Almost no</td>
</tr>
<tr>
<td><strong>Driven by</strong></td>
<td>Design specification</td>
<td>Catalog</td>
</tr>
<tr>
<td><strong>Product assortment</strong></td>
<td>Limited to large</td>
<td>Very Large</td>
</tr>
<tr>
<td><strong>Number of suppliers</strong></td>
<td>Limited, transparent</td>
<td>Very Large</td>
</tr>
<tr>
<td><strong>Purchasing turnover</strong></td>
<td>Very large, considerable</td>
<td>Limited</td>
</tr>
<tr>
<td><strong>Number of purchase orders</strong></td>
<td>Considerable</td>
<td>Very Large</td>
</tr>
<tr>
<td><strong>Control</strong></td>
<td>Depends on type of production planning</td>
<td>Limited, forecast-related or project-related planning</td>
</tr>
<tr>
<td><strong>Decision making unit</strong></td>
<td>Engineering, manufacturing specialist dominant</td>
<td>Fragmented, varies with product or service.</td>
</tr>
<tr>
<td><strong>Purchase Predictability</strong></td>
<td>Volatile</td>
<td>Internally-driven</td>
</tr>
<tr>
<td><strong>Order Size</strong></td>
<td>Large lots</td>
<td>Often small</td>
</tr>
<tr>
<td><strong>Collaboration with Suppliers</strong></td>
<td>Varies, usually high, but low for commodities</td>
<td>Varies, low for MRO supplies, high for equipment and services</td>
</tr>
<tr>
<td><strong>Percentage of Total Dollars Spent</strong></td>
<td>80%</td>
<td>20%</td>
</tr>
<tr>
<td><strong>Percentage of Total Number of Purchase Orders</strong></td>
<td>20%</td>
<td>80%</td>
</tr>
<tr>
<td><strong>End Customer</strong></td>
<td>External customer</td>
<td>Internal customer</td>
</tr>
</tbody>
</table>


2-1-7. Purchasing methods

**Systematic and spot sourcing**

According to Chaffey (2004), considering the way that how items are bought, business tends to buy by one of two methods:

- Systematic sourcing—negotiated contracts with regular suppliers, typically in long-term relationships.
- Spot sourcing—fulfillment of an immediate need, typically of a commoditized item for which it is less important to know the credibility of the supplier.

Business purchasing can be classified in how products and services are bought. Companies can engage either in systematic sourcing or in spot sourcing. Systematic sourcing involves negotiated contracts with qualified suppliers. Because the contracts
tend to be long term, the buyers and sellers often develop close relationships. In spot sourcing the buyers’ goal is to fulfill an immediate need at the lowest possible cost. The prices are dynamic based on supply and demand and the buyers on the spot market often do not know whom they are buying from. Commodity products like oil, steel and energy exemplify this approach. (Weele, 2002: P174)

2-1-8. Purchasing & Procurement functions

Many OEMs need to reorganize their purchasing functions in order to capture the best possible innovations while keeping costs within reasonable margins. Purchasing functions must master three key objectives: innovation capture, supplier management, and cost optimization. The purchasing department must fulfill four core functions: systems purchasing, components purchasing, non-production purchasing, and strategic supplier management (Dietz at al, 2004:P7). However, the scope of the purchasing function is usually much broader than that of the purchasing department. (Weele, 2002)

In practice, as well as in the literature, many terms and concepts are used in the area of purchasing. However, no agreement exists about the definition of these terms. Terms like procurement, purchasing, supply and logistics management are used interchangeably. (Ibid)

In short, the purchasing function should obtain the proper equipment, material, supplies and services of the right quality, in the right quality, at the right price and from the right source. In this description, the purchasing function is regarded primarily as an operational activity (Weele, 2002). Procurement refers to all activities involved with obtaining items from a supplier; this includes purchasing, but also inbound logistics such as transportation, goods-in and warehousing before the item is used. The key procurement activities and associated information flows within an organization are shown in figure 2-3, which is adopted from Chaffey (2004).

![Figure 2-3. Key procurement activities within an organization (Chaffey, 2004)](source: Chaffey, 2004)
Purchasing function is obtaining from external sources all goods, services, capabilities and knowledge which are necessary for running, maintaining and managing the company's primary and support activities at the most favorable conditions. Figure 2.4 schematically illustrates the main activities within the purchasing function. It shows that these activities are closely interrelated. This picture is referred to as the purchasing process model. (Weele, 2002: 14)

Figure 2.4. Purchasing process model and some related concepts: *=USA; **=UK

As seen figure 2.4, procurement is a somewhat broader term. It contains all activities needed in order to get the product from the supplier to its final destination. It encompasses the purchasing function, stores, traffic and transportation, incoming inspection, and quality control and assurance. (Weele, 2002)

Typically, a company’s procurement function is subdivided into strategic and tactic or operational processes since activities and priorities in these two areas are entirely different. Supplier management, the pooling of purchase requisitions and procurement-oriented product development are tasks that are typically assigned to strategic procurement. (Puschmann and Alt, 2005)

Classified procurement is classified functions in three categories of strategic, tactic and operational procurement functions. He explained that in the strategic procurement function decisions on supplier selection are made. In the tactic procurement function decisions are made on contracts and contract renewal. And finally, in the operational procurement function the ordering, delivery and payment process is performed. (Dignum, 2003)
2-1-9. Purchasing & procurement process and activities

In the literature a number of different theories and definitions of purchasing, procurement and supply processes exist. However, much of the literature is relate to purchasing or procurement of indirect goods. In fact no precise differentiation was found between processes of purchasing those two types of goods.

Robinson, Fairs and Wind (1967), made a short summary of the purchasing process description. Their model consists of eight different phases as follows:

- Phase 1: Anticipation or recognition of a problem (need);
- Phase 2: Determination of characteristics and quantity of needed items;
- Phase 3: Description of characteristic and quantity of needed item;
- Phase 4: Search for and qualification of potential sources;
- Phase 5: Acquisition and analysis of proposals;
- Phase 6: Evaluation of proposals and selection of supplier(s);
- Phase 7: Selection of an order routine;
- Phase 8: Performance feedback and evaluation.

Robinson et al. stated that above phases are dynamic and changing and there are relations between the phases, which means instead of occurring sequential they can be parallel.

The primary job process of procurement was indicated by (NECCC, 2002) as follows:

- Search for products and services needed by the organization;
- Handle myriad details relating to their requisition;
- Approval;
- Payment;
- Taking responsibility for the delivery of the host of items about which they might or might not know very much.

He continued that process was labor-intensive, dominated by paper, often centralized, and subject to countless costly inefficiency due to re-keying, changing prices, product sets and personnel.

The purchasing function traditionally encompasses the process of buying. It involves determining the need, selecting the supplier, arriving at a proper price, specifying terms and conditions, issuing the contract or order, and following up to ensure proper delivery. (Weele, 2002)

According to Dobler and Burt, the purchasing function consists of the essential activities associated with the acquisition of the materials, services, and equipment used in the operation of an organization (see figure 2-5). The major types of activities are:

1- Coordination with user departments to identify purchase needs;
2- Discussions with sales representatives;
3- Identification of potential suppliers;
4- The conduct of market studies for important materials;
5- Negotiation with potential suppliers;
6- Analysis of proposals;
7- Selection of suppliers;
8- Issuance of purchase orders;
9- Administration of contracts and resolution of related problems;
10- Maintenance of a variety of purchasing records (Dobler and Burt, 1996, P: 35).

The procurement process, or concept, encompasses a wider range of supply activities than those included in the purchasing function. In addition, it typically includes a broadened view of the traditional buying role, with more buyer participation in related materials activities. Specific activities usually included in the process are:

1- Participation in the development of material and service requirements and their specifications;
2- Conduct of materials studied and management of value analysis activities;
3- Conduct of more extensive material market studies;
4- Conduct of all purchasing function activities;
5- Management of supplier quality;
6- Purchase of inbound transportation;
7- Management of investment recovery activities (salvage of surplus and scrap) (Ibid).

In essence, procurement tends to be broader and more proactive, with some focus on strategic matters, as compared with the typical implementation of the purchasing concept. (Ibid, p: 36)

Supply management is a process responsible for the development and management of a firm's total supply system-both the internal and the external components. At an operational level, it includes and expands the activities of the purchasing function and the procurement process. Its major focus, however, is strategic.

According to Dobler and Burt (1996), specific activities generally included in supply management are:

1- Early purchasing involvement (EPI) and early supplier involvement (ESI) in product design and subsequent specifications development for important items, typically using cross-functional teams.
2- Conduct of all purchasing function and procurement process activities.
3- Heavy use of cross-functional teams in supplier qualification and selection.
4- Heavy use of purchasing partnering arrangements and strategic alliances with suppliers- to develop close and mutually beneficial linkages with key suppliers in the value chain and to control quality and costs.
5- Continuous identification of threats and opportunities in a firm's supply environment.
6- Development of strategic, long-term acquisition plans for all major materials.
7- The monitoring of continuous improvement in the supply chain
8- Active participation in the corporate strategic planning process.
Figure 2-5. The relationship of purchasing/procurement/supply management activities— with materials management and the flow of materials decisions through a firm

**Material Management**

### Purchasing Activities
1. Identification of purchasing needs
2. Discussion with sales people
3. Identification of suppliers
4. Market studies
5. Negotiations
6. Analysis of proposals
7. Selection of suppliers
8. Issuance of P.O.s
9. Contract administration
10. Purchasing records

### Procurement Process Activities
- Material specifications
- Materials studies and value analysis
- Market research
- Purchasing Function Activities
- Management of supplier quality
- Purchase of inbound transportation
- Management of investment recovery

### Supply Management Activities
1. EPI and ESI in product design
2. Purchasing Activities
3. Supplier qualification and selection teams
4. Partnering and strategic alliances
5. Monitoring of supply environment
6. Strategic materials acquisition plans
7. Monitoring of continuous improvement
8. Corporate strategic planning

### Inventory Decisions
- Row materials
- Subassemblies
- Parts
- Supplier

### Operational Activities
- Receiving
- Materials Handling
- Storage
- Production Scheduling and Control
- Traffic

**Tactical Focus**

**Strategic Focus**
A compilation of the Novack and Simco, Archer and van Weele (2002) on purchasing processes is presented by Knudsen (2002), which clearly compares three proposed processes.

### Table 2-2. Three purchasing processes from the literature and a compilation of them

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify or reevaluate needs</td>
<td>Information gathering (search for suppliers that can satisfy requirements)</td>
<td>Determining the specification of goods and services that need to be bought</td>
<td>Identify needs</td>
</tr>
<tr>
<td>Define and evaluate user requirements</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decide to make or buy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identify type of purchase</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conduct market analysis</td>
<td></td>
<td>Conduct market analysis</td>
<td></td>
</tr>
<tr>
<td>Identify all possible suppliers</td>
<td>Supplier contact (RFx are advertised or direct contact with suppliers are initiated)</td>
<td></td>
<td>Send out for and expedite RFx</td>
</tr>
<tr>
<td>Prescreen all possible suppliers</td>
<td>Background review (references are consulted, one's own investigations conducted)</td>
<td></td>
<td>Do background review</td>
</tr>
<tr>
<td>Evaluate remaining supplier base</td>
<td></td>
<td>Identify most suitable supplier</td>
<td></td>
</tr>
<tr>
<td>Choose supplier</td>
<td>Negotiation (price, availability, customization possibilities)</td>
<td>Preparing and conducting negotiations</td>
<td>Negotiate contracts and select suppliers</td>
</tr>
<tr>
<td>Deliver product/performance service</td>
<td>Fulfillment (shipment, delivery and payment)</td>
<td>Placing an order with the selected supplier</td>
<td>Purchase order fulfillment</td>
</tr>
<tr>
<td>Post purchase/make performance evaluation</td>
<td>Consumption, maintenance and disposal (evaluation of performance)</td>
<td>Monitor and control the order</td>
<td>Monitor supplier performance</td>
</tr>
<tr>
<td></td>
<td>Renewal (when product is consumed)</td>
<td>After-care and evaluation</td>
<td></td>
</tr>
</tbody>
</table>

In the above table the three purchasing processes are not completely harmonized and the compiled purchasing process does not cover exactly all mentioned aspects. Source: Knudsen, 2002: Part 3.5.1
2-2. e-Procurement

2-2-1. General e-procurement issues and definitions

Traditionally, procurement has involved a number of communication mediums to facilitate procurement process between the various parties. These have included the use of mail, phone, and fax, EDI and more recently, email and the Internet.

Basically, e-procurement means that electronic communications are used to support all of the transactions that facilitate the procurement process. (NECCC, 2002)

E-procurement is a new phenomenon, but what it wants to achieve is not new. As long as companies have been around, they have sought to improve efficiency and effectiveness. E-procurement is an umbrella concept that barks up the same tree, improving efficiency and effectiveness (Neef, 2001, p: 58), gives three example of this. Firstly, e-procurement systems continue the trend of reducing transaction costs by automating processes, replacing human labor with information technology. Secondly e-procurement helps to facilitate increased integration, and thirdly, e-procurement helps to facilitate increased integration, and Neef argues: "e-procurement is an important step towards development of the extended enterprise where the supply chain becomes a continuous, uninterrupted process extending from buyer through selling partners".

It can also include activities such as:

- Advertising tenders;
- Electronic submission of tenders;
- Electronic ordering;
- Internet sourcing via third parties;
- Electronic mail between buyers and sellers;
- Electronic mail in contract management;
- Research into supplier markets; and
- Integration of procurement within the financial and inventory systems.

There are some fundamental things the purchasing company wants to achieve when it comes to purchasing. These include reducing the time employees spend looking for a product, service or suitable supplier, reducing the time and cost of administering purchases, reducing cycle times, increasing volume with a few preferred suppliers to get better pricing and other conditions, as well as limiting choices to only a number of pre-qualified suppliers to ensure quality. (Bakowski, 2002)

Electronic procurement systems in essence mirror the procurement process through the provision of two distinct, but connected, infrastructures - internal processing (via, for example, corporate intranet) and external communication with the supply base (via, for example, Internet-based platforms). (Croom, 2000)
E-procurement has been the subject of a great deal of research but again this has tended to focus on the development of inter-organizational electronic networks. (De Boer, 2002)

The term e-procurement results from the electronic support of procurement activities between a purchaser and a supplier through information and communication technologies. (Chaffey, 2002)

According to (Rayport and Jaworski, 2002; Eyholzer, 2000) we understand e-procurement as the usage of Web-based functions and services (e.g. Catalogue management, requisition, control and approval, receiving and exception processing, financials and payment processing and logistics and supply-chain management) that allow employees of a buying organization to purchase goods and services and allow suppliers to manage and communicate the fulfillment of purchase orders submitted.

2-2-2. Impact of e-Procurement on procurement work

During the last year or so there has been a shift in the attitude towards e-procurement and e-business as well. The hype has to some extent subsided, and companies are becoming more aware and demanding a solid business case before jumping on the e-something bandwagon. The Internet is not a miracle cure for poorly functioning purchasing organizations (Van Weele, 2002, P: 181).

Expectations were great at the end of the 20TH century but nowadays it seems as though the harvesting did not fully materialize. Many of the anticipated benefits came mainly from improving operational efficiency, and also from reduced input costs. The follow-up studies that have been done indicate that savings from increased operational efficiency were very hard to find. Instead, the rationale for implementing e-procurement solutions has shifted towards compliance, increasing leverage, etc (John, 2001: 27). Another example tells the same story; ROI has been hard to measure and the e-procurement initiative had been seen as an infrastructure project and as an enabler for business (Arminas, 2001). Even if some of the operational benefits did not materialize, information technology is a significant enabler and will continue to be for purchasing to take a more integrative and strategic role (Mentzer, 2001:232; Essig and Arnold, 2001:48), and also for promoting overall corporate success. (Ellram and Zsidisin, 2002)

It has also been realized that e-procurement alone generates savings or added value, but in order to reap the full potential of e-procurement it must be harmonized with the sourcing strategy. Too often have e-procurement applications been set to handle low-value indirect items, certainly saving process costs, but the full potential is believed to reside with direct material in conjunction with efficient and effective sourcing strategies. (Balchin, 2001)

E-procurement impact on procurement performance has not fully materialized as expected. There are however important and promising features of e-procurement, such as improved information sharing capabilities increased connectivity, and efficiency improvements that should not be overlooked.
E-procurement solutions come in a variety of types and configurations to fit the needs of virtually any business. Today’s challenging economy has put increased pressure on businesses to improve productivity and reduce costs. Many organizations are finding that an effective way to accomplish this is to change the role of their purchasing departments instead of focusing on operational, transaction-oriented services, empowering purchasing staff to strategically manage the entire purchasing process. An e-procurement solution plays a fundamental role in transition of procurement to e-procurement by streamlining the buying process and providing the information needed to make more intelligent purchasing decisions. An effectively implemented e-procurement solution can: (Cisco Systems, 2002)

- Reduce paperwork and redundant effort, improving productivity and lowering the cost of the purchasing process
- Enable companies to locate suppliers with the best prices and quality and help streamline negotiations and contracting
- Take full advantage of an enterprise’s buying power by enabling it to qualify for volume discounts and ensuring purchases are made through preferred suppliers
- Streamline and automate purchasing through critical suppliers, enabling more timely and accurate order fulfillment

Table 2-3 illustrates the impact e-procurement is having on enterprise compliance and spend management initiatives. Performance improvements recorded map very closely to Aberdeen’s previous benchmarks, indicating that e-procurement is consistently delivering on its initial value proposition.

<table>
<thead>
<tr>
<th>Performance Area</th>
<th>Before e-Proc</th>
<th>After e-Proc</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Of spending that is off-contract (“maverick”)</td>
<td>38%</td>
<td>14.2%</td>
</tr>
<tr>
<td>Price savings on maverick purchases brought into compliance</td>
<td>-</td>
<td>7.3%</td>
</tr>
<tr>
<td>Requisition-to-order cycles</td>
<td>20.4 days</td>
<td>3.8 days</td>
</tr>
<tr>
<td>Requisition-to-order costs</td>
<td>$56</td>
<td>$23</td>
</tr>
<tr>
<td>% Of spend under management of the procurement group</td>
<td>56%</td>
<td>69%</td>
</tr>
</tbody>
</table>

Source: Aberdeen Group, December 2004
2-2-3. e-business, e-commerce & e-procurement

We start this section by presenting some definition of e-business and then some definition of e-procurement will be outlined. In the literature several definitions of e-business are available.

When a business has fully integrated information and communications technologies (ICTs) into operations, potentially redesigning its business processes around ICT of completely reinventing its business model…e-business, is understood to be the integration of all these activities with the processes of a business through ICT (Chaffey, 2004: P9).

IBM defines e-business like this: E-business is the use of Internet technologies to improve and transform key business processes (Knudsen, 2002: P99).

Amit and Zott, say that business conducted over the Internet is e-business. Kalakota and Robinson, proclaim, 'E-business is the complex fusion of business process, enterprise solutions, and organizational structure necessary to create a high-performance business model. The four references cited do not provide a homogenous view of e-business; instead, they seem to emphasize different aspects such as technology, communication, the Internet, business process, etc (Knudsen, 2002: P99).

Knudsen define e-business as, the use of IT (and the Internet) for business purposes in inter-firm relationship, including both the technology-mediated exchange between parties and the electronically based intra- or inter-organizational activities facilitating such exchanges. He define state that electronic commerce ' generally refers to an inter-organizational information system that is intended to facilitate business-to-business electronic communication, information exchange and transaction support through a web of either public access or private value-added networks (Knudsen, 2002: P99).

Chaffey (2004) defines electronic business (e-business) as all electronically mediated information exchanges, both within an organization and with external stakeholders supporting the range of business processes. In relation to e-commerce he states e-business is applied as a broader term encompassing e-commerce but also including all electronic transactions within an organization.

Chaffey (2004) employs electronic commerce (e-commerce) to refer to all types of electronic transactions between organizations and stakeholders whether they are financial transactions or exchanges of information or other services. He believes e-business is broader and also contain e-commerce in itself, since e-commerce does not refer to many of the transactions within a business, such as processing a purchasing order, that are part of e-business. Then he divides e-commerce to Buy-side and Sell-side e-commerce. Based on his definition e-commerce transactions between an organization and its suppliers and other partners is buy-side e-commerce and e-commerce transactions between an organization and its customers are Sell-side e-commerce. By these definitions it can be interpreted that e-procurement in B2B setting is the same as or very close to buy-side e-commerce.
2-2-4. e-Procurement definition

Since the 1960s the earliest literature on e-procurement is that relating to electronic data interchange – a technology that has been in use in organizations since the 1960s. One of the earliest articles on this subject was a 1967 paper extolling the benefits of electronic data interchange for buyers and sellers in the hospital environment. Most discussions about electronic inter-organizational systems in the academic literature up until the mid 1990s involved electronic data interchange. It is only from the mid 1990s onward that there is a shift towards the discussion of the use of the Internet for electronic commerce. (Tonkin, 2003)

The main idea of e-procurement is to include the end-user (requester) in the procurement process via an electronic multi-vendor catalog and to close the process gaps (e.g. re-entry of data) in the supply chain for indirect goods. (Puschmann and Alt, 2005: P122–133)

Knudsen (2002) by combining the procurement definition and e-business definition produced the following e-procurement definition:

E-procurement – The use of IT (and the Internet) for procurement purposes, including both the technology-mediated exchanges between parties and the electronically based intra-or inter-organizational activities facilitating such exchanges. (Ibid: P99)

E-procurement is a way of sourcing suppliers and buying goods and services that spends on new practices, new technology, and new services accessed over the Internet. (McKie, 2001, P99)

E-procurement — the purchase of goods or services through the Internet — forms part of an overall strategic procurement plan. That plan may include strategic sourcing or supplier rationalization, supply chain automation, and participation in one or more market places. The commodities purchased can be operational resources (non-production) or production resources (raw materials). (Bu’rca, Fynes and Marshall, 2005)

E-procurement is defined as inter-company trade where the final order is placed online. (Ibid)

For each of the 'five rights' of purchasing e-procurement should be directed at improving performance, which are sourcing items: (Chaffey, 2004)

1. At the right price
2. Delivered at the right time
3. Are of the right quality
4. Of the right quality
5. From the right source

Electronic procurement (e-procurement): the electronic integration and management of all procurement activities containing purchase request, authorization, ordering, delivery and payment between a purchase and a supplier. (Chaffey, 2004)
2-2-5. e-procurement benefits

As we will see in the section of barriers of e-procurement, there are some benefits that are related to adoption of Internet or e-business applications in general while; some benefits are just attributed to implementation of e-procurement system, likewise.

Internet technologies can reduce production times and costs by increasing the flow of information as a way to integrate different value chain activities. The Internet enables value to be created by gathering, organizing, selecting, synthesizing and distributing information (Chaffey, 2004: 256). Aggregation alone can generate savings of 5 to 10 percent. This does not include other process-related savings. Although e-commerce is not needed for aggregation, it makes aggregation easier, faster, and cheaper (Andrew, 2001).

For many companies, the greatest benefit of e-commerce will come not from lower prices but from new levels of collaboration all along the value chain, from product development through production and distribution to managing the customer relationship. The ability to use e-commerce tools in order to collaborate with suppliers, distributors, and customers in all these activities will help determine tomorrow's winners. (Ibid: P6)

Chaffey (2004), classified benefits of e-business adoption to tangible benefits and intangible benefits as follows:

**Tangible benefits:**
- Increased sales from new sales lead giving rise to increased revenue from:
  - New customer, new markets
  - Existing customers (repeat-selling)
  - Existing customers (cross-selling).
- Marketing cost reduction from:
  - Reduced time in customer service
  - Online sales
  - Reduced printing and distribution costs of marketing communications.
- Supply-chain cost reductions from:
  - Reduced levels of inventory
  - Increased competition from suppliers
  - Shorter cycle time in ordering.
- Administrative cost reductions from more efficient routine business processes such as recruitment, invoice payment and holiday authorization.

**Intangible benefits:**
- Corporate image communication
- Enhancement of brand
- More rapid, more responsive marketing communications including PR
- Faster product development lifecycle enabling faster response to market needs
- Improved customer service
- Learning for the future
• Meeting customer expectations to have a web site
• Identifying new partners, supporting existing partners better
• Better management of marketing information and customer information
• Feedback from customers on products.

The greatest benefit of e-commerce for many companies will come not from lower prices but from new levels of collaboration all along the value chain, from product development through production and distribution to managing the customer relationship. Usability of e-commerce tools in order to collaborate with suppliers, distributors, and customers in all these activities will help establish tomorrow's winners. According to Andrew, e-procurement is a high-return investment. General Electric estimates that it will soon be saving $10 billion per year through e-procurement. (Andrew, 2001)

Electronic business (e-business) is aimed at enhancing the competitiveness of an organization by deploying innovative information and communications technology throughout an organization and beyond, through links to partners and customers. (Chaffey, 2004)

Through use of e-procurement technology and processes, e-businesses have the opportunity to reduce the cost of the procurement process, to source from a wider range of supplier at lower prices, and to pursue individual employees to conform more closely to corporate procurement policies and practice. (McKie, 2001)

The use of Internet technologies in procurement is aimed at realizing faster and more efficient operational procurement processes which bypass the purchasing department and enable those people to concentrate on more strategic tasks (see Figure 2.6). (Puschmann and Alt, 2005)

**Figure 2-6. Effects of e-procurement**

![Figure 2-6. Effects of e-procurement](source: Puschmann and Alt, 2005)
A number of costs which are wrapped up in the procurement process, including the cost of are presented by McKie (2001:P99) as follows:

- Staffing internal purchasing departments
- "Maverick buying" by employees
- Paper forms, handling, and storage
- The time taken to perform procurement roles
- Delays in the procurement process
- Managing three-way matching
- Cutting checks to pay vendors
- Maintaining large vendor master files

To date more or less all studies on e-procurement report large efficiencies regarding process and procurement costs. (Puschmann and Alt, 2005)

Prior to the introduction of e-procurement, buyers frequently had to deal with individual transactions. They had to negotiate with suppliers, convert purchase requests into purchase orders, handle queries and ensure the correct allocation of the invoices received. In the operational workload, strategic aspects were neglected and buyers had little influence over the choice of suppliers and the purchased products. Their negotiating power was limited as the purchasing decision was made by the requester or the authorizer and not by the purchasing department. The requester was at the center, with all activities emanating from him or her (see Figure 2.7).

**Figure 2-7. Shift from managing transaction to managing suppliers**

![Diagram showing the shift from managing transaction to managing suppliers](source)

Source: Puschmann and Alt, 2005: P127

e-Procurement enables companies to decentralize operational procurement processes and centralize strategic procurement processes as a result of the higher supply chain transparency provided by e-procurement systems.
According to Puschmann and Alt (2005), e-procurement benefits fall into two major categories: efficiency and effectiveness. The former consist of process, products and inventory savings (see Figure 2.8), the latter the proactive management of key data and higher-quality purchasing decisions within organizations.

Figure 2-8. Savings potential of e-procurement

The more complicated the old paper-based procurement processes, the more authorization stages and exceptions, and therefore the higher the savings will be. To take advantage of these potentials, the procurement process needs to be redesigned. In the successful practices, this revamp focused on:

- Reduction or elimination of authorization stages;
- Regulation of exceptions to a limited degree at the beginning;
- Elimination of paper;
- Integration of suppliers in the entire process chain; and
- Consideration of the complete process, from searching for articles through to invoicing (Ibid).

Given the intense publicity surrounding the impact of e-procurement, Croom (2001) states four main benefits of e-procurement as follows:

- Financial performance, but not as much as widely ‘hyped’ benefits promoted in the press;
- Improved information flow;
- Improved internal and external communications;
- Improvements in planning and control.

Then he continued that a major concern is the apparent lack of clear strategic awareness of the implication and benefits of e-procurement (Croom, 2001).
Business benefits achieved through successful e-procurement initiatives include cost reductions, improved information, increased efficiencies, self-service approach, integrated supplier management and the strategic use of purchasing staff. (Ernst & Young, 2001; Bu’rca, Fynes and Marshall, 2005)

Another set of e-procurement benefits is given by Chaffey (2004: 295) as follows:

- Reduced purchasing cycle time and cost;
- Enhanced budgetary control (achieved though rules to limit spending and improved reporting facilities);
- Elimination of administrative errors (correcting errors is traditionally a major part of a buyer's workload);
- Increasing buyers' productivity (enabling them to concentrate on strategic purchasing issues);
- Lowering prices through product standardization and consolidation of buys;
- Improving information management (better access to prices from alternative suppliers and summaries of spending);
- Improving the payment process (this does not often occur currently since payment is not always integrated into e-procurement systems).

Shaw and Subramaniam (2002) studied the value of electronic procurement to an organization. They proposed a formula to measure value of e-procurement:

\[
\text{Value of E-Procurement} = \text{Price Benefits} + \text{Transaction Cost Benefits} - \text{Technology Lock-in Costs}
\]

Price benefits comes from potential price reduction off average market price while transaction cost benefits result from savings in search, negotiation and contracting, and coordination costs. Technology lock-in costs are costs involved in choosing and using a specific procurement system, including switching costs, opportunistic behavior by contracted suppliers. These costs are offset by the extent of protection from uncertainty. (Shaw and Subramaniam, 2002)

The potential benefits and characteristics of e-procurement, especially for indirect goods and services, are described and proved in a huge number of articles and studies (see e.g. Eyholzer and Hunziker, 2000; Gebauer and Segev, 1998). The main results are that e-procurement decentralizes operative tasks and centralizes strategic procurement processes. This eliminates the so-called maverick buying and reduces transaction costs (e.g. decreasing process time and media discontinuities or reducing personnel expenditures) (Dittler, 2000) and purchasing costs (e.g. through grouping effects and/or a reduction of the number of their suppliers) (Arthur Andersen, 2000; Dolmetsch, 2000; Wirtz, 2001).

According to David C. Wyld, (2004), there is a plethora of literature espousing the benefits of an e-procurement solution. These benefits would be identified as drivers for any implemented solution. They include:

- Price reduction;
- Improved contract compliance;
Shortened Proc cycle times;
Reduced administration costs;
Enhanced inventory management;
Improved visibility of customer demand;
Improved visibility of supply chain;
Reduced operating & inventory costs;
Increased accuracy of production capacity;
Enhanced decision making, and,
Improved market intelligence.

Considering the benefits which are defined by David C. Wyld, the following theories provides definition and description for some of benefits regarding his theory:

**Price Benefits**

According to Shaw (2004), price benefits are derived as a result of better demand management capability of e-procurement systems. Web-based systems provide a centralized and more accurate visibility of the enterprise-wide procurement of products and services. This helps to consolidate the demand at the enterprise-level and negotiate lower prices with suppliers. Using a demand function, the price benefits are calculated as the difference between a lowest negotiated contract price and average market price for a product (or product category). (Shaw and Subramaniam, 2002)

Procurement costs are reduced through economies of supplier search and increased price competition among suppliers (Croom and Johnston, 2003).

**Shortened Procurement cycle times**

According to NECCC (2002) e-procurement has the ability to reduce resources currently involved in paper and manually based procurement processes through improved payment processes and decreased cycle time.

Workflow — from producing a purchase request through to payment — can be managed electronically by e-procurement processes, reducing errors and processing time. These efficiencies enable a reduced cycle time from requisition to payment. The Aberdeen Group estimates the time saved at 70 per cent. These timesaving allow reduced inventory levels, resulting in additional cost savings through better cash flow and lessened inventory carrying costs. (Ernst & Young, N.D.)

A high level of interest in EC is piqued by its ability to reduce order cycle time, paperwork, order-processing error, and procurement cost. Realizing such managerial benefits, buying firms need to reassess their current business-to-business purchasing strategy, which, in most cases, still relies on traditional paper-based transactions. (Min and Galle, 1999)

**Reduced transaction and administration costs**

The efforts (time, money and human resource) spent on carrying out any exchange become transaction cost (process or administration costs). The existence of transaction costs indicates a waste of time and efforts of purchasing personnel in non-value added
activities, such as performing data entry and correcting errors in paperwork. Reduction in transaction cost is one of the most attractive benefits from e-procurement adoption. (C. Nam, 1998)

According to Shaw and Subramaniam (2002), transaction cost benefits result from savings in search, negotiation and contracting, and coordination costs. Lowering procurement administration costs starts with reducing the time and/or the number of people required to process purchase order (PO) requisitions. (Aberdeen group, 2001)

**Improved visibility of customer demand and supply chain**

Companies that have successfully integrated E-Business into their operations can capture the full range of advantages E-Business provides, including stronger relationships with customers, distributors, retailers, suppliers, and business partners. (PricewaterhouseCoopers, 2002)

The ability to use e-commerce tools in order to collaborate with suppliers, distributors, and customers in all these activities will help determine tomorrow's winners. (Andrew, 2001, P6) e-Procurement enables companies to decentralize operational procurement processes and centralize strategic procurement processes as a result of the higher supply chain transparency provided by e-procurement systems. (Puschmann and Alt, 2005)

**Reduced operating & inventory costs**

According to Puschmann and Alt (2005), e-procurement efficiency benefits consist of process, products and inventory savings. By adopting e-business, supply-chain cost reductions come from reduced levels of inventory, increased competition from suppliers and shorter cycle time in ordering. Chaffey (2004)

The buyer will obtain operational efficiency by implementing the e-procurement system in the form of reduced inventory costs and ordering costs, and this efficiency gain increases with the number of suppliers who join in the network. (Dai and Kauffman, 2003)

**Enhanced decision-making**

Business benefits achieved through successful e-procurement initiatives include cost reductions, improved information, increased efficiencies, self-service approach, integrated supplier management and the strategic use of purchasing staff (Ernst & Young, 2001; Bu’rca, Fynes and Marshall, 2005).

According to NECCC (2002) e-procurement provide the opportunity for increased auditing and automated accountability and tracking from start to finish; and increased and more sophisticated reporting functionality which lead to enhance decision making. e-procurement efficiency benefits comprise the proactive management of key data and higher-quality purchasing decisions within organizations. Puschmann and Alt (2005) Exchange of critical information brings greater understanding and value for all players, adding to the required commitment, but offering significant competitive advantages. (PricewaterhouseCoopers, 2002)
2-2-6. e-Procurement Barriers

There are some barriers that hinder the adoption of any of Internet based or e-business applications while, some barriers may just relate to e-procurement adoption and are not applicable to other applications.

In a study by the Economist Intelligence Unit (the business-to-business arm of The Economist), the main obstacles to e-business success were found to be internal. The greatest identified barriers were the need to re-engineer business processes (cited by 58 per cent as very significant), a lack of e-business skills (50 per cent) and a lack of integration between front and back-end systems (45 per cent) (Ernst & Young, 2001: P4), While the Internet may give the impression of making it readily possible to swap between suppliers and use new suppliers, two-thirds of those interviewed said building a trusted relationship with suppliers is necessary before they would trade using the Internet (Chaffey, 2004:P298).

Introduction of e-procurement entails major changes, often apparently running counter to the corporate culture, which in most organizations is to empower local business units. Care will be needed to manage the 'soft' aspect including (BuyIT report, 2002):

- Need for visible executive sponsorship;
- Motivating end-users to adopt the new systems;
- Re-engineering internal processes and dealing with cross-company cultural differences; and
- Effort will be needed to avoid being seduced by the technology.

Naturally there are many barriers to the adoption and implementation of e-procurement, significant amongst these being cost and system integration, which are mentioned in Croom's studies. He identified and ranked impediments to e-procurement implementation is by their importance.

In presenting the data in table 2-4, He highlighted the level of agreement and disagreement with the five impediments identified. As is depicted in table 2-4, only in the case of the first item – development costs – there was a lack of disagreement with the criteria identified as an impediment (Croom, 2001 and 2005).

Table 2-4. Major barriers to adoption of E-Procurement

<table>
<thead>
<tr>
<th>Impediment</th>
<th>Agree (%)</th>
<th>Disagree (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development Costs to be the</td>
<td>49.4</td>
<td></td>
</tr>
<tr>
<td>System Integration</td>
<td>35.3</td>
<td>27.1</td>
</tr>
<tr>
<td>Culture</td>
<td>34.1</td>
<td>28.2</td>
</tr>
<tr>
<td>Development Time</td>
<td>22.4</td>
<td>38.8</td>
</tr>
<tr>
<td>Security Issues</td>
<td>16.5</td>
<td>44.7</td>
</tr>
</tbody>
</table>

Source: (Croom, 2001 and 2005)
A PricewaterhouseCoopers survey of 400 senior European business leaders indicates that security concerns and lack of faith in trading partners are the most significant factors holding back e-procurement (Chaffey 2004: P298), which is not approved by Croom (2001 and 2005) studies.

Another view about risk associated by e-procurement is that e-procurement is applied in a uniform way, not differing at all between different suppliers (Knudsen and Lindroth, 2000). If all of the company’s traditional purchases were put on the web using reversed auctioned for any kind of items, the result will probably will not be able that great. Therefore the risk is not in only technology it self, It is imperfect application of technology that possesses the biggest risk. Other risks are limitation from geographical, cultural and organizational limitation of the underlying business the serve (Avery, 2002). Also the biggest expenses associated with implementing e-procurement are the software and license. (Ware, 2002)

A summary of barriers identified in the literature are shown below:

- Security of transactions (Gebaur et al, 1998; PWC, 2002; Boston Consulting, 2002);
- Lack of Supplier e-procurement (solution PWC, 2002; Gebauer et al, 1998; Boston Consulting, 2002);
- High cost of technology (PWC, 2002);
- Lack of legal framework (PWC, 2002);
- Lack of technical expertise (PWC, 2002);
- Lack of e-Procurement knowledge (PWC, 2002; Gebauer et al, 1998; Boston Consulting, 2002);
- No real business benefit identified (PWC, 2002; Gebauer et al, 1998; Boston Consulting, 2002);
- Data exchange standards lacking (PWC, 2002);
- Lack of business relationships with suppliers (PWC, 2002).

As mentioned in the benefits section (Shaw, 2004), derived three components based on the critical factors that drive the costs and benefits and how the Web impacts those factors, in turn affecting the value of e-procurement. Here are the costs (barriers):

**Technology lock-in costs:** This is more a cost, rather than a benefit. By implementing a particular type of system, the enterprise essentially “locks” itself into a technology solution and incurs switching costs to move its transaction to a different procurement model. Thus, these costs reduce the extent of the benefits realized from the use of a specific Web-based procurement system. However, lock-in also protects the buyer enterprise from costs due to uncertainty in the supply market.

The report, “Procurement management systems: a corporate black hole”, Byline Research, identified six reasons as the failures for computerizing procurement (e-procurement):

- The failure of ERP and supply-chain management systems to address non-production related procurement (often because these systems are either too highly specified, too costly, or both for smaller companies);
The difficulty of integrating procurement systems with the existing IT infrastructure;
Unwillingness to incur training and other costs;
Indifference to the problem on the part of the IT department, either because IT faced other priorities but often simply because procurement was considered an unglamorous or otherwise unrewarding problem to address;
Negative attitudes to procurement among senior managers, who were more likely to regard it as an overhead than as a strategic function;
The perception that automating procurement would prove more difficult than automating many other business processes.

Byline research named below barriers to e-procurement:

- Operational management culture
- Supply-base culture
- Senior management culture
- Lack of appropriate offerings
- Lack of technical knowledge

(Aberdeen, 2002) has identified the following barriers to e-Procurement adoption and success:

**High cost:** Early e-Procurement systems cost about $1 million, on average, to implement, including license, implementation, and first-year maintenance fees paid to the independent software vendor (ISV). Systems integrator fees range from 100% to 400% of the license fee.

**Long implementation cycles:** e-Procurement deployments take between 9 months and 13 months to complete, on average.

**Costly delivery model:** Early e-Procurement systems were premise-based applications that required significant resources to implement and maintain.

**Poor supplier enablement:** A key hurdle to e-Procurement success has been the inability of organizations to effectively aggregate and manage supplier catalog content.

**Limited fulfillment support:** Most e-Procurement solutions have focused on automating the front-end procure-to-order cycles, providing little, if any, support for critical back-end processes such as supplier management, sourcing, order fulfillment, and financial settlement.

A summary of the barriers appears below identified by David C. Wyld (2004):

- Inadequate Technological Infrastructure;
- Lack of Skilled Personnel;
- Inadequate Tech Infrastructure of partners;
- Lack of Integration with Business Partners;
- Implementation Costs;
Company Culture;
Inadequate Business Processes to support e-Procurement;
Regulatory and Legal Controls;
Security;
Co-operation of Business Partners;
Inadequate e-procurement Solutions; and
Upper Management Support.

The following theories describes the barriers, which are point out in Wyld theory:

**Inadequate Technological Infrastructure**

Payne stated that SME’s in developing countries face more challenges when trying to gain from electronic commerce than businesses in developed countries. This context includes constraints related to technical infrastructure (access and pricing), laws and regulations, limited logistics systems (roads, rail, and air), and more. The competitiveness and sophistication of the telecommunications network can affect electronic commerce options available for businesses and the adaptations (e.g., shared access points, use of satellite access) that will be necessary. Equally as important, there may be critical legal and regulatory constraints to recognize. These can range from taxation and currency exchange issues to the transparency and efficiency of customs clearance procedures or how the banking industry is regulated. (Payne, N.D.)

**Inadequate Technological Infrastructure of partners**

The difficulties of integrating both internal and supplier legacy systems were seen as a major barrier to increased supply chain integration. In particular, supplier readiness and capability was felt by many to be the main constraint, particularly where the supply base consisted of a high proportion of SMEs. Integration was seen as central to improved control and coordination for improved materials flow through the chain, yet while many small suppliers did not have the necessary technology infrastructure; even large suppliers had very different levels of compatibility in areas such as database integration and use of XML. (Croom, 2005)

The technological infrastructure especially in relation to procurement business partners is considered one of the main barriers to e-procurement. (Stein & Hawking, 2002) Based on Hoppen et al study one the main barriers of e-procurement for direct goods and services was seen named insufficient systems on the side of their business partners as a problem. (Hoppen et al, 2002)

**Lack of Skilled Personnel**

In a study by the Economist Intelligence Unit, the main obstacles to e-business success were found to be internal. The greatest identified barriers were the need to re-engineer business processes, a lack of e-business skills and a lack of integration between front and back-end systems. (Ernst & Young, 2001) Based on Tranmit, lack of technical knowledge was identified as the biggest barrier to e-procurement, closely followed by lack of viable e-procurement products and services.
(Tranmit, N.D.) Need of skilled people at every level for transformation to E-Business was also recognized by *PricewaterhouseCoopers* (1999) as an important factor for success. Like so many other “e-solutions” lack of skilled staff is also considered a serious impediment. (Stein & Hawking, 2002)

**Lack of Integration with Business Partners and their Co-operation**

A *PricewaterhouseCoopers* survey of 400 senior European business leaders indicates that security concerns and lack of faith in trading partners are the most significant factors holding back e-procurement (Chaffey 2004: P298)

The scope of B2B operations goes beyond the buying enterprise and extends to the “extended enterprise”, to include all suppliers and other business partners. However, all business partners do not have the same characteristics to adopt e-procurement. From the enterprise point of view, business units and suppliers are the two most important participants in e-procurement system. Suppliers are resistant to Web-based procurement, as they anticipate fierce competition online and they need strong incentives to Web-enable their catalog and ordering process. The potential value of the system cannot be realized unless both users and suppliers participate in the system. (Shaw and Subramaniam, 2002)

**Implementation Costs**

According to Aberdeen (2002), early e-Procurement systems cost about $1 million, on average, to implement, including license, implementation, and first-year maintenance fees. Systems integrator fees vary from 100% to 400% of the license fee.

Croom in his study report highlighted the level of agreement and disagreement with the five important impediments identified. Only in the case of development costs there was a lack of disagreement with the criteria identified as an impediment. Other barriers were: system integration, culture, development time and security issues (Croom, 2001 and 2005)

**Company Culture**

Cultural aspects either in buyer organization or in its suppliers have been recognized as a pertinent barrier in number of studies. According to *PricewaterhouseCoopers*, one of the early requirements of e-business adoption are the understanding that e-Business is an evolving area, which will require future investment and constant attention to developments. In other words, the organization must be transformed into a change-embracing entity, one with a culture that accepts that every tomorrow is different and all developments are worth examining for the benefits they may bring. (PricewaterhouseCoopers, 2002)

**Inadequate Business Processes to support e-Procurement:**

Need to re-engineer business processes as the greatest identified barriers in a study of the main obstacles to e-business success. (Ernst & Young, 2001: P4)
Organizations are increasingly taking a step-by-step approach; initially understanding and reengineering their purchasing processes and then finding the correct solution that meets their requirements. Individual obstacles highlighted the need to define what process is required first before defining a technical solution. (Tranmit, 2002)

**Regulatory and Legal Controls**

Perhaps the most important challenges facing companies contemplating E-Business are legal and regulatory issues such as conflicting jurisdictions, taxes, and intellectual property rights and security issues such as data confidentiality, privacy, fraud, and industrial espionage (PricewaterhouseCoopers, 2002)

**Security**

Min and Galle stated that when asked to rate the severity of obstacles that may hinder effective Internet-based cyber-purchasing, the most serious obstacle to Internet-based cyber-purchasing is a lack of security of Internet transactions. This result is consistent with the general belief that the Internet is more vulnerable to security problems than is EDI. Other obstacles stated are: (Min and Galle, 1999)
- Fear of Internet Fraud
- Lack of Management Support
- Poor Telecommunications Infrastructure
- Cost of Internet Investment
- The Buying Firm’s Unreadiness for Technological Advancement
- Legality of Internet Transactions

**Inadequate e-procurement Solutions**

Lack of appropriate offerings is one of the e-procurement barriers named by Tranmit. Accordingly, the most important factor that is holding back progress to e-Procurement is technical integration. (Tranmit, 2002)

Most e-Procurement solutions have focused on automating the front-end procure-to-order cycles, providing little, if any, support for critical back-end processes such as supplier management, sourcing, order fulfillment, and financial settlement. (Aberdeen, 2002)

According to Ernst & Young (2001), one of the greatest identified barriers of e-business success is lack of integration between front and back-end systems.

**Upper Management Support.**

When you embark on a transformation to E-Business, understanding that complete buy-in from management at the highest level is the only way to succeed is essential. The initiatives you put in place must be business-driven and involve senior-level business champions. In fact to be effective, E-Business initiatives must be integrated thoroughly into a company’s existing strategies, structures, and systems. Their success depends on strategic decisions that ensure alignment with the company’s long-term vision and goals, which requires senior management commitment. (PricewaterhouseCoopers, 2002)
Numerous IT studies that suggest that top management support is a decisive factor for the successful implementation of any IT innovation (i.e., the Internet) leading to superior performance (Avlonitis and Karayanni, 2000)

2-2-7. e-Procurement models

There is a range of different models for procurement. The models are evolving fast, so it is difficult to know which to select (Chaffey, 2004: P299). There are three fundamental models for location of B2B e-commerce: sell-side, buy-side and marketplace-based. These alternative options for procurement links with suppliers are summarized in figure 2-9 and the advantages and disadvantages of each are summarized in table 2-5.

Figure 2-9. The three main e-procurement model alternatives for buyers

E-procurement can take place in an e-marketplace (defined as “marketplaces implemented by use of telemetric, which means mechanisms of marketypical
exchange of goods and services, which support all phases of the transaction” (Schmidt, 1993) or directly between two organizations and the software automates the purchasing process using Internet technologies. Requisitioners can access the system via a standard browser where they are routed to company approved catalogues either internal or external. (Bu’rca, Fynes and Marshall, 2005)

Table 2-5. Assessment of the procurement model alternative for buyers

<table>
<thead>
<tr>
<th>Procurement model</th>
<th>Advantages to buyer</th>
<th>Disadvantages to buyer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sell-side</td>
<td>• Searching</td>
<td>• Different interface on each site (catalogue and ordering)</td>
</tr>
<tr>
<td>e.g. many catalogue-based B2B Suppliers such as <a href="http://www.rswww.com">www.rswww.com</a></td>
<td>• Onus of maintaining data on supplier</td>
<td>• Restricted choice</td>
</tr>
<tr>
<td></td>
<td>• Different interface on each site (catalogue and ordering)</td>
<td>• Poor integration with ERP/procurement systems</td>
</tr>
<tr>
<td></td>
<td>• Restricted choice</td>
<td>• Limited purchase control</td>
</tr>
<tr>
<td>Buy-side</td>
<td>• Simplicity-single interface</td>
<td>• Onus of maintaining data is on buyer</td>
</tr>
<tr>
<td>e.g. solutions developed by <a href="http://www.sap.com">www.sap.com</a>, <a href="http://www.arbia.com">www.arbia.com</a>, Covisint and IBM private marketplace</td>
<td>• Wider choice than sell side</td>
<td>• Software license costs</td>
</tr>
<tr>
<td></td>
<td>• Integration with ERP/procurement systems</td>
<td>• Retraining</td>
</tr>
<tr>
<td></td>
<td>• Good purchase control</td>
<td></td>
</tr>
<tr>
<td>Independent marketplace</td>
<td>• Simplicity-single interface</td>
<td>• Difficult to know which marketplace to choose (horizontal and vertical)</td>
</tr>
<tr>
<td>e.g. <a href="http://www.sciquest.com">www.sciquest.com</a>, <a href="http://www.barclaysb2b.com">www.barclaysb2b.com</a></td>
<td>• Potentially widest choice of suppliers, products and prices</td>
<td>• Poor purchase controls*</td>
</tr>
<tr>
<td></td>
<td>• Often unified terms and conditions and order forms</td>
<td>• Uncertainty on service levels from unfamiliar suppliers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Interfacing with marketplace data format*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Relatively poor integration with ERP*</td>
</tr>
</tbody>
</table>

Source: Bu’rca, Fynes and Marshall, 2005

* Note that these advantages of the marketplace will disappear as marketplace develops ERP integration.

Companies supplying products and services had to decide which combination of these models would be used to distribute their products. From the buyer's point of view, the selling model their suppliers have adopted will limit them. Figure 2-9 shows options for integration for a buyer who is aiming to integrate an internal system such as an ERP system with external systems. Specialized e-procurement software may be necessary to interface with the ERP system.

E-procurement can generally be conducted with intermediation through electronic marketplaces or catalogue brokers or without intermediation through bilateral connections between business partners. (Hoppen et al, 2002)

An electronic market space is a virtual place such as the Internet in which no direct contact occurs between buyers and sellers (Chaffey, 2004). In an e-marketplace, buyers and sellers are brought together for the purposes of information exchange, the buying and selling of products and services, and financial transactions. All of these exchanges take place through a Web site instead of a physical space. These
e-marketplaces result in benefits for both buyers and sellers. (Murtaza, Gupta, Carroll, 2004)

There are several criteria for classifying e-marketplaces. For example, offered a classification based on business functionality. An e-marketplace can provide either indirect goods that support the production process or the direct goods used in production. The way the buying process occurs can also fall into two categories: long-term contractual buying between two entities, or a one-time (spot) purchase with no long-term relationship between the two parties. Based on these two criteria, e-marketplaces have been classified into four categories, as shown in figure 2-10. These categories are not mutually exclusive, and an e-marketplace may fall into more than one class. Direct materials are purchased in “vertical” e-marketplaces, and indirect materials are purchased in “horizontal” e-marketplaces. (Murtaza, Gupta, Carroll, 2004)

![Figure 2-10 Classification of e-marketplaces](image)

There are different types of e-marketplaces available. Seller-controlled sites are the main home of the company and are e-commerce-enabled. Buyer-controlled sites are intermediaries, which have been set up so that it is the buyer who initiates the market making. This can occur through procurement posting where a purchaser specifies what they wish to purchase, it is sent by e-mail to suppliers registered on the system and then offers are awaited. Aggregators involve a group of purchasers combining to purchase a multiple order thus reducing the purchase cost. Neutral sites are independent evaluator intermediaries that enable price and product comparison. (Chaffey, 2004)

(Chaffey, 2004) introduced the framework of additional locations for purchase which are as follows:
- Seller-oriented sites are controlled by third parties, but are representing the seller rather than providing a full range of options.
- Buyer –oriented sites are controlled by third parties on behalf of the buyer. (Chaffey, 2004:P45)
As shown in figure 2-11, online marketplaces designed for the automotive industry, such as Covisint or SupplyOn seem to play a relatively minor role in the sector. A large share of companies surveyed prefers either standard software or company-specific tools to e-marketplaces. This trend is more pronounced in the automotive industry than in other sectors. The lack of standards and the delayed emergence of an industry-wide exchange platform increase the costs of doing business. For example, as discussed in the case study about an automotive supplier, numerous OEMs’ initiatives can increase the costs for suppliers to do business with many customers, which limit the cost saving potentials for suppliers. (e-business Watch, 2005)

![Figure 2-11. ICT solutions used for e-procurement](image)

Base (100%): Companies using special ICT solutions for e-procurement. N=99 (Automotive, EU-7), N=784 (Total, EU-7), In % of firms.

ASP = Application Service Provider

Source: (e-Business Survey 2005) W@tch Source: e-Business

2-2-8. E-procurement Systems & Applications

E-procurement is more than just a system for making purchases online. A properly implemented system can connect companies and their business processes directly with suppliers while managing all interactions between them. This includes management of correspondence, bids, questions and answers, previous pricing, and multiple e-mails sent to multiple participants. (Burt, 2003), (Bu´rca, Fynes and Marshall, 2005)

Electronic support of internal supply chains for direct or production goods has been a major element during the implementation of enterprise resource planning (ERP) systems that has taken place since the late 1980s. However, supply chains to indirect material suppliers were not usually included due to low transaction volumes, low product values and low strategic importance of these goods. Dedicated information systems for streamlining indirect goods supply chains have emerged since the late 1990s and subsequently have faced a broad diffusion in practice. The concept of these e-procurement solutions for indirect good has also been described broadly in the
literature. However, studies on features, implementation and benefits of e-procurement systems for direct goods are still rare.

Essentially, E-procurement systems must enable their users to specify their purchasing requirement, to conduct purchasing market research, to pre-qualify suppliers and if possible allow for the running of tenders. To realize the savings claimed by the providers of these applications, a high degree of integration is required between the front office and back office on the one hand, and between the back office and the supplier's systems on the other. (Weele, 2002: P175)

Based on Auramo, Kauremaa and Tanskanen (2005) a wide variety of e-business solutions exist that aim at improving customer service. An example is Kone Elevators’ e-procurement system. When a customer places an order for Kone, it is also immediately visible to suppliers. Major suppliers receive an EDI message directly via their ERP system; for smaller suppliers, Kone has an extranet solution. A few suppliers still receive the information by fax. With this operation model Kone is able to check its suppliers’ capabilities and confirm customer orders within three days. Using also a collaboration model with a logistics service provider, their delivery time has shortened from eight weeks to four weeks, and delivery accuracy has improved. Customers also have real-time access to information related to their order.

An e-procurement solution typically contains functionality to automate searching for products and services, creating and submitting requisitions, online approvals, creating and transmitting purchase orders, supplying advanced shipping notices, invoicing, and payment processing. (Bu´rca, Fynes and Marshall, 2005: P4)

Two types of e-procurement systems are extranets and electronic markets. Extranets connect the buyer and its suppliers with a closed network. In contrast, electronic markets create open networks for buyer and supplier interactions. The differences between these two types of e-procurement channels lie in system implementation costs, marketplace benefits, and the extent of supplier competitive advantage that develops due to information sharing. (Dai, Kauffman, 2003).

According to McKie (2001), procurement software (or service) must have:

- Access to online catalog that can be viewed via a web browser or interrogated programmatically to select goods and services to buy;
- A role-based electronic approval cycle and a rules-based exception handling capability to manage the e-procurement work flow;
- E-mail connectivity between the participants in the process and access to Web-based self-service tracking pages to monitor the e-procurement process;
- The ability to generate and transmit payments electronically to settle invoices in a paper-free way;
- Automated interfaces to keep the financial or enterprise resource planning (ERP) system synchronized with the e-procurement system (or service).

A comparatively similar procurement cycle taken by Chaffey (2004) is illustrated in figure 2-12.
This figure shows how different types of information system cover different parts of the procurement cycle. The different types of systems are as follows:

- Stock control system;
- CD/web-based catalogue;
- E-mail or database-based workflow systems;
- Order-entry on web site;
- Accounting systems;
- Integrated e-procurement or ERP systems.

**Figure 2-12. Use of different information systems for different aspects of the fulfillment cycle (Chaffey, 2004: 300)**

Based on Dignum classification of procurement functions in three categories of strategic, tactic and operational procurement functions, it is primarily the operational function that is automated in e-procurement systems. Therefore, these systems assume that there is a contract with a supplier that specifies the price and delivery conditions. They do, therefore, not offer any negotiation facilities, but only offer order and payment functions and sometimes tracking functions. (Dignum, 2003:P288)
Some authors see e-procurement systems as complements of ERP systems however; others present the former as a substitute of the later. For instance Puschmann and Alt (2005: P122-123) state that Compared to ERP, e-procurement systems were considerably less expensive and more flexible due to increased standardization on a technical level, which implied ERP systems could be replaced by e-procurement systems. While, Chaffey (2004) depict an e-procurement system as an add-on to ERP (see figure 2-13).

![Figure 2-13. Integration between e-procurement systems and catalogue data](source: Chaffey, 2004)

The various application of e-procurement present many potential opportunities for VMs to reduce their costs, be it through reduced searching costs in e-sourcing for new suppliers or more directly through e-reverse auctions as suppliers bid against each other for the business on a price basis. IBM had reduced the cost of purchased goods and services by $4.2 billion since 1994 and expected to purchase goods in the value of $29 billion electronically in 2000, up from $12 billion in 1999.

E-procurement applications are designed to facilitate the development of efficient procurement. Internet technology, both the Internet protocol and the public network, plays five key roles in developing e-procurement beyond the capabilities now available in an EDI enabled ERP procurement solution. (Steven R LEONARD, 2000):

- Reduces the cost of deploying e-procurement solutions in the enterprise;
- Reduces the network management costs of the procurement solution;
- Enables a user friendly e-procurement application;
- Increases the supplier's benefits from cooperation with buyer;
- Expands the reach of trading communities.

The list of e-procurement application is as follows: e-sourcing, e-tendering, e-informing, e-reverse auctions, e-MRO, Web-based enterprise resource planning (ERP) and e-collaboration (Knudsen, 2003).
Each form of e-procurement is described regarding functionality:

(1) **e-Sourcing:**

  e-sourcing is the process of finding potential new suppliers using the Internet in general or, more specifically, a B2B marketplace. Takes place in the information-gathering step of the procurement process.

(2) **e-Tendering:**

  e-Tendering is the process of sending request for information (RFI), request for price (RFP), etc to suppliers and receiving the responses using Internet technology. The data concerned with e-tendering are focused on the product or service itself. Here, it is also possible to have an initial screening process where a selected number of suppliers qualify for the negotiation step. Takes place in the supplier contact step of the procurement process.

(3) **e-Informing:**

  e-Informing is a part of e-procurement that does not involve transactions or call offs, but instead handles information about the supplier regarding quality certification, financial status or unique capabilities. Supplier data can come from third party information providers and from a firm’s own investigation into the supplier.

(4) **e-Reverse auctions:**

  e-Reverse auctions enable the purchasing company to buy goods and services that have the lowest price or combination of lowest price and other conditions via Internet technology. The auction is most often traded in real time and ends in a closing bid between the Aligning corporate strategy.

(5) **e-MRO and Web-based ERP:**

  e-MRO and also web-based ERP focus on the process of creating and approving purchasing requisitions, placing the orders and receiving the goods or service ordered using a software system based on Internet technology. The difference between the two is that e-MRO deals with indirect items (maintenance, repair and operating materials), whereas the Web-based ERP deals with product-related items. Takes place in the fulfillment step of the procurement process.
(6) e-Collaboration:

Correct and updated data regarding product versions, blueprints and sales forecasts are always available from the buying company’s Web site or extranet, thus reducing errors before they occur and making it possible for suppliers to be in sync with the buyer; handle mainly gathering and disseminating of purchasing related information. It also encompasses the usage of different collaboration tools such as virtual meeting rooms, bulletin boards, and even shared knowledge management systems.

However, there is no general agreement to the scope and extent of e-procurement applications. Chaffey (2004) illustrates 11 different types of business model that can be facilitated by the web as follows:

1. E-shop
2. E-procurement
3. E-malls
4. E-auctions
5. Virtual communities
6. Collaboration platforms
7. Third-party marketplaces
8. Value-chain integrators
9. Value-chain service providers
10. Information brokerage
11. Trust and other services.

As it can be seen above, e-auctions or collaboration are indicated separately from e-procurement model.

The last chapter," Future directions", of (Monczk's, 2001) recent purchasing and supply management textbook, gave a list of procurement activities that they argued would increasingly occur through the Internet:

- Web –based intelligence agents that would allow for truly global search for best price, quality, and availability.
- Internet –based tools that would provide the infrastructure for performance measurement, information sharing and managing the integrated supply chain.
- Increased usage of internet-based auctions for trading commodities and standard goods, with implications for risk handling and creating opportunities.
- Aggregation of buyers and suppliers on B2B exchanges, providing for information leveraging and pooling of demand and supply Increased connectivity resulting in worldwide access to emergent markets.

2-2-9. e-Procurement Process

According to (Michael J. Shaw and Chandrasekar Subramaniam, 2003), two types of procurement process were categorized based on two ends of a continuum – structured and unstructured procurement.
Structured procurement: On the one end, there are procurement processes that are highly automated in terms of the need identification, ordering, and fulfillment. The customized needs, high demand volume and potential uncertainties associated with supply can lead to high transaction costs for the buyer enterprise, if each transaction has to undergo the supplier search, approvals, processing and ordering. If the demand is regular and the product specifications do not change with time, organizations can reduce the transaction costs by negotiating a long-term contract with a supplier and designing an automated procurement process for reordering the items. We call this type of procurement as “structured” procurement. Examples of such procurement include tooling items, welding wires, and custom replacement parts.

Unstructured procurement: On the other end, there are some products that are not suitable for any level of automated procedures. Often organizations allow the end-users to take advantage of best deals available at the time of ordering and there is very little benefit of tying such procurement to product-specific purchasing steps with a particular supplier. These procurements tend to have very broad procurement rules giving plenty of freedom to the users to choose suppliers. We call this type of procurement as “unstructured”. Examples of this category of procurement include office equipment and furniture.

Table 2-6. Characteristics of structured and unstructured procurements

<table>
<thead>
<tr>
<th>Unstructured Procurement</th>
<th>Structured Procurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sporadic demand with high demand uncertainty</td>
<td>1. Regular demand with low demand uncertainty</td>
</tr>
<tr>
<td>2. Low demand volume</td>
<td>2. High demand volume</td>
</tr>
<tr>
<td>3. Involves greater product variety and options</td>
<td>3. Specifications do not change with each order</td>
</tr>
<tr>
<td>4. Low risk of supply uncertainty</td>
<td>4. High business risk of supply uncertainty</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Process characteristics</th>
<th>1. Orders manually initiated by the end-user</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Consists mostly of one-time orders</td>
<td>1. High level of automation</td>
</tr>
<tr>
<td>3. Product selection, supplier selection and order details are decided for each transaction</td>
<td>2. Consists mostly of re-orders</td>
</tr>
<tr>
<td>4. Approvals are required for most transactions, based on dollar volume and requesting employee’s status in the organizational hierarchy</td>
<td>3. Product selection, supplier selection and order details are decided at set-up and coded into the procedures</td>
</tr>
<tr>
<td>4. No approvals needed for individual transactions</td>
<td>4. No approvals needed for individual transactions</td>
</tr>
</tbody>
</table>

Examples:

<table>
<thead>
<tr>
<th>Office furniture</th>
<th>Tooling items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office equipment</td>
<td>Welding supplies</td>
</tr>
<tr>
<td></td>
<td>Custom replacement parts</td>
</tr>
</tbody>
</table>

Source: Shaw and Subramaniam, 2003

Kim & Ramkaran (2004) presented the process of procurement of indirect goods in two perspectives of traditional e-process management models, which follows.
In their article, Figure 2-14 illustrates the traditional view of a material requisition process. The requestor submits the request for supplies to the Supplier. Various suppliers submit bids that are evaluated by the purchasing department, which then selects an appropriate supplier. The purchasing department then issues a purchase order to the supplier. The supplier finally ships goods to either the purchasing department or the requestor. (Kim & Ramkaran, 2004)

Figure 2-14. Traditional view of a material requisition process

In Figure 2-15, (e-process management perspective), standard requests, bids, and purchase orders are not processed manually, but rather using business rules. Online catalogs provide an interface to interact with the initiator of the process. According to the e-process management definition, business rules dictate outcomes, and results for tasks initiated from recurrent, routine requests. Such tasks may be combined into one, performed by the stakeholder using an appropriate Internet-enabled interface. (Kim & Ramkaran, 2004: P35).

Figure 2-15. E-Process management perspective

McKie (2001) states, e-procurement software support the procurement process from requisition to check (requisition to payment). By his definition, a typical e-procurement workflow involves the following steps:

- Requisitioning
- Order Submission
- Order Tracking
- Receipt Processing
- Payment Processing
- ERP update

2-2-10. e-Technologies in Supply chain management

Technology is vital to supply chain management since managing, relationships with customers, suppliers and intermediaries is based on the flow of information and the transactions between these parties. Improving customer value involves improving product quality, customer service quality and/or reducing price and fulfillment times. An alternative emphasis is on increasing efficiency in obtaining resources from a supplier organization or distributing products to customers. This emphasis is about reducing operational costs and so increasing profitability. (Chaffey, 2004: P248)

Supply chain management is essentially the optimization of material flows and information flows involved with an organization's operations. By applying information systems, companies can enhance or radically improve many aspects of the supply chain. Supply chain management can be enhanced through buy-side e-commerce, internal communications, and relationships with partners and sell-side e-commerce. (Chaffey, 2004: P247)

As a major part of supply chain management, supply chains in procurement are traditionally supported by information technology. With the implementation of enterprise resource planning (ERP) or manufacturing resource planning (MRP) systems in the 1980s electronic data interchange (EDI) connections with suppliers were established. For example, close partnerships have been forged with direct material suppliers through the automation of delivery schedules by linking a company’s materials management system with supplier systems. Since the mid-1990s companies have also been redesigning their relationships with business partners for indirect procurement. (Puschmann and Alt, 2005: 122–133)

In a research conducted by Croom (2005), after supply chain management and integration, price pressures and cost reduction was the second major supply chain issue facing organizations which they hoped to get removed of by implementation of e-business. According to him, the majority of an organization's costs are vested in the supply side of their operation (typically averaging 60 per cent of an organization's total revenue), and improvements in the efficiency and effectiveness of customer-facing activities are necessary to respond to mounting competitive pressure. (Croom, 2005)
2-2-11. e-Procurement & Supply chain management

As a major part of supply chain management (Monczka et al., 1997), supply chains in procurement are traditionally supported by information technology. With the implementation of enterprise resource planning (ERP) or manufacturing resource planning (MRP) systems in the 1980s electronic data interchange (EDI), connections with suppliers were established. For example, close partnerships have been forged with direct material suppliers through the automation of delivery schedules by linking a company’s materials management system with supplier systems. In last years, information technology and the worldwide web in particular are having an increasing impact on the way operations are conducted. E-procurement gained a significant foothold during the “dot-com” buildup of the late 1990s; and although the rate of e-procurement penetration into purchasing has not its fantastic early prediction, it continues to grow steadily. For industrial procurement, e-business offers purchase process efficiency gains and price reductions, enhances collaborative relationships and provides significant opportunities for improving internal service levels.

E-business can thus be seen to impact on supply chain structures; supply chain coordination and supply chain relationships. (Croom, 2005) As the relationships between OEMs and suppliers grow ever more complex, with increased interaction between participants of different tiers, e-commerce is emerging as a necessary tool and enabler of this new business paradigm. (Morell, Swiecki, 2001)

For most commercial and not-for-profit organizations we can distinguish between upstream supply chain activities which are equivalent to buy-side e-commerce and downstream supply chain activities which equate to sell-side e-commerce. (Chaffey, 2004: P247)


Knowing when and where it makes sense to move beyond e-procurement to e-supply-chain management will determine the champion. In Table 2-7 we saw that common platforms such as e-mail and web systems reinforced the focus on supply chain integration in the development of inter-organizational systems. (Croom, 2005)

Table 2-7. Major e-business infrastructure deployment areas in supply chain management

<table>
<thead>
<tr>
<th>E-supply chain management deployment during next 12 months</th>
<th>Yes (%)</th>
<th>No (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-mail</td>
<td>85.9</td>
<td>10.6</td>
</tr>
<tr>
<td>Web sites</td>
<td>83.5</td>
<td>7.1</td>
</tr>
<tr>
<td>E-procurement</td>
<td>43.5</td>
<td>54.1</td>
</tr>
<tr>
<td>Intranet</td>
<td>58.8</td>
<td>37.8</td>
</tr>
<tr>
<td>Extranet</td>
<td>36.5</td>
<td>63.0</td>
</tr>
<tr>
<td>OEM</td>
<td>24.1</td>
<td>75.9</td>
</tr>
</tbody>
</table>

Source: Croom, 2005
Internet & supply chain management

The Internet creates new opportunities for collaboration among partners in a supply chain. By sharing customer demand data, for example, all partners can reduce forecasting errors, thus driving down inventories and improving manufacturing utilization. Similarly, coordination of production and delivery schedules contributes to reduced inventories and lower costs. (Christodouleas et al, 2001:P3)

Supply chain procurement is an aspect of buy-side e-commerce within the B2B arena. (See figure 2-16), (Chaffey, 2004:P288)

**Figure 2-16. A typical supply chain (an example from the B2B Company)**

2-2-12. e-Technologies in the automotive industry

Knowledge and application of modern information technologies will be crucial to competitive advantage of companies. (Weele, 2002:P6)

By using Internet technology, large manufacturing companies can communicate and trade both with their customers and suppliers faster, more efficiently and on a larger scale. (Weele, 2002:P170)
According to PricewaterhouseCoopers (2000), e-Technologies will have no less an impact on the automotive industry than Henry Ford 86 years earlier. Enterprises that innovate consumer centric practices, which engage the consumer in an enduring relationship, will enjoy a more sustainable period of advantage over their competitors. As a key enabler of this dynamic, e-Technologies will have a critical impact. However, its effects will not be confined to the consumer interface. E-Technologies will also transform the intra-enterprise landscape, enabling the fundamental redefinition of business processes and altering the balance of power in relationships within the "extended enterprise". (Ibid: P25)

E-Technologies will have a critical and multifunctional role in this process. E-Technologies will allow members of the enterprise group to operate and interact more fluidly, rather than at arms’ length, and will therefore underpin the transformation of relationships as well as processes. (Ibid: P27)

According to a survey of automotive/manufacturing companies, conducted by KPMG and the Economist Intelligence Unit in June and July 2000, e-business has unarguably become an integral element in the business and engineering strategies of manufacturers and suppliers in the automotive industry. (Hoppen et al, 2002:427)

The automotive equipment sector is an area of industry that has warmly embraced the use of the new information and communication technologies: “e-procurement” for buying, “e-design” for product development, “e-supply chain” for logistics. These new technologies are now developing rapidly and contribute to reducing costs, improving quality and shortening lead times. Co-design and data transfer systems are becoming the norm and are standardizing along the entire chain: the carmakers, the large equipment manufacturers in charge of modules and components, and the other suppliers involved in an automotive project. (e-business Watch, 2005)

In the study conducted by e-business Watch (2005) it was found that among the 7 manufacturing sectors surveyed, electronic business activity has reached the highest level of intensity in the automotive, pharmaceutical and aeronautics industries. Supply-chain integration and the streamlining of procurement processes are widespread objectives in these industries for which e-business solutions are attractive. (Ibid)

Obviously, the procurement of thousands of unique parts requires much more coordination than, say, the procurement of parts for a wooden chair. Therefore, the large part variety indicates that an automaker’s value chain has more to gain in terms of a procurement cost reduction through recent technological advances than the chair manufacturer’s value chain. Hence, automotive OEMs and suppliers are among the relatively new technology’s “first adopters.” The most frequently adopted technologies include Enterprise Resource Planning (ERP), Supply Chain Management (SCM) and collaborative design systems. The automotive industry predominantly uses EDI-based standards and proprietary standards to exchange data between companies. However, EDI applications that barely allow the exchange of data between systems hinder the diffusion of more flexible and open standards. (Ibid)
What e-business can provide for automotive manufacturers and suppliers has been well stated and has become a sort of mantra: improved product quality, reduced costs, and shortened time-to-market cycles. These gains can be achieved via the Internet’s boundless architecture, permitting the free flow of information and ideas in real time among OEMs, suppliers, and dealers. The benefits of e-business are more than just a mere incantation, however, since largely virtual technologies are being used for supply-chain management, product development, customer relations, and e-procurement. (Hoppen et al, 2002:P423)

The automotive industry appears to lead in the integration and automation of internal processes as well. This is in line with the findings on the intensive use of applications such as ERP, SCM and collaborative design tools by large firms. Furthermore, OEMs and their suppliers are also forerunners in electronic procurement and supply chain integration. This result seems to be intuitive considering that e-procurement was one of the e-business applications that drew considerable attention from most of the industry players. As a result, despite the delay, e-sourcing is an actively employed practice industry-wide. (e-business Watch, 2005)

Online procurement has become part of everyday business and included in the most frequently adopted e-business applications. However, online purchases are rather limited in terms of volume and, contrary to commonly held opinions, micro firms emerge as e-procurement leaders. Although online marketplaces play only a minor role in the sector, evidence presented in the case study on SupplyOn indicates that electronic marketplaces slowly gain acceptance in the automotive industry. (Ibid)

Many firms in the automotive industry have identified procurement as an area in which they can make improvements to their bottom line by reducing the costs of a transaction. Some examples of major web exchanges in the automotive industry are Covisint, SupplyOn, and FreeMarkets.

2-2-13. e-procurement adoption

Despite many disappointments online procurement together with e-marketplaces has become part of everyday business in the automotive industry. Furthermore, online procurement belongs to the most frequently adopted e-business solution in the sector and its diffusion has not reached saturation levels yet. (e-Business Watch Sector Report July 2003)

According to one study on procurement practices in the automotive industry, online procurement has improved efficiency through catalogue systems and auctions. Moreover, companies realized that new practices introduced together with e-sourcing had positive effects on communication along the supply chain and quality of their purchasing processes, and increased transparency. Contrary to initial expectations, these were more significant benefits than direct material cost reduction or the bundling of purchases. (Croom, 2005)
Ford and General Motors were key drivers of the e-revolution in the automotive industry among car manufacturers. They established separate e-business units in an attempt to reinvent the automotive business. (Klein and Helmut, 2005:P2)

On November 2 1999, General Motors and Ford declared that they would transfer their purchasing operations to the web. AutoXchange, a joint venture between Ford and Oracle, aimed at connecting Ford to its material and parts suppliers over the net. GM, together with CommerceOne forged GM MarketSite for the same reasons: connecting suppliers, business partners and customers on a single platform to increase supply chain efficiency. AutoXchange claimed up to 20% savings on procurement and inventory for the case of Ford. Microsoft’s CarPoint, launched in 1995 joined forces with Ford Direct, a joint venture between Ford Motor Co. and its Ford Division Dealers (The Economist, 1999). This initiative focused on the customer side of the carmakers operations and aimed towards the manufacturing of built-to-order cars. (Ibid: P4)

By connecting with its suppliers and sharing demand and forecasting data, GM is improving quality and responsiveness as well as reducing costs. GM now estimates that 68 percent of its direct materials procurement will be done over the Internet by 2004. (Benko and McFarlan, 2003)

Despite the potentials promised by the vendors of such systems, e-procurement got off to a slow start. A study by Eyholzer and Hunziker shows that only 18 percent of the Swiss companies analyzed used electronic product catalogs, auctions or requests for quotations in procurement in the year 2000. According to this study, however, many companies were planning to implement e-procurement systems at that time. Other studies show similar proportions for other countries. Wyld, reports that currently almost half of all American companies use e-procurement systems. (Croom, 2005)

Although the adoption of e-procurement has rapidly increased in recent years, companies face different challenges associated with the advent and use of e-procurement. One is that most companies only apply single e-procurement functions. A second challenge is that, despite the overwhelming evidence, which shows the advantages of e-procurement systems, proprietary systems such as EDI continue to persist, and have to be included in a company’s overall e-procurement infrastructure. (Croom, 2001)

In 2000, in a remarkable example of how far collaboration can extend in the industry, the traditional “Big Three” of Detroit – along with Renault and Nissan – together launched a digital marketplace called Covisint. By building a system based on open standards, the industry is integrating and eliminating the expensive process of developing proprietary point-to-point connections. Covisint’s members now include representatives of the entire value network. In 2001 alone, one year after the launch of the new system, GM auctioned approximately $100 billion through Covisint. (Benko and McFarlan, 2003:P7)

Only 23.2% of the European suppliers and manufacturers in the automotive industry use e-procurement. (Hoppen et al, 2002)
The procurement of direct items is often determined by special software applications (buy-side solutions) and standards (e.g. xCBL) needed to access a seller's system (sell-side solution) and restrictions (e.g. permanence of a business relation), the procurement of indirect products is less complex. Frequently, no specific software application is required so that the purchasing process can be carried out with a simple Web-browser. Beyond that, the indirect procurement is less restrictive. (Ibid)

In addition, numerous initiatives aiming at establishing industry-wide standards for e-business practices failed. Contrary to initial expectations, online marketplaces did not gain wide acceptance among firms in the automotive industry. Main reasons included suppliers’ security concerns, a “battle of power” among customers, suppliers and operators of e-marketplaces, and a preference of carmakers for proprietary systems over industry wide platforms. Consequently, electronic marketplaces were scarcely used in this sector. Many firms either preferred their established suppliers or else used the Internet to operate their own e-procurement system. (e-business Watch, 2005)

A few years ago, many managers in the automotive industry saw e-procurement as the solution for the industry’s cumbersome and complex purchasing processes. Public marketplaces such as Covisint and SupplyOn, as well as OEM-specific marketplaces such as Toyota's WARP and VW Group's Supply.com, were created in the anticipation that a high percentage of the industry's purchasing-especially of commodities-would flow through such channels. However, the industry has adopted e-procurement at a far slower pace than was projected. The main reason for this slow and partial adoption is that many supplied systems and components are not optimally suited for online bidding. In fact, the only parts that can be sourced easily through online bidding are those that can be clearly defined in drawings and specifications, requiring little or no interaction between engineers from the supplier and the OEM. In addition, the limited compatibility of the IT systems currently used for purchasing with online marketplaces represents a considerable hindrance to the adoption of e-procurement (Dietz, 2004:P15).
3. Conceptualization and frame of reference

The purpose of the conceptualization is to explain the main area of a study either graphically or in the narrative form. Conceptualization presents the main points that are going to be studied (Miles & Huberman, 1994). In the chapter one an introduction to the topic area was presented. The chapter continued with a description of the problem area and concluded with the formulated research questions of this thesis. In chapter two, the relevant literature needed to develop the frame of reference was provided. This chapter will concisely introduce the research questions, which will be followed by the conceptualization that will provide a guide to answer the research questions. Lastly, the emergence of the frame of reference will provide a graphical illustration of interaction between SAPCO and its suppliers through an e-procurement system, which is associated with some benefits and barriers in development.

3.1 Conceptualization

This study concerns procurement area to investigate about and focus on e-procurement as a new concept of procurement, to narrow the area of research; it is limited to the direct procurement. Direct procurement is one of the most frequently performed business activities. It encompasses all items that are part of finished products, such as raw material, components and parts (Gebauer, and A. Segev, 2001).

In this part, concerning research questions, we present selected theories from literature review, which provides the conceptualization that will make it possible to answer our research questions.

The criteria for the selection of proposed theories is our main research question that were defined in chapter one and are presented below:

RQ: How can e-procurement development in SAPCO and its suppliers be described?

To answer our research question, we need to investigate about models, systems, process and applications of e-procurement as well as benefits and barriers of it, which are suggested in literature and used them as a basis for our study.

We consider that theories can be divided in our research questions as follows:

RQ1: How e-procurement is being used for acquisition of parts and components between SAPCO and its suppliers?

e-Procurement definition: The term e-procurement results from the electronic support of procurement activities between a purchaser and a supplier through information and communication technologies (Chaffey, 2002).
**e-Procurement model:** According to Chaffey, 2004, there are three fundamental models for location of B2B e-commerce: sell-side, buy-side and marketplace-based.

**e-Procurement system:** According to Croom (2001), electronic procurement systems in essence mirror the procurement process through the provision of two distinct, but connected, infrastructures - internal processing (via, for example, corporate intranet) and external communication with the supply base (via, for example, Internet-based platforms).

**e-Procurement process:** McKie (2001) states, e-procurement software support the procurement process from req. to check (requisition to payment). By his definition, a typical e-procurement workflow involves the following steps:

- Requisitioning
- Order Submission
- Order Tracking
- Receipt Processing
- Payment Processing
- ERP update

**e-Procurement application:** An additional theory that will be used to answer this question is put forward by Knudsen (2003), which defines e-procurement applications as follows:

1. **E-sourcing:**
   - Finding potential new suppliers using the Internet in general or a B2B marketplace for information gathering.

2. **E-tendering:**
   - Process of sending request for information (RFI), request for price (RFP), etc to suppliers and receiving the responses using Internet technology. Takes place in the supplier contact step of the procurement process.

3. **E-informing:**
   - Handling information about the supplier regarding quality certification, financial status or unique capabilities.

4. **E-reverse auctions:**
   - Buying goods and services that have the lowest price or combination of lowest price and other conditions via Internet technology.

5. **E-MRO and Web-based ERP:**
   - Focusing on the process of creating and approving purchasing requisitions, placing the orders and receiving the goods or service ordered using a software system based on Internet technology. The difference between the two is that e-MRO deals with indirect items (maintenance, repair and operating materials), whereas the Web-based ERP deals with product-related items. Takes place in the fulfillment step of the procurement process.
Note: In our investigation, we will use web-based ERP application due to the choosing direct procurement category.

(6) E-collaboration:
- Correcting and updating data regarding product versions, blueprints and sales forecasts are always available from the buying company’s Web site or extranet, thus reducing errors before they occur and making it possible for suppliers to be in sync with the buyer; handle mainly gathering and disseminating of purchasing related information. It also encompasses the usage of different collaboration tools such as virtual meeting rooms, bulletin boards, and even shared knowledge management systems.

Component definition: According to (Weele, 2002; Hoppen et al, 2002), the definition of components are manufactured goods, which will not go through additional physical changes, but which will be incorporated in a system with which there is a functional relationship by joining it with other components. They are built into an end product. Examples are headlight units, lamps, batteries, engine parts, electronic parts and transmissions.

RQ2: What are the benefits of applying e-procurement in SAPCO and its suppliers?

The second research question will be answered by applying numbers of benefits of Wyld (2004) research, concerning the benefits that could be gained by applying an e-procurement system, because it is the most comprehensive among the rest and also recent. We have found definitions for benefits stated by below references:

Price Benefits

Price benefits are derived as a result of better demand management capability of e-procurement systems. Procurement costs are reduced through economies of supplier search and increased price competition among suppliers (Croom and Johnston, 2003; Shaw and Subramaniam, 2002).

Shortened Procurement cycle times

According to NECCC (2002) e-procurement has the ability to reduce resources currently involved in paper and manually based procurement processes through improved payment processes and decreased cycle time.

Reduced transaction and administration costs

Reduction in transaction cost is one of the most attractive benefits from e-procurement adoption, which is achievable by eliminating data entry and correcting errors in paperwork and also savings in search, negotiation and contracting, and coordination costs. (C. Nam, 1998; Shaw and Subramaniam, 2002)
Lowering procurement administration costs starts with reducing the time and/or the number of people required to process purchase order requisitions. (Aberdeen group, 2001)

**Improved visibility of customer demand and supply chain**

The ability to use e-commerce tools in order to collaborate with suppliers, distributors, and customers in all these activities will help determine tomorrow's winners. (Andrew, 2001, P6) E-procurement enables companies to decentralize operational procurement processes and centralize strategic procurement processes as a result of the higher supply chain transparency provided by e-procurement systems. (Puschmann and Alt, 2005)

**Reduced operating & inventory costs**

The buyer will obtain operational efficiency by implementing the e-procurement system in the form of reduced inventory costs and ordering costs, and this efficiency gain increases with the number of suppliers who join in the network. (Dai and Kauffman, 2003)

**Enhanced decision-making**

According to NECCC (2002) e-procurement provide the opportunity for increased auditing and automated accountability and tracking from start to finish; and increased and more sophisticated reporting functionality which lead to enhance decision making. E-procurement efficiency benefits comprise the proactive management of key data and higher-quality purchasing decisions within organizations. Puschmann and Alt (2005)

**RQ3: What are the risks of applying e-procurement in SAPCO and its suppliers?**

We considered again Wyld (2004) research for the third research question as our reference because it covers most of given risks in different literature and the research was new.

**Inadequate Technological Infrastructure**

Payne stated that SME’s in developing countries face more challenges when trying to gain from electronic commerce than businesses in developed countries. This context includes constraints related to technical infrastructure (access and pricing), laws and regulations, limited logistics systems (roads, rail, and air), and more. (Payne, N.D.)

**Inadequate Technological Infrastructure of partners**

The technological infrastructure especially in relation to procurement business partners is considered one of the main barriers to e-procurement. (Stein & Hawking, 2002)

**Lack of Skilled Personnel**

Like so many other “e-solutions” lack of skilled staff is considered a serious impediment. (Stein & Hawking, 2002)
**Lack of Integration with Business Partners and their Co-operation**

The scope of B2B operations goes beyond the buying enterprise and extends to the “extended enterprise”, to include all suppliers and other business partners. However, all business partners do not have the same characteristics to adopt e-procurement. The potential value of the system cannot be realized unless both users and suppliers participate in the system. (Shaw and Subramaniam, 2002)

**Implementation Costs**

Croom in his study report highlighted the level of agreement and disagreement with the five important impediments identified. Only in the case of development costs there was a lack of disagreement with the criteria identified as an impediment. (Croom, 2001 and 2005)

**Company Culture**

According to PricewaterhouseCoopers, the organization must be transformed into a change-embracing entity, one with a culture that accepts that every tomorrow is different and all developments are worth examining for the benefits they may bring. (PricewaterhouseCoopers, 2002)

**Inadequate Business Processes to support e-Procurement:**

Need to re-engineer business processes as the greatest identified barriers in a study of the main obstacles to e-business success. (Ernst & Young, 2001: P4)

**Regulatory and Legal Controls**

Perhaps the most important challenges facing companies contemplating E-Business are legal and regulatory issues such as conflicting jurisdictions, taxes, and intellectual property rights and security issues such as data confidentiality, privacy, fraud, and industrial espionage (PricewaterhouseCoopers, 2002)

**Security**

Min and Galle stated that when asked to rate the severity of obstacles that may hinder effective Internet-based cyber-purchasing, the most serious obstacle is a lack of security of Internet transactions. (Min and Galle, 1999)

**Inadequate e-procurement Solutions**

Lack of appropriate offerings is one of the e-procurement barriers named by Tanmit (2002). Most e-Procurement solutions have focused on automating the front-end procure-to-order cycles, providing little, if any, support for critical back-end processes such as supplier management, sourcing, order fulfillment, and financial settlement. (Aberdeen, 2002)
Upper Management Support.

e-Business initiatives success depends on strategic decisions that ensure alignment with the company’s long-term vision and goals, which requires senior management commitment. (PricewaterhouseCoopers, 2002)

3.2 Frame of reference

In below figure, the frame of references is emerged from the conceptualization also the three research questions are demonstrated:

Figure 3-1. Frame of reference

Source: By Authors, 2005
4. Methodology

This chapter provides the methodology of the empirical study and gives the details concerning case study. According to Marshall and Rossman (1999), a methodology chapter serves to describe the research design and research method. Although the choice of research method and practices depends upon the research problem and research questions that are asked, it should also reflect the researcher’s scientific positioning.

4-1. Research Purpose

Classifying business research on the basis of purpose allows us to understand how the nature of the problem influences the choice of research strategies. Referring to Zikmund (2000), the nature of the problem will determine whether the research is exploratory, descriptive or causal. Accordingly, Reynolds (1971) and Yin (2003) mentioned that scientific research has three purposes: exploratory, descriptive or explanatory.

Exploratory studies are used to clarify and define the nature of a problem. They are used to analyze a situation, to gain a better understanding of the dimensions of a problem. The purpose is however not to determine a particular guideline. Exploratory research is instead conducted with the expectation that subsequent research will be required to determine the proper course of action (Zikmund, 2000). According to Yin (2003), the purpose of this kind of research is to gather as much information as possible about a specific subject. It is further common to use many different sources to gather this information. The technique that is best suited for information gathering when performing an exploratory research is interviews.

Unlike exploratory studies, descriptive research is based on some previous understanding of the nature of the research problem. The purpose of descriptive studies is to describe the characteristics of a complex phenomenon or population. Even though the answer to the question why is never given, descriptive information in many cases enough to solve business problems. (Zikmund, 2000)

Moreover, descriptive research is often used when a problem is well structured and there is no intension to investigate cause/effect relationship. (Yin, 2003)

Causal or explanatory research is often preceded by exploratory and descriptive research. Causal studies refer to research conducted to identify cause-and-effect relationships among variables where the research problem has been identified narrowly. Research with the purpose of inferring causality should according to (Zikmund, 2000):

1. Establish the appropriate causal order of events;
2. Measure the concomitant variation, i.e. the occurrence of two phenomena that vary together, between the presumed cause and effect;
3. Recognize the presence or absence of alternative reasonable explanations or causal factors.

According to Yin (2003), the objective with an explanatory research is to analyze cause-effect relationship, explaining what cause produces what effects.

Based on our research question, our study is preliminary descriptive due to the fact that we intend to describe the area of research and try to explain the collected data in order to investigate the differences and similarities with our frame of reference. Beside that, it is also our intention to explain causal effect on relationships by evaluating answers to the research questions. Therefore, it makes our study somehow explanatory.

4-2. Research approach

The purpose of the study and the accompanying research questions determines the best approach for a study. (Yin, 1994)

According to Guba and Lincoln (1994), two approaches or methods – quantitative and qualitative – are available to researchers. The qualitative approach implies an emphasis on processes and meanings that are not measured in terms of quantity, amount, intensity or frequency. The qualitative approach provides a deeper understanding of the phenomenon within its context. Moreover, qualitative researchers stress the socially constructed nature of reality that states the relationship between the researcher and the phenomenon under investigation. On the other hand, quantitative researchers emphasize the measurement and analysis of causal relationships between variables, not processes.

As stated by Sullivan (2001), the distinction between qualitative and quantitative approaches depends primarily on two factors: 1) the state of our knowledge on a particular research topic, and 2) the researcher’s assessment regarding the nature of the phenomenon being studied. According to Sullivan (2001), when there is little theoretical support for a phenomenon, it may be impossible to develop precise hypotheses, research questions, or operational definitions. In such cases, qualitative research is appropriate because it can be more exploratory in nature.

Characteristics of qualitative studies are that they are based largely on the researcher’s own description, emotions and reactions (Yin, 2003). The qualitative approach also includes a great closeness to the respondents or to the source that the data is being collected from (Jung and Widmark, 2004). It is characterized by gathering abundant information and to investigate several variables from a few numbers of entities. To make use of the possibility to gather high quality data, the most common way to do this is with the use of case studies and interviews where no set answering alternatives are being offered. (Jung and Widmark, 2004)

Based on our research questions and above discussions, we choose the qualitative approach, because we need to investigate the area of research very closely and we are
seeking in-depth materials/answers in order to gain deep understanding of procurement subject and its new concept. Also we do not intend to quantify and generalize the data.

4-3. Research strategy

“The strategy is a road map, an overall plan for undertaking a systematic exploration of the phenomenon of interest” (Marshall and Rossman, 1999: 61). There are many possible strategies available to a researcher. Yin (1994) has identified five strategies; experiments, survey, histories, analysis of archival information, and case studies. Each of these strategies is a different way of collecting and analyzing empirical evidence. Usually, case studies are considered appropriate for the exploratory phase, while surveys and histories fit the descriptive phase, and experiments are the only way of doing explanatory or causal inquiries.

However, according to Yin (1994), this hierarchical view is incorrect and each strategy can be used for all three purposes: exploratory, descriptive, or explanatory. He distinguishes strategies on the basis of three conditions (Table 4-1):

1. The type of research questions posed
2. The extent of control an investigator has over actual behavioral events
3. The degree of focus on contemporary as opposed to historical events

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Form of research questions</th>
<th>Required control over Behavioral events</th>
<th>Focuses on contemporarily events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiments</td>
<td>How, Why</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Survey</td>
<td>Who, What, Where, How Many, How Much</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Archival Analysis</td>
<td>Who, What, Where</td>
<td>No</td>
<td>Yes/No</td>
</tr>
<tr>
<td>History</td>
<td>How, Why</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Case study</td>
<td>How, Why</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Source: Yin, 1994, p.6

Research questions are considered the first and most important condition for differentiating among different strategies. “What”, “who”, and “where” questions and their derivatives – “how many” and “how much” – are likely to favor survey and archival records, while “how” and “why” questions lead us to case studies, histories and experiments as the preferred research strategies. In addition to the type of research question, “extent of control over behavioral events” and “degree of focus on contemporary as opposed to historical events” differentiates among different strategies. While experiment is the only strategy that requires control over events, history is the strategy that does not deal with contemporary events. Case study is appropriate for examining contemporary events when the relevant behaviors cannot be manipulated.
Considering our research questions which are based on what and how questions, having no control over behavioral events and focusing on contemporarily event, we are standing between survey and case study (or studies). The case study is our superior alternative due to the fact that we choose qualitative approach to carry out our research.

According to Yin (1994), a case study is an inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident. He has also explained that a “case” may been individual, or some event or entity that is less well defined than a single individual, e.g., a process or an organization. He also highlights that the unit of analysis can be the case itself and relates the unit of analysis (and therefore the case) to the way the initial research questions have been defined.

Miles & Huberman (1994) also see the case as the study’s unit of analysis and picture it as the “heart” of the study. Therefore, according to Yin (1994), the case study could assume not only either a single-case or a multiple-case design, but both types of design may have either a single unit or embedded multiple units of analysis.

According to Miles & Huberman (1994), multiple-case studies add confidence to findings by looking at a range of similar and contrasting cases. By investigating similar and contrasting cases, the researchers have the opportunity to better understand the findings than if they came from a single case. “A major insight is to consider multi-pleases as one would consider multiple experiments – that is, to follow replication logic”. (Yin, 1994, p45)

Based on our problem discussion, in order to make a comparison between related cases in our research area, we ought to choose multiple-case study as our research strategy. This strategy makes the opportunity to discover similarities and differences between cases.

**4-4. Sample selection**

As stated earlier, a multiple-case study approach is adopted in this study. According to Miles & Huberman (1994), “multiple-case sampling, although it may have iterative aspects, normally has to be thought through carefully. An explicit sampling frame is needed. It will be guided by the research questions and conceptual framework. However, random sampling does not help in multiple-case studies. (Ibid)

Therefore, purposive and theoretical sampling, in which a theoretical framework and concepts guide sampling (Marshall & Rossman, 1999) are used in this study. Yin (1994) has defined three main criteria for selection of cases: convenience, access and geographic proximity. In this study, sampling begins with accessible sites (convenience sampling) and builds on insights and connections from the early data collection.

According to the defined area of the research and research problem, we intend to investigate in automotive supply chain in the field of e-procurement in both buying
and selling side. The reason that we choose automotive industry was based on below reference:

Based on PricewaterhouseCoopers report (2002), the existing landscape of the global automotive industry is a minefield of challenging issues. Declines in shareholder return and stock prices, too many e-business and quality management programs, and the lack of integration and standards as a basis for collaboration within the supply chain threaten the very survival of every supplier. OEM over-capacity and developing electronic procurement practices are rapidly spreading the pain of variable cost pricing of new automobiles to every part of the supply chain. E-procurement is here to stay, and it will drive a new period of rationalization.

The reason why we also do our investigation in supplier side is based on Croom (2005), who stated that after supply chain management and integration, price pressures and cost reduction was the second major supply chain issue facing organizations which they hoped to get removed of by implementation of e-business. According to him, the majority of an organization's costs are vested in the supply side of their operation (typically averaging 60 per cent of an organization's total revenue), and improvements in the efficiency and effectiveness of customer-facing activities are necessary to respond to mounting competitive pressure.

Due to geographical location and limitation of resources the empirical investigation of this study will be limited to Iranian companies.

In the buyer side, we choose SAPCO (Supplying Automotive Parts Company) due to the fact that this Company is the most powerful purchasing organization in Iran. It was founded in 1993, and soon become the pioneer in auto parts industry. SAPCO is a subsidiary of Iran Khodro Company, the largest auto-manufacturer with the annual production capacity of 1,000,000 units in Iran. At present there are 13 vehicle manufacturers active in Iranian market, while Iran Khodro with 65% of market share is the leader. Meanwhile, referring to our pre-investigation in automotive industries of Iran, we found that SAPCO as the pioneer in implementing e-procurement applications with its suppliers. It is needless to say that two of the researchers are working in SAPCO and Iran Khodro (as OEM), so the data accessibility of cases becomes more achievable while also reliable and valid.

According to the SAPCO organizational chart (Appendix 1. provided form SAPCO documentation) this company consists of six divisions named:

1-Commercial Division
2-Human resources Division
3-Financial and Economic Division
4-Manufacturing Division
5-Planning Division
6-Technical and Engineering Division
Refer to the SAPCO organizational chart (Appendix 1. provided form SAPCO documentation); “Computer and systems” department is in charge of developing software, technical support and ICT development through all deputies in SAPCO. This department is the most influencer in the process of SAPCO's procurement, its automation and applying some of the e-procurement applications. In this regards, this department targeted as one our interviews places. According to the purchasing process, procurement activities of parts and components are running in below divisions of SAPCO:

1-Commercial Division
2-Financial and Economic Division
3-Manufacturing Division
4-Planning Division

To investigate the e-procurement development in every aspects and functions and also to increase the reliability and validity of our study, we endeavored to conduct an interview with all related departments of direct procurement; as a result, we made a face-to-face interview with 9 informants in the departments, which are depicted in table 4-2.

<table>
<thead>
<tr>
<th>Division</th>
<th>Departments &amp; supportive units</th>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning</td>
<td>Logistic</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Planning and procurement of car parts</td>
<td>✓</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>Trim parts</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Electronic parts</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Polymer parts</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Mechanism and standards</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Body parts</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Transmission</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Engine parts</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Suspension, brake and wheel</td>
<td></td>
</tr>
<tr>
<td>Commercial</td>
<td>Foreign purchase</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Domestic direct purchase</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Domestic indirect purchase</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Purchasing services</td>
<td></td>
</tr>
<tr>
<td></td>
<td>After market Sales &amp; Production support</td>
<td></td>
</tr>
<tr>
<td>Finance</td>
<td>Parts purchasing and contracts accounting</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Commercial specialized</td>
<td>✓</td>
</tr>
</tbody>
</table>

Source: By Authors, 2005

In the selling side, we have a wide range of Iranian automotive suppliers who are supplying direct items (i.e. parts and components) to SAPCO; the total number of domestic parts and components supplying base of SPAPCO is 480 companies. While, based on SAPCO's ranking system, all direct suppliers of SAPCO are divided in three
categories according to the level of their annual sale to SAPCO. These categories are as follows:

1. Big suppliers with the annual sale value of more than 30 Billion Rial ($3M)
2. Middle suppliers with the annual sale value of between 10 to 30 Billion Rial ($1M to $3M)
3. Small suppliers with the annual sale value of less than 10 Billion Rial (1 M$)

As we intend to investigate the e-procurement development, it was imperative to choose suppliers who have already some kind of electronic and web-based relationship with SAPCO. The reason is that when a company is implementing web-based transaction, it is more relevant to our study area and more reliable and in-depth information will be gathered. Therefore, all suppliers with web-based transaction make our sampling frame. To select the required samples from our frame, considering the number of suppliers in three mentioned categories (Appendix [II]) and our resource limitation, we choose top five suppliers from big suppliers’ category who have web-based and at the same time the largest amount and transaction with SAPCO. The total number of suppliers who have web-based transaction with SAPCO was 94 which from it 5 companies are selected as follows:

1. Mehrkam Pars company
2. Mehvarsazan Iran Khodro company
3. Sanden Iranian company
4. Majmooeh Sazi Tous (MST) company
5. Shetab Kar company

The interviews with suppliers conducted with people who were introduced by SAPCO as a person with most responsibilities and involvement in procurement subject.

**4-5. Data collection method**

In case studies, data collection can rely on different sources of evidence. Yin (1994) refers to six important methods: 1) documentation, 2) archival records, 3) interview, 4) direct observation, 5) participant-observation, and 6) physical artifacts. Denzin & Lincoln (1994) also mention seven: 1) interview, 2) direct observation, 3) analysis of artifacts, 4) documents, 5) cultural records, 6) visual materials, and 7) personal experiences. And finally, Marshall & Rossman (1999) suggest four sources: 1) participation in the setting, 2) direct observation, 3) in-depth interviewing, and 4) analyzing documents and material culture. All these authors agree that no single source has a complete advantage over all others.
According to Yin (1994), the strengths and weaknesses of the different sources of evidence are presented in table 4-2:

<table>
<thead>
<tr>
<th>Source of evidence</th>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Documentation</td>
<td>Stable: can be reviewed reputedly</td>
<td>Retrievability: can be low</td>
</tr>
<tr>
<td></td>
<td>Unobtrusive: not created as a result of the case</td>
<td>Reporting bias: reflects (unknown) bias of author</td>
</tr>
<tr>
<td></td>
<td>Exact: contains exact names, references and details of an event</td>
<td>Access: may be deliberately blocked</td>
</tr>
<tr>
<td></td>
<td>Broad coverage: long span of time, many events and settings</td>
<td>Biased selectivity: if collection is incomplete</td>
</tr>
<tr>
<td>Archival records</td>
<td>(Same as for Documentation)</td>
<td>(Same as for Documentation)</td>
</tr>
<tr>
<td></td>
<td>Precise and quantitative</td>
<td>Accessibility due to privacy reasons</td>
</tr>
<tr>
<td>Interview</td>
<td>Targeted: focuses directly at the case study topic</td>
<td>Bias due to poorly constructed questionnaires</td>
</tr>
<tr>
<td></td>
<td>Insightful: provides perceived casual inferences</td>
<td>Response bias</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inaccuracies due to poor recall</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reflexibility: interviewee gives what interviewer wants to hear</td>
</tr>
<tr>
<td>Direct observations</td>
<td>Reality: covers events in real time</td>
<td>Time consuming</td>
</tr>
<tr>
<td></td>
<td>Contextual: covers context of event</td>
<td>Selectivity: unless broad coverage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reflexivity: event may proceed differently because it is being observed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Costs: hours needed by human observers</td>
</tr>
<tr>
<td>Participants observation</td>
<td>(Same as for Direct observation)</td>
<td>(Same as for Direct observation)</td>
</tr>
<tr>
<td></td>
<td>Insightful into interpersonal behavior and motives</td>
<td>Bias due to investigator’s Manipulation of events</td>
</tr>
<tr>
<td>Physical artifacts</td>
<td>Insightful into cultural features and technical operations</td>
<td>Selectivity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Availability</td>
</tr>
</tbody>
</table>

Source: Yin, 1994

According to Yin (1994), one of the most important data collection methods for case studies is the interview; therefore, we choose this method of data collection for our study.

The interview could be divided into two types, structured and focused interviews (Emory & cooper, 1991). The structured interview follows a structured questionnaire is therefore best suited for surveys. The focused interview is better suited for complex subjects since it follows an interview guideline instead and promotes discussion by the respondent. (Yin, 1994)
Accordingly, the interviews can take several forms regarding the type of questions. Patton (1990) categorizes interviews into three general types: 1) informal conversational interview, 2) general interview guide approach, and 3) standardized open-ended interview (in Marshall & Rossman, 1999), while Yin (1994) refers to three forms of interview: open-ended nature, focused, and structured questions.

The interviews conducted in our research are based on a pre-determined set of discussion topics. However, opportunity is left open for any type of response. In fact we use “focused approach” based on interview guide, because it provides topics or subject areas which is free to explore, probe and ask questions by interviewer which elucidate and illuminate the subject under investigation. In fact, the interview guide enabled us to:

- a) Build a conversation within a particular subject area;
- b) Word questions spontaneously;
- c) Establish conversational style.

But with the focus on a particular subject which has been predetermined based on our conceptualized framework.

Referring to Emory & Cooper (1991), there are two different ways of conducting the focused interview, by telephone interviewing or personal interviewing face-to-face. In order to avoid lower response rate, use follow-up questions, probe the answers and receive complete responses, we prefer to use personal face-to-face interview. Face-to-face interview also makes the opportunity to see the reaction of the respondents when they are answering questions or discussing related issues.

It is needless to mention that although this study is strongly focused on interview, we also use documentation as a complementary source for data collection. According to Yin (1994), documentary information is likely to be relevant to every case study. This type of information can take any form of communication, usually written materials (textbooks, novels, newspaper, formal studies, agenda, announcements and minutes of meeting, etc), and other forms of communication. The most important use of documents is to corroborate and augment evidence from other sources.

4-6. Data analysis

According to Marshall & Rossman (1999), “Data analysis is the process of bringing order, structure and interpretation to the mass of collected data” (p.150). In qualitative studies, researchers devote more attention to conceptualization “to understand people, groups and organizations within the full context or situation in which they act” (Sullivan, 2001, p.451). In fact, in qualitative data analysis, researchers devote more effort to contextualizing than to abstracting or generalizing.

According to Miles & Huberman (1984, 1994) data analysis contains three linked sub processes: data reduction, data display and conclusion drawing / verification (in Denzin & Lincoln, 1994). “These processes occur before data collection, during study
design and planning; during data collection as interim and early analyses are carried out, and after data collection as final products are approached and completed” (ibid. p.429). However, as stated by Marshall & Rossman (1999), since the “qualitative data are exceedingly complex and not readily convertible into standard measurable units” (p.151), they “are not immediately available for analysis, but require some processing” (Huberman & Miles in Denzin & Lincoln, 1994, p.430). In order to overcome the problem of the manipulation of the qualitative data and to avoid biasing the result, Yin (1994) noted that more important than selecting analytic technique is to have a general analytic strategy. He presents two general strategies for case study analysis:

1. Relying on theoretical propositions
2. Developing a case description

According to Yin (1994), the preferred strategy is to follow the theoretical proposition (the research questions and the review of literature) that led to case study. The propositions shape the data collection plan and help to focus attention on certain data and ignore other data. In other words, “choices of conceptual framework, of research questions, of samples, of the “case” definition itself, and of instrumentation are all involve anticipatory data reduction – which, as we have noted, is an essential aspect of data analysis” (Huberman & Miles in Denzin & Lincoln, 1994, p.430). The second strategy is a descriptive mode that is used to present the case without specific concern for following the theoretical foundations. Similar to Yin (1994), Marshall & Rossman (1999) also suggest that researchers should use the preliminary research questions and the related literature to provide guidelines for data analysis.

To analysis the collected data in this research and with reference to above discussion, we use our research questions, which are derived from theoretical literature and our conceptualization. Based on research problem and questions, empirical data from each case is described and analyzed separately and accordingly compared against the theoretical framework. Then after, interview results in each case are assembled and integrated in accordance with each subject they are gathered. The within-case analysis is then followed by the cross-case analysis of each subject of analysis. Finally, the findings and conclusions are discussed and presented on the basis of the conceptualized framework.

4-7. Quality standards

When conducting empirical studies, it is vital that the method and data collection is thoroughly prepared, in order to avoid systematic and random errors and to increase the quality of the research.

According to Louise Jung and Widmark (2004) Validity is defined by Eriksson and Wiedersheim-paul, as a measuring instrument’s ability, to measure what it is supposed to measure. Validity is the most important demand on a measuring instrument. If the instrument does not measure what it is support to, then it will not matter if the measurement itself is good.

To enhance the validity of our research, we conducted pilot study in both sides- SAPCO and suppliers in order to pretest our interview guides and make it more accurate and understandable. We made interviews with four samples from SAPCO
located in logistic, finance, manufacturing and IT departments. Accordingly two interviews were conducted with Farasanatshomal Co. and Bronze industrial group at suppliers’ side.

According to Yin (1994), when conducting a case study, the researcher should try to use multiple sources of evidence in order to improve the reliability and validity of the study. This is called triangulation.

In order to ensure the integrity, validity and accuracy of the findings (Yin, 1994; Guba & Lincoln, 1994; Patton, 1990) different steps were taken. First of all, principles of triangulations such as the following were used in collection and investigation of the same data.

- Different sources (interview and documentation)
- Different measures (recording the answers during interview and written answers to questionnaire)
- Different types of questions (open-ended, close-ended, yes-no, and five-point Likert)
- Different method (cross-case, quantitative method including mean analysis, t-test)

In terms of the validity of this study, the use of two interviewers and a tape recorder will help to increase the validity of the data. Multiple cases may also contribute to achieving a higher degree of validity than doing a single case study. By using two sources of data (interview and documentation) and having two interviewers at each interview occasion, we make triangulation efforts to improve the quality of the study.

A further demand, or way of estimating the quality standard, is reliability. This means that the measuring instrument (e.g. a questionnaire) gives accurate and stable results. Refer to Louise Jung and Widmark (2004), a research with good reliability involves that another investigator would get the same results if he/she used the same methods at another point of time and with another sample. In order to increase the reliability of this study, we tried to avoid leading and subjective question. In addition, we have kept all notes and the tapes from the interviews in order to develop a case study database.
5. Empirical Data

In this chapter, we will represent the empirical data collected from "SAPCO" the biggest supplier of automotive parts in Iran and its Suppliers. The empirical data is drawn from personal interview with representatives of case studies as a preliminary data and from documents as a secondary data. In SAPCO we have conducted interview with four divisions, in supplier side we have interviewed with five companies where each company is first introduced. Afterwards each interview is divided into sections according to the research questions posed and frame of reference.

5-1. SAPCO

SAPCO (Supplying Automotive Parts Co.) as an Iranian Purchasing company is the main case study of this master thesis. SAPCO was founded in 1993 and soon become the pioneer in auto parts industry in Iran. SAPCO is a subsidiary of IKCO, the largest auto-manufacturer in Iran with annual production capacity of 800,000¹. In fact, due to lack of a developed automotive suppliers sector in the country, SAPCO was initially established by IKCO to take the responsibilities for design, engineering and procurement of domestic parts and components and also quality and planning aspects of auto parts localization. Its turnover in year 2004 is equal to $2.862 bn.

SAPCO (www.sapco.com), as a main part of IKCO for designing and supplying parts outlined a framework with a set of objectives as follows:

- To identify promising auto-parts manufacturers
- To attract qualified potential sources of supply to join in collaboration
- To provide required guidelines for product quality improvement
- To design effective auto-parts distribution network
- To open channels of communication between other international automotive parts suppliers and vehicle manufacturers

According to the SAPCO organizational chart (Appendix 1. provided form SAPCO documentation) this company consists of six divisions named:

1-Commercial Division
2-Human resources Division
3-Financial and Economic Division
4-Manufacturing Division
5-Planning Division
6-Technical and Engineering Division

¹ IKCO Strategic Planning Center, annual report, 2005
Refer to the SAPCO organizational chart; “Computer and systems” department is in charge of developing software, technical support and ICT development through all deputies in SAPCO. As we mentioned in methodology there is influence of this department in SAPCO procurement process and in applying some e-procurement application, in this regards we interviewed with this department as part of SAPCO. According to the purchasing process, procurement activities of parts and components are running in below Deputies in SAPCO:

1-Commercial Division
2-Financial and Economic Division
3-Manufacturing Division
4-Planning Division

According to methodology chapter and sampling selection, the following samples has been selected to do interview:

1. IT department-software section
2. IT department-ERP manager
3. Planning Division-Logistic department
4. Planning Division-Planning and procurement of vehicle parts
5. Manufacturing Division-Trim parts
6. Manufacturing Division-Polymer parts
7. Commercial Division-Domestic direct purchase
8. Finance Division-Parts purchasing and contracts accounting
9. Finance Division-Commercial specialized

### 5-1-1. Systems & Computer Department

This department was founded since SAPCO establishment and it is directly under supervision of managing director. This department is in charge of all information systems including automated and non-automated and responsible for analysis, design and development of all ICT applications.

This department consists of five sections as shown in table 5-1. Due to this fact that Software section is responsible for of development, support and improvement of all ICT systems, we choose this section as one of the sources of our data collection procedure. Based on integration between e-procurement and ERP systems, which was shown in figure 2-11, and existence of a separate section as ERP project, we decided to have an interview with its manager.

Therefore, the interviews were conducted with the head of software section and the ERP project manager.
5-1-1-1. Software management section

The interview was conducted with Mr. Reza Bigdeli, who has 10 years of experience in SAPCO.

Regarding the necessity of establishment and to describe the activities of this section, Mr. Bigdeli stated that since SAPCO was one of the first companies involved in SCM and procurement of vehicle parts and components, there was no software company available to have enough knowledge and experience to develop ICT systems compatible with their processes. In addition, continuous and significant number of changes in SAPCO processes which need nonstop adjustment in the existing software in one hand and inflexibility of ASPs in other hand motivated SAPCO to create this department. Therefore, from the establishment of this department, all ICT systems needed by SAPCO have been developed internally.

The most processes of SAPCO are based on IT solutions and they have developed a unique database based on Oracle. The MIS system has been divided based on the need of executives, middle managers, employees and suppliers. Inside the company, to view the available information and to generate reports, both Oracle viewer and SAPCO's intranet can be used. However, external users and suppliers can have access to information and reports by connecting to SAPCO's Extranet, which is specially designed for them.

One of the most important automated systems is related to direct procurement process including: Planning, logistic, finance and delivery.

Regarding direct procurement, all inter-organizational processes have been automated and automating of processes with suppliers has been started. In indirect Procurement, to some extent some activities such as: Contracts, Inventory, Coding and Accounting are automated and they are trying to expand automation to all activities.

**RQ1: How e-procurement is being used for acquisition of parts and components between SAPCO and its suppliers?**

According to Mr. Bigdeli, procurement process, which is spread in different departments of SAPCO, encompasses following steps:

1- Requisitioning and ordering, by means of its production plan IKCO express its requirements regarding parts and components to be purchased by exposing the number of vehicles, which are going to produce in the next month. Generally, this plan will be revised and modified every week. The data file of these requisitions can be transferred to SAPCO's BOM system, which is handled by planning staffs. The purchasing requisition list generated by BOM system provides the quantity required and the desired delivery date of each item. The list of required parts will be transmitted to the departments under supervision of manufacturing division according to their field of activity.
2- Required items will be classified as new task purchase, modified rebuy, and straight rebuy. If the item has been procured from specific suppliers in the past (i.e. for rebuy items), manufacturing system will automatically check the amount of required items with inventory level and pending items based on current contracts. Then, according to suppliers' database which contains suppliers' records, evaluations and etc., potential suppliers will be chosen for negotiation. Up to this point all the activities are automated. It should be mentioned that sourcing is done manually and by a separate division, which is responsible to find and evaluate suppliers on a defined system, which its final results are available in the abovementioned database. However, being a well-known company and due to several years of activity, all the potential and reliable suppliers have been identified and evaluated. Meanwhile, domestic new comers will automatically approach SAPCO to choose under production and for introducing their capabilities. Constantly, under production parts will be listed based on SAPCO's localization policy.

3- Potential suppliers will be asked to provide SAPCO with proposal consists of price analysis and delivery schedule through a specific application, which is manually given to them. Negotiation will be done based on target price, which is defined in integrated BOM system. Besides, commercial specialized personnel will feed supplier’s proposal in that system for further analysis. In some cases when acquired items are vital for running the production and there is no time for assessment of suppliers and other formal procedures, a purchasing permission instead of contract is granted.

4- When negotiation is finalized, selected supplier will be invited to sign contract. The process of signing contract by SAPCO's authorities will be handled manually; however, simultaneously all the contract information and its approvals will be kept in automated system, as well. This information is visible by planning staffs through it they can follow the remaining steps.

5- Based on contract, the production capacity of selected suppliers, and the type of items, planning and logistic experts will place the orders. Parts that are included in electronic KANBAN project will be ordered by logistic department via SAPCO's Extranet and Internet website while simultaneously an e-mail is sent to suppliers. However, other parts are ordered by planning department generated by their material resource planning (MRP) system every two other weeks by means of Zetafax server, which is an automated fax system.

6- Suppliers based on purchase orders either by fax or viewed on SAPCO’s Web do the delivery. In the later case suppliers will enter their Advance shipment Notice (ASN) in the SAPCO's Web, which is viewable by logistic department of SAPCO and IKCO's goods receiving inventories. In this stage, IKCO’s inventory personnel check delivery of goods by the suppliers in accordance with the order and a transitory receipt is issued which is visible by SAPCO’s planning department.

7- Based on prevailing standards and original order, both quantity and quality are inspected and when approved, final receipt of delivery send to SAPCO’s
planning department. In this stage planning personnel once again check the final receipt with their orders and do the confirmation, which is viewable by finance department.

8- Finance personnel by means of automated system check the confirmed final receipt with the items included in the main contract or purchasing permissions and according to their balance of payment with suppliers and their calculating based on negotiated price and after subtracting deductibles including advance payments, suppliers loan and legal items prepare the payable voucher file which is sent to treasury section or under contract banks automatically.

9- Besides production plan, blueprints and other informative reports, there is a possibility for suppliers to view and follow all the accounting procedures on SAPCO’s Web, until their payment is ready to deliver and accordingly they approach treasury or definite banks to collect their money.

According to Mr. Bigdeli, supplier information system, which is accessible for all suppliers through SAPCO’s Web site, included below information:

- Suppliers suggestion system;
- Evaluation of suppliers performance (includes: Audit results, customer claim, the list of test that can be done in SAPCO laboratory, test inquiries and results;
- Procurement Planning for direct items (customer needs prediction, IKCO production volume, packing standards, requisitioning, ordering schedule, preliminary and final receipt,…);
- Suppliers Contracts;
- Technical drawings and documents;
- Financial information including balance sheet, audit, invoice, supplier’s turn over and financial reports.

**RQ2: What are the benefits of applying e-procurement for SAPCO and its suppliers?**

By using e-procurement system paperwork is decreased drastically as the whole process is automated. By this mean, information flows and running the process as a whole became smoother and easier. Controlling of inventory level became more accurate and procurement cycle and finance process got shortened as suppliers have a time limit to deliver their parts and components and if they exceed the time limit, it affects their evaluation results.

By eliminating and shortening some ordering steps and by means of automated system, orders receive by supplier in few seconds just after sending.

In comparison with strong change in number of vehicle production in last decade, SAPCO maintained the number of employees almost unchanged thanks to improved and automated procurement process. e-Procurement also helped in having better management on suppliers’ performance since now almost all the needed information is available.
RQ3: What are the barriers of applying e-procurement for SAPCO and its suppliers?

The software which supports SAPCO’s procurement process is limited to the inter-organizational process and do not contain all the interaction with suppliers. In other hand, since it was developed internally and the automation of SAPCO’s errands was the main goal of system development it has not passed beyond the internal processes. Therefore by defining the ERP project and acquiring SAP software as global standard software, they intend to overcome this shortage.

There are infrastructural barriers in developing web-based network of SAPCO and suppliers. For example, they are working on establishing a Virtual Private Network (VPN), which is an exclusive network between SAPCO and its suppliers. To implement this project they faced several problems related to governmental regulation and the telecommunication facilities. Some of their suppliers are located in an area, which the network coverage is not adequate.

Another barrier refers to the suppliers’ technical competencies; some of them have limited number of PC’s, lack of skilled personnel and non-automated internal commercial processes. Having inadequate relationship and integration with suppliers in decision making is count as another barrier of e-procurement implementation for SAPCO and it should be removed by preparing the needed requisites and culture in suppliers. As Mr. Bigdeli continued, they need to lead their business partners to go through automating their processes and assist them to develop well-matched culture to implement an integrated automated relation.

Implementation costs is another barrier for suppliers, Mr. Bigdeli believes that SAPCO should support and help its suppliers specially those with low turnover.

Cultural issues are again another barrier in applying electronic technology in SAPCO and their suppliers. This fact that it is not necessary to have face to face contact between people by using an automated system especially for contracts and financial discussion is a new concept in Iran’s society, also roles and regulations are not defined and clear to deal with this phenomenon. For example, the electronic signature is not legally accepted.

Information security, particularly in procurement process was one of challenges of e-procurement implementation. Therefore, SAPCO has adopted several methods to prevent data hacking and distortion by using. In fact, from the beginning of network development security has got a high priority by managers and system developers.

5-1-1-2. ERP Project

This interview has been done with the manager of ERP project, Mr. Khosro Moradi. He has about 10 years experience in the field of system analysis and design from which 6 years were in SAPCO. He also used to be in charge of supply chain project.
He explained the reason and necessity of defining ERP project in SAPCO as follows:

Concerning the exigency to reform SAPCO's structure from functional to process based structure, and also the need for reengineering the processes in accordance to best practices which was obvious after ISO and EFQM auditors visits, and initiation of EPR project in IKCO, the same project was defined in SAPCO by appointing a particular section for managing the processes. Since the focus of ERP is on processes and software is just useful for automating the reengineered processes, all these issues were raised together under supervision of System and Computer department. In this respect, this unit is active in fields of evaluating and documenting the processes, and providing instructions and structures for their execution after reengineering based on best practices. The special software to be used in ERP project is called “SAP” which has been already purchased by IKCO and is being taught to the appointed team started from financial department. In this software the procurement process has been designed in the best possible way and if being actually utilized it will be replace all of their ORACLE-based self-developed applications, which are being used at present.

As above mentioned, currently organization structure is functional and almost all departments are work as separate islands. The reason for ERP project lies in the management’s emphasis on turning all the activities into process based structure. The advantage of having a process based outlook is that all processes will have a certain owner who will be responsible for all related matters and other units give service to him meanwhile in this situation automation will be done easier and faster.

RQ1: How e-procurement is being used for acquisition of parts and components between SAPCO and its suppliers?

Regarding the history and reasons of process automation Mr. Khosro Moradi explained, due to proliferation of SAPCO's transactions and errands in the past years, there was an intense need to an integrated information system. Defects in inventory management, slow performance in handling the affairs, lack of coordination as well as exceeded bureaucracy and paperwork, altogether hindered the efficiency and productivity of the organization. Besides, inventory Management was faced with severe problems because of huge number of items and transactions. At that time, there were several disintegrated DOS based databases for same information mostly developed by FoxPro programmer, which sometimes came from different sources. Because of unavailability of a reliable automated system, calculation and data storage had encountered serious problems. Beside these problems, high bureaucracy and official formalities wasted their time and accordingly increased the expenses, which was reinforced by prolonged work processes and errors in calculations and information processing. Thus the importance of accuracy in information circulating became the highest priority of IT development in SAPCO. To this end the company made a strategic decision to execute the procurement process automatically as far as possible.

Currently 90% of SAPCO processes are carried out automatically and an intra-organization electronic data transferring system has been established. Supplier's information, data of contracts, orders, direct and indirect purchasing and inventory purchasing all are available in their automated system which has been gradually
developed since 1994. However, the procurement modules based on ORACLE, which support company’s main processes, have been in work since 1998. A unified and integrated information database, with different modules, is available in the company. This database is viewable either by Web browsers or and ORACLE report viewer. So far, the entire system has been designed and developed by SAPCO. Moreover, it has been for two years that the information required by suppliers is accessible through the company’s Extranet.

The procurement process of parts and components is carried out through an automated system inside SAPCO; however the electronic communication with suppliers is somehow unilateral. For instance, in case of electronic KANBAN, suppliers can view their order and just submit their ASN to SAPCO. While, entering or updating any other information by suppliers into the SAPCO’s system has not been possible yet. Besides, SAPCO does not have any access to their systems and no integration between SAPCO’s and suppliers’ systems is accessible. However, suppliers are provided with required information via SAPCO’s website and special Extranet which is designed for suppliers and was created two years ago. Briefly, Suppliers’ Extranet has some information about production plan, reports on quality inspection of parts and components, evaluation of suppliers based on delivery and quality and financial and payment status.

So far, the focus of processes automation has been placed on procurement of parts and components; however, currently processes of production materials and non-production item are getting included in automated systems.

**RQ2: What are the benefits of applying e-procurement for SAPCO and its suppliers?**

According to Mr.Khosro Moradi, reengineering along with automating the processes led to an increase in accuracy and preciseness in procurement process. Engineering systems, quality assessment, analyzing prices and controlling the whole process, reduced the expenses and workloads in all units. At first, the manufacturing staffs and other departments – as main system users- were against automation, however, when they understand the contribution of automated systems to speeding execution of errands, reducing inventory imbalances, and improving inventory management as well as removing bureaucracy and preventing errors and mistakes, it was widely welcomed and adopted by the organization.

As Mr.Khosro Moradi described, the ORACLE system and the current paperless office system assist the company to reduce the administration, inventory taking and operating expenses and this leads to a reduction in the price of final products (i.e. cars). Also since the contracts and their attachments are all available in the system, compliance with contracts has become achievable. Using automated warehousing system has made a great evolution in SAPCO inventory management and costs.
**RQ3: What are the barriers of applying e-procurement for SAPCO and its suppliers?**

Mr. Khosro Moradi stated, in his opinion, Sanctions against Iran are the most significant obstacles that SAPCO faces in the area of new technology adoption. If SAPCO wants to act globally and has electronic communication with its partners, it has to use standard and global products. Currently SAPCO does not have any direct access to certain markets.

The other issue is the fast changing in software programs and their several upgrades that acquiring them is some time inevitable, causes some extra expenses for users. In other word, purchasing powerful and fitting software is highly costly in the first place, while maintaining and updating them in a short run sometime add considerably to initial price, as well.

Considering their communication with suppliers, in this country there are no suitable technologic infrastructures available. A large percentage of suppliers do not have centralized network system or even access to the Internet. If they try to implement SAP, lack of pertinent rules and regulations regarding in the area of e-business in our country and needed customization in SAP software, which is necessary to make it compatible with their current commercial and legal systems, make its adoption harder and slower.

Data security is really important while it can be simply settled by using up-to-date and appropriate relevant software and also proficient network design. Though, still electronic communication is not very familiar and popular among suppliers and its prerequisites like culture and needed technology have to be provided.

---

**5-1-2. Planning Division**

Planning division was founded in 2001 when direct procurement planning departments of SAPCO and IKCO merged together. This division is in charge of planning, ordering and controlling of inventory of production items. Planning division consists of two departments: planning and logistic. Due to the fact that planning is as a start point of procurement process, having an interview with planning department was expected. Furthermore, logistic department conducted electronic KANBAN project, so our third interview was done with the manager of that department.

**5-1-2-1. Planning Department**

This interview has been done with the manager of planning department, Mr. Esmaeili. For 12 years he has been active in the field of procurement and he has been working in SAPCO since 2001. This department including 63 staffs is responsible to plan for the procurement of production items- both imported and domestic items- in the right time and accurate quantity.
As Mr. Esmaeili mentioned, IKCO production plan is a major input to planning process of SAPCO. Based on IKCO productions plan, integrated BOM system and inventory stock, orders planning runs by the automated system and forwarded to the suppliers. Suppliers receive the orders in two ways, for the KANBAN parts, through the Web and for the other items, via the Zetafax system. After order placement and receiving them by the IKCO's goods receiving inventories, final receipt sends back to the planning department. It is checked with the related documents and then forwarded to the finance department as confirmed receipt. All this process is automated and backward and forward integrated with previous and next processes. Planning personnel has just a supervisory role in this process.

**RQ1: How e-procurement is being used for acquisition of parts and components between SAPCO and its suppliers?**

As Mr. Esmaeili stated, the inter-organizational process, as far as planning activities are concerned, which means generating and placing the orders and their confirmation by IKCO's goods receiving inventories after delivery, is carrying on by using an automated system based on ORACLE. Also communication with suppliers is done via SAPCO’s Extranet, Website, e-mail and Zetafax. It is needless to say that all communication with the customer (IKCO) is facilitated by local area network (LAN).

**RQ2: What are the benefits of applying e-procurement for SAPCO and its suppliers?**

Mr. Esmaeili believe that through the use of automated system, inventory stock has been decreased and accordingly turnover has been increased. Benefits of e-procurement achieved through better flow of information, improved internal communications and reduced cost in administration and operation of procurement process.

As he mentioned, integrated system from the customer to suppliers, is very supportive to do planning quick and accurate. At present, any changes, take place in IKCO production schedule, transmitted to SAPCO very quickly that cause accuracy in planning and ordering.

To some extent, supplier evaluation has been improved, in any cases of delay in delivery, system record it and consequently, it affect on the next contract.

According to Mr. Esmaeili, in spite of increase in IKCO production volume, reduction of ordering duration as well as increase in number of orders, thanks to Web-base communication to reduce telephone communication and face-to-face contact with suppliers.
RQ3: What are the barriers of applying e-procurement for SAPCO and its suppliers?

According to Mr. Esmaeili, inadequate software is one of the pertinent barriers of SAPCO to implement e-procurement in whole supply chain. He hopes to remove this barrier through implementation of SAP solution. However, inadequate IT infrastructure of suppliers makes some difficulties to implement such these systems in supply chain. He believes most of barriers coming from outside -environment and business partners- especially those suppliers, which have not enough capabilities and infrastructure for these applications. Also he considers that culture is not barrier, but they should work on it to decrease organizational resistance.

5-1-2-2. Logistic Department

The logistic department is a subdivision of planning division, which is responsible for management of logistic affairs including; receiving, inventory, transportation and distribution of parts and components. This department also designs and executes several projects in the abovementioned subjects. This interview has been done with Mr. Roohbakhsh who has been the manager of logistic department since 2001.

The logistic activities were firstly supervised by “Supportive projects affairs” until 2001 after which the unit has been supervised by planning division with the intention of improving logistic process from suppliers to the customer (i.e. production line of IKCO).

The major activities of this department related to procurement process are: transportation and inventory management, and improving ordering with the intention of reducing the costs of supply chain. It is worth mentioning that the entire process of this unit is limited to the logistic of domestic parts and components. This department is in contact with 500 suppliers and around 100 persons work in it.

The management of electronic KANBAN project is one of the main responsibilities of this department. 70 parts and components commenced this project commenced in Oct. 2003. In that Iranian year ended to March 20, 2004, that number rose to 500 and currently 1094 components which contain 38% of all components value are procured based on this project. Currently, 95 out of 500 suppliers are involved in this project. The main objectives are reaching the minimum costs of transportation, ordering and inventory and also preventing the costs associated with production line discontinuation. Before executing this project, components would be stored for averagely 15 to 20 days in the company’s warehouses, however currently this period has been shortened to 1 or maximum 2 days. Planning department via MRP system does placing monthly orders for KANBAN and non-KANBAN components respectively, while logistic department defines daily delivery schedule based on production line requirements. This department is responsible for controlling the orders delivery for all the components. Placing the orders for KANBAN parts and components is done by sending email and also by putting on Website and Extranet of SAPCO.
RQ1: How e-procurement is being used for acquisition of parts and components between SAPCO and its suppliers?

Automated systems and information technology are used in electronic KANBAN project. All the information is stored in SAPCO databank, which is somehow connected to IKCO and is accessible by suppliers via Internet and Extranet. When a production KANBAN is released, the supplier receives an email and also can see the related order on the web. Supplier then uploads data and documents such as ASN which contain information about the number requested parts, specification of the carrier (i.e. truck and its driver), time of delivery and etc to the website so that they can control the process of parts and components transportation to IKCO warehouses. There is no such possibility for the parts, which are still out of electronic KANBAN project. Meanwhile, it should be mention that never all of the parts and components will be added to electronic KANBAN project.

Electronic KANBAN system is fully automated, from IKCO to suppliers, but its functions are not completely integrated. This system was not integrated with SAPCO's ORACLE system and also IKCO systems because it was designed and developed by logistic not system and computer department. Presently, system and computer department is working to develop similar functions based on ORACLE, which make the integration possible. However, data file of IKCO's requirements is read by our system and integration with IKCO's information systems is still postponed until implementation of SAP software.

RQ2: What are the benefits of applying e-procurement for SAPCO and its suppliers?

As Mr. Roohbakhsh described, concerning the fact that based on unsaturated local market, IKCO regularly has been increasing its production and the fact that the current sources and assets of the company are not adequate to fulfill the liquidity needed to handle their requirements, decrease in their inventory level in order to reduce non-circulated cash has been inexorable. In addition having a large variety of production requirements and existing 500 suppliers just in case of procurement of domestic parts and components, make it really hard to keep all the relevant information manually. In addition, by having an automated system their waste especially during production of some components such as batteries, which have expiry date, is reduced.

According to Mr. Roohbakhsh, conveying customers feedback to suppliers are being done more effectively when any quality problem reported by customers, they would inform the supplier much sooner than before consequently the number of returned components is getting fewer. The less inventory level the sooner the problem is settled. In addition they have fewer problems in transportation palettes which its scarcity and purchasing cost was one of their main problems before performing the electronic KANBAN project. Now, if the logistic system indicates any discrepancy, supplier can be contacted immediately. This system is based more upon prevention rather than treatment. The major advantage of having this system in his point of view, is reduction of the costs of supplying chain logistics which leads to cost reduction in final product of their customer.
Now, informing the suppliers about the plans has been done more precisely than before. They can view the estimation of 4-month or monthly and weekly plans via the website. By considering these predictions they can estimate the pattern of customer demand and it seems that this kind of planning has increased the accuracy of suppliers’ production capacity.

Electronic KANBAN seems effective in evaluation of supplier's performance and based on that, future contracts will be affected in a way that if a supplier cannot deliver the required product on time and not more and not less than needed in the next contract that supplier will have a lower priority in selection. Considering the point that IKCO's inventory level was very high in the past, this type of delays in delivery and incompliance with order specifications, which caused extra costs or production discontinuity, were not visible.

Carrying out the things faster as well as acquiring more precise information which are needed for decision making and also prevention work force growth are among the advantages of electronic procurement system, which causes to establish a compatible organizational culture to fit into the new changes.

**RQ3: What are the barriers of applying e-procurement for SAPCO and its suppliers?**

According to Mr. Roohbakhsh, one of the problems of IKCO and SAPCO is lack of integration in their information systems, which lead to lack of harmony in some functions. In this respect, IKCO has initiated ERP project and purchased SAP software. They hope they can do something for disintegration by applying this software.

Other obstacles, which SAPCO is facing, are mostly originated from outside of the organization. There are suppliers who do not have Internet access, lack required culture or are conservative in using computer and information systems. Besides by some of the suppliers implementation cost of certain software and hardware may consider high. Therefore, those suppliers resist against any change toward applying e-technologies. At the present some of their suppliers- about 5% of them- do not have Internet access and for communication with them we have to use traditional instruments like telephone and fax.

5-1-3. Manufacturing Division

Manufacturing division was founded since SAPCO established. This division is responsible for selection and evaluation of domestic suppliers and provides them technical support in order to develop the degree of localization of parts and component at the defined and approved quality. This division includes following departments, which are categorized based on different part and components of a typical vehicle:

- Trim
- Electronic
- Polymer
- Mechanism and standards
Concerning the main process of this division, which is related to direct procurement process, they are involved in acquisition and analysis of suppliers' proposals, evaluation of proposals, suppliers' selection and to some extend supervision on suppliers’ quality, price, and delivery performances and providing technical support to them. In the case of quality problems and customer's disputes, this division is responsible to deal with suppliers to eliminate and compensate the defective parts and keep them improved according to customers' expectations. Therefore, due to the function of manufacturing division, it has a close relationship with SAPCO's domestic parts and components suppliers.

To trace e-procurement applications in manufacturing division and having comprehensive information, we conducted two interviews with trim and polymer departments.

5-1-3-1. Trim Department

This interview has been done with the one of the heads of Trim department, Mr. Kosari. He has been working in SAPCO since 1998 and from last two year, he has had that position. This department focuses on procurement of dashboard parts, interior trim, doors trim, and exterior trim (e.g. bumper and grill) and works with 37 suppliers.

RQ1: How e-procurement is being used for acquisition of parts and components between SAPCO and its suppliers?

According to Mr. Kosari, all correspondents within SAPCO and with IKCO are automated, while the correspondents with suppliers are handled manually and certain communications are mostly conducted through face-to-face meeting or by use of telephone. However, suppliers have access to their needed information including production plan and modifications, quality inspection and supplier evaluation. As Mr. Kosari pointed out, process of suppliers' evaluation is automated through SAPCO integrated database.

RQ2: What are the benefits of applying e-procurement for SAPCO and its suppliers?

Mr. Kosari believes that innovative information and communications technology enhances the competitiveness of an organization. It improves business management and control and it will lead company to globalization. Concerning the amount of turnover, it is a must for SAPCO as a sizeable company to be equipped with such new e-technologies systems. So far, benefits of e-procurement achieved through reduced errors, improved internal communications and reduced cost in inventory and operation
of procurement process. Also it helped to improve the visibility of customer demand and expectation for SAPCO and its suppliers.

**RQ3: What are the barriers of applying e-procurement for SAPCO and its suppliers?**

According to Mr. Kosari, inadequate current solution, which is developed internally, is one of the important barriers to implement e-procurement in SAPCO and the whole supply chain and he thinks it is better to use a global solution, which is based on best practices and can automate the whole process of SCM. Besides, inadequate country infrastructure (e.g. telecommunication deficiencies like lack of an extensive fiber optic cable) hinders the adoption of electronic systems. In his point of view, suppliers IT infrastructure, organizational culture and their level of financial competence are main barriers that probably SAPCO will face them in time of implementation of e-procurement in the whole supply chain.

**5-1-3-2. Polymer Department**

The polymer department is a subdivision of manufacturing division, which is in charge of procurement of rubber parts, mat, upholstery, and glasses. This interview has been done with the manager of Trim department, Mr. Seyedi. For ten years he has been working in SAPCO and has been in this position from 2000. This department is currently working with 54 suppliers and based on value near 80% of their parts is procured through electronic KANBAN project.

**RQ1: How e-procurement is being used for acquisition of parts and components between SAPCO and its suppliers?**

As Mr. Seyedi states, all inter-organizational processes are automated and all required information are available through the internal network. Automated system, smoothes the progress of internal procedures, but this automation is limited to SAPCO, to some extent to the main customer (i.e. IKCO). Currently, most of their communications go over automated mechanism. To communicate with suppliers, they rarely use electronic systems. Actually, depends on which kind of data is required; information transmission is done either through mail, fax or e-mail. In the case of sending e-mail, simultaneously they use fax system, as a confirmation to be sure that, suppliers will definitely receive the required data or message.

**RQ2: What are the benefits of applying e-procurement for SAPCO and its suppliers?**

Mr. Seyedi believes that automated systems are beneficial to them because it improves efficiency by means of shortened cycle time of their different activities especially those that are in relationships with customer needs fulfillment. In some cases, period of numerous transactions between SAPCO and IKCO has been reduced from 30 days to 1 or maximum 2 days. Electronic system causes visibility of customer demand more accurate in terms of transparency in customer needs and expectations. Better flow of information and elimination of paper work decrease administration time. Furthermore,
due to faster accessibility of information and precise reporting, top managers have been encouraged to implement a standard e-solution for procurement in the whole supply chain which is considered to be SAP software.

**RQ3: What are the barriers of applying e-procurement for SAPCO and its suppliers?**

As Mr. Seyedi mentioned, there is no inter-organizational significant blockage, and they are just trying to upgrade their ICT systems in terms of promptness, comprehensiveness and integration. However, according to him, culture is an issue, which needs to be improved. In some cases, parallel to automated flow of information, some documents are printed and kept. Then, based on theses hard copies manual operation is done, while keeping their result and not doing whole process is handled by information systems. Mr. Seyedi believes this situation is mostly a result of lack of desirable culture.

Mr. Seyedi believes that the major barriers are related to suppliers' side due to their inadequate infrastructure and business processes as well as lack of enough financial competence. These barriers are more challenging when they come to smaller suppliers that even have neither computers nor expert personnel.

---

**5-1-4. Commercial Division**

The responsibilities of this division are; procurement of material, parts, components, machinery and spare parts and other requirements of IKCO and SAPCO, based on sourcing of domestic and foreign suppliers and related affairs like customs, insurance, transportation and obtaining required certificates for importation, and also conducting price, capacity and quality studies. However, activities related to procurement of domestic parts and components are not being done by this division.

Commercial division, which was established in IKCO by the name of purchasing division, was merged to SAPCO in 2000. However, still it has dual function and act as both IKCO's and SAPCO's purchasing division. Briefly, this division procures all the direct and indirect materials, foreign parts and components; machineries and instruments, while just domestic parts and components are obtained by other divisions of SAPCO.

Commercial division consists of five departments as follows:

- Foreign purchase
- Domestic direct purchase
- Domestic indirect purchase
- Purchasing services
- After market Sales & Production support

Based on our research area our interview in this division, took place with manager of Domestic production purchasing department.
5-1-4-1. Domestic production purchasing department

This interview has been done with the manager of domestic production purchasing department. The main purchased items of this department are paint, tire, steel sheets, oil and gas which 80 companies supply and purchasing of parts and components are excluded.

Mr. Mirzaei who holds 25 years of experience in commercial affairs has been working in IKCO supplying department for 12 years. The commercial division including this section was merged to SAPCO in 2000. Domestic production items department is divided into two groups. For procurement of some materials which are requested by SAPCO’s Planning department the process is managed within SAPCO procedures, while for other materials requested by IKCO the procurement process is carried out directly by IKCO, as the process owner. That is to say, in the later case, drawing up contracts, ordering and payment all are run by IKCO. It is worth mentioning the activities of this unit, which are requested by SAPCO, are automated and the activities defined by IKCO are non-automated and done manually.

RQ1: How e-procurement is being used for acquisition of parts and components between SAPCO and its suppliers?

According to Mr. Mirzaei, generally, all procurement processes related to SAPCO’s requirements like ordering, goods delivery and financial affairs are done automatically. They use the Internet to search for suppliers, particularly foreign suppliers for comparing international prices, and for communication like exchanging catalogs they use email. While contacting with suppliers for sending their proposals and prices and also data requests are done via fax or telephone.

Since almost all processes are executed automatically in SAPCO, their staffs rarely get involved in controlling the whole matters, however. On the contrary, in the procurement process of IKCO everything is done more or less manually. Thus this unit is in constant contact with IKCO’s related units to take care of orderings, payments and receipts. There also has to be a daily follow-up to make sure whether the contracts have been signed, delivery and supplier receipts issuance, and payments to supplier companies and etc have been done or not, which these issues waste much of the purchasing personnel effective times.

RQ2: What are the benefits of applying e-procurement for SAPCO and its suppliers?

As Mr. Mirzaei mentioned, during the processes, which are not carried out automatically, they encounter some lingering and unacceptable problems. For example when the ordering has not been done timely, they would experience problems like material shortage, which causes chaos in the entire process. These cases cause an increase in their expenses and waste much of their time for reordering the required materials. e-Procurement helps them to handle much more orders in the process. More precise planning and reducing expenses are the advantages of e-procurement system. Decision making mechanism will be improved and supply chain management will
become clearer. For instance, currently they can track the production and supplying status of their required steel sheets on the supplier company website and see when they will receive what they ordered. This has led to a decrease in the amount of the steel storage in their warehouses and consequently a reduction in their expenses.

**RQ3: What are the barriers of applying e-procurement for SAPCO and its suppliers?**

As Mr. Mirzaei stated, due to frequent political and economical instabilities in this country, such as soaring oil price, dollar rate fluctuations and political relations with foreign countries in the region and through the world, their planning cannot be very accurate and is influenced by great variability. Disorganizations in interactions, which paralyze systematic planning, compelling them to act physically and to settle down the crisis in any way. For example, when a foreign material supplying company is unwilling to continue its transaction with their suppliers – say due to political problems – their entire planning (from ordering to delivery) faces disorder.

As Mr. Mirzaei point out, an automated system must bring all the relevant components of the supplying chain in to the picture, otherwise the risks and expenses from one party will move to others. For example, during electronic KANBAN project, which is currently being carried out with suppliers, SAPCO and IKCO warehouses have been emptied yet; the stocks are transferred to suppliers. While, suppliers have to increase their inventory so that in case of having problems with supplying required materials or in time of fluctuation in their orders, suppliers don’t face shortage of material, which cause any probable discontinuity in IKCO's production.

Mr. Mirzaei believes that lack of expert workforce and knowledge are other problems in the way of applying e-procurement to whole network. Besides, they face with some legal barriers. For example e-signature is not valid and not approved by many people. While, many have felt the necessity and importance of these systems, on the whole national infrastructure is not ready and suitable for applying e-technologies. For example, SAPCO and its suppliers are not able to easily communicate in all places by electronic means.

**5.1.5 Financial and Economic Division**

SAPCO's Financial and Economic Division has been created since SAPCO's establishment and is responsible for setting financial policies, converting plans to budget requirements, sourcing of financial funds, financial analysis of events, preparing financial information and repots for top management, controlling the compliance between target and contracted prices for each part and preparing the reports needed by outside parties like auditing and governmental organizations.
This division with 45 employees consists of below sections:

- Project accounting
- Foreign purchasing and export accounting
- Budget management and accounting
- General accounting
- Parts purchasing and contracts accounting
- Treasury
- Document auditing and contracts controls

5-1-5-1. Parts purchasing and contracts accounting

Regarding our focus on domestic procurement of direct items, this interview is conducted with the head of parts purchasing and contracts accounting department and is concentration on domestic parts and components suppliers and their contracts with SAPCO. Mr. Khorshidi is in charge of this unit and has 8 years of experience in financial area.

In procurement process, after issuing final receipt from IKCO's goods receiving inventories, the receipt can be converted to SAPCO's financial automated system. At this stage some checking between contracts and purchasing permission documents with receipt of parts and components are done automatically. According to final receipts and purchasing documents, after checking the accounts payable and receivable and deduction of prepayments, and all remaining debts the final payment is calculated and allocated to the supplier. The accounting documents issue by system and automatically sent to treasury department or bank, where finally the cheque will be drawn to the supplier favor. Until now money transferring from SAPCO to supplier's accounts is not done automatically. However, the information needed for transaction is all available and transferable in SAPCO's automated system.

RQ1: How e-procurement is being used for acquisition of parts and components between SAPCO and its suppliers?

Mr. Khorshidi stated that, all received information from IKCO convert to SAPCO's system by authorized staff, and then is accessible for other allowed users. Besides, all internal information needed for financial functions from suppliers contracts or purchasing permissions to cheque drawing are available and are processed automatically through SAPCO's integrated system based on ORACLE. While, for executing the process, in each stage a confirmation and control of responsible financial personnel is needed.

All suppliers' needed financial information, like accounts payable and receivable, deductions and their balance are available at SAPCO's suppliers Extranet. In case of any required information from suppliers, SAPCO usually send its request via email or put the request in the Extranet, then SAPCO will be received suppliers information in word and excel file and requested reports will be calculated and extracted from suppliers’ files. However, there is still no place for suppliers to enter or update their information. Moreover, at present no software which connects SAPCO and its suppliers'...
suppliers is available but it is considered to design special forms and on SAPCO's Extranet which will be connected to SAPCO's current databases.

**RQ2: What are the benefits of applying e-procurement for SAPCO and its suppliers?**

According to Mr. Khorshidi enormous increase in IKCO's production plan which translated to massive extent of SAPCO's activities make the processes so complicated that continuing the process by hand or even disintegrated low level software, was impossible. Furthermore, it was a very time consuming task for SAPCO’ people to handle the procurement process. For example there was no possibility of automated counting and pricing of material in SAPCO's inventory and serious problem in inventory was felt. Besides, manual activities and disintegrated software available at that time, caused to significant amount of administration and data entry costs, no needs to mention are problems caused by human errors.

Mr. Khorshidi believes that after applying integrated system of SAPCO based on ORACLE, they have gained a lot in many aspects. For instance, the company was able to reduce the period of inventory controlling from six months to one week! Now they aim to reach daily inventory flow checking. The level of inventory and inventory management became very much clear after applying suitable electronic technology.

By implementation of an automated system and by informing suppliers via email and through Extranet, Suppliers’ representative presence in SAPCO for following up their matters, has reduced a lot and this help in saving time and costs for both suppliers and SAPCO. By automating and integrating all SAPCO's financial calculations and error prevention advantages, the company enjoys a lot from lowering administration, operational and inventory costs. Moreover, the procurement cycle has shortened and contracts compliances and ordering procedures have improved noticeably after applying electronic technology in SAPCO.

**RQ3: What are the barriers of applying e-procurement for SAPCO and its suppliers?**

As Mr. Khorshidi indicated, as far as the process is related to SAPCO inter-organization affairs there are no serious barriers for e-procurement adoption. However, there is not adequate foundation available for implementation of e-procurement systems in the whole supply chain of IKCO. For example, banking system is not accepting the electronic payments. The environmental factors especially regulation and laws (e.g. banking, customs and taxes laws) are not yet compatible with electronic technology requirements. In a few words, in the implementation of e-procurement in the whole supply chain, SAPCO faces barriers such as inadequate technological infrastructure of country, level of technological adoption by of its partners (i.e. either IKCO or suppliers), lack of integration with partners and supplier's cultural issues which should be dealt with.
5-1-5-2. **Specialized commercial department**

This department has been established since SAPCO foundation, firstly under name of contract controlling. During last years, the function of this department has been expanded and in 1998 its name was changed to Commercial specialized department.

The interview took place with Mr. Forouhar, the manager of Commercial specialized department. As he stated, they are working on three kinds of activities:

- **Pricing strategy**

  Based on IKCO target price for each product (vehicle) and production BOM, a preliminary target price for each component is estimated and then concerning the financial and economical indices such as exchange and inflation rates, and GDP form one side and suppliers evaluation and proposals, a more certain target price for each component and part is set.

- **Pricing analysis**

  Specified target prices are analyzed and then convey to the manufacturing division in order to hold negotiation sessions with suppliers and reaching to finalization. Through this process, expenses and field calculations and also possible cost and price reductions are done together with suppliers and the final price for each part or component will be the outcome of these negotiations.

- **Contracts**

  Contracts, which are signed by the suppliers and confirmed by manufacturing division, are transmitted to this department for final check and get the sign of SAPCO’s authorized individuals and then be placed in their automated system.

**RQ1: How e-procurement is being used for acquisition of parts and components between SAPCO and its suppliers?**

According to Mr. Forouhar, all the internal functions and interactions are automated except signing the contract, which is still done manually. However, some of the activities are done both manually and again by automated system, which are attributable to cultural or perceptions of certainty and security of automated systems.

Meanwhile, they do not have any direct relationship with suppliers and all of their interactions with suppliers are conducted through manufacturing division.
RQ2: What are the benefits of applying e-procurement for SAPCO and its suppliers?

Mr. Forouhar believes that automated system; smoothes the progress of internal procedures and improve the accuracy and richness of the needed data for decision-making. More rapid operations with lower number of workforces reduce the administration cost and accordingly the cost of production. In his point of view, e-procurement could have several benefits for SAPCO, but they are not much related to their functions. Lower inventory and operational costs, better visibility of supply chain and enhanced inventory management are the potential benefits that he believes are achievable through e-procurement implementation.

RQ3: What are the barriers of applying e-procurement for SAPCO and its suppliers?

According to Mr. Forouhar, inadequate technological infrastructure in the country and among suppliers is the main barrier of applying e-procurement. Also currently, legal regulations do not support applications. For instance, signing the contracts by means of electronic system is not still legally accepted. Besides, security of the valuable data like prices, calculations and contracts would be significant concern of SAPCO in implementation of e-procurement. To some extent, culture, lack of skilled personnel and integration with partners are potential barriers to the e-solutions adoption. According to him, current internal processes are not considered as obstacle for e-procurement. Considering the benefits of this system, he believes that top management support e-procurement, as he was aware that the acquisition of SAP has been approved and supported by IKCO's and SAPCO's top managers.
5-2. Suppliers

Although Iranian automotive industry has been started since 1966 by producing Paykan, but up to the last decade, there were not powerful suppliers, capable of supplying vehicle components due to the lack of knowledge and technology, as a result car manufacturers procured the required parts and components through importation, which made difficulties concerning sanction, exchange fluctuation and inflation. Hence as long-term strategic solution to enrich the supplying capabilities of the nation, Iranian Automotive Society decided to establish an interpreted chain of suppliers, this strategic intent led to the establishment of SAPCO. Since SAPCO foundation, Irankhodro aims to establish its domestic supply chain through its subsidery-SAPCO. During the passed years, suppliers under SAPCO supervision achieved quality goals and were competitive enough to export their product to the global market and sell their manufactured goods to the world-class manufacturers such as Peugeot.

As we are investigating e-procurement, then we need to choose suppliers who have web-base relationship with SAPCO. According to the methodology chapter, sample selection section, the following companies have been chosen as our samples in seller-side:

- Mehrcam Pars
- Mehvarsazan Irankhodro
- Sanden Iranian
- ShetabKar
- Majmooeh Sazi Tous (MST)

5-2-1. MehrcamPars Co.

MehrcamPars Company, www.Mehrcampars.com is tier-one supplier active in manufacturing of interior and exterior trim parts and air conditioning system of passenger cars. It also targets at supplying module, cockpit and conditioning system of parts, which are embedded in cockpit.

MehrcamPars started its activity in 1993 as a subsidiary of SAPCO and at present 85% of its share belongs to IKCO and 10% of it to SAPCO. Presently, Mehrcam Pars has 45 suppliers and its total turnover for the year 2004 was $232 mln. This company enjoys of the first rank of SAPCO's suppliers based on its sales value.

Our interview was conducted with Mr. Fasihi who is the manager of planning department. He has 20 years experiences in car manufacturing companies, specialized in procurement and logistic planning and inventory control.
**RQ1: How e-procurement is being used for acquisition of parts and components between SAPCO and its suppliers?**

Mr. Fasihi indicated that MehrcamPars, as a subsidiary of SAPCO, which is not located far away from its parent company, is connected both to IKCO and SAPCO network system. All the communication between those companies is done electronically through the automated system, which is present in SAPCO and IKCO. The information, which is sent from MehrcamPars to SAPCO through electronic systems, includes price, proposals and technical documents. In this respect, the most frequent and important task that currently is being done is electronic KANBAN, which is concentrated on ordering and delivery.

According to Mr. Fasihi, MehrcamPars’ production is based on weekly production plan of IKCO, but delivery of finished goods is based on the real daily production line requirements. While, most of the time there are differences between broadcasted production plan and actual daily needs. Thanks to integrated network between Mehrcam Pars and IKCO, as soon as each vehicle passed the post-up step in production, all info will be entered to the system and transferred to Mehrcam Pars via wireless network and fax. After the order is seen on the web the order will be placed and order will be delivered with related ASN which is enter in SAPCO's website and carried by cargo. Order should be delivered at IKCO, not more than 100 minutes after receipt of SAPCO's order. After delivery is taken place at good receiving inventories of IKCO, its time and actual number of parts will be entered to an automated system and its discrepancies with original order will be come into view. The delivery receipt will be transferred to SAPCO afterward and it will be converted into SAPCO's automated system for further procedures. So all the steps from ordering to delivery can be seen and traced on the web.

**RQ2: What are the benefits of applying e-procurement for SAPCO and its suppliers?**

Mr. Fasihi believes that automated and integrated system between SAPCO and MehrcamPars caused a lot of saving in time and cost for administration jobs, besides that information flow has become more smoother and faster than before, especially in operational activities from ordering to delivery. The visibility of processes has been improved and they can follow up their financial records and payment procedures at SAPCO's Extranet.

Another benefit that Mr. Fasihi mentioned was improvement in accuracy of their production capacity, due to the link between IKCO and MehrcamPars production line, now, there is no safety stock of their supply needed either by each company, hence all planning of material inventory and production capacity should be accurate.

Mr. Fasihi stated that taking into account SAPCO's benefits from e-ordering, decision making of Mehrcam Pars to support e-procurement through its suppliers has enhanced and they aim to implement this system with their partners-suppliers and customer.
MehrcamPars confirms that although some of e-applications like electronic KANABAN has not any financial benefits for them but it improved their processes and they are experiencing a worldwide and up-to-date system, which is a competitive advantage for them. In fact, recently they offered Saipa, another big car manufacturer in Iran, to use this system for their ordering. They believe that adoption the new technology has helped them to develop their market, either domestically or internationally. Furthermore, implementing new technologies increase the knowledge level of their staffs and this is counted as a benefit for MehrcamPars.

**RQ3: What are the barriers of applying e-procurement for SAPCO and its suppliers?**

Mr. Fasihi believes that inaccurate and not organized ordering from the customer make difficulty in operational activities. In this respect, SAPCO's electronic procurement system has affected some of their ratios like capital return and profitability, which are obviously undesirable.

As a matter of fact, electronic KANBAN has increased the level of MehrcamPars material inventory and logistic costs because of shortened procurement cycle and online ordering. According to him, prior to electronic KANBAN, safety stocks of IKCO for each part and components make planning and production convenient for suppliers, but now, these tasks are problematic and stressful for them. Besides, currently their production line is directly connected to IKCO production line and any fluctuation in IKCO's production line, which may appear because of shortage of even an invaluable part, will affect their production and inventory level, too.

Mr. Fasihi confirms that although it seems that inadequate technological infrastructure of SAPCO or MehrcamPars is not a barrier for e-procurement implementation but there were some instances of technological problems. For example, one of the problems is several server disconnections without any obvious reason. In that situation they have to call on SAPCO and get the order by telephone. Any failure in SAPCO and IKCO on time ordering will terribly cause Mehrcam Pars supplying plan since it is very hard for them to respond to accumulated orders that have not been sent at their actual time in less than 100 minutes.

Mr. Fasihi referred to some inadequate existing processes in electronic procurement, which are still carried on from past time. Long queue and complicated administration duties for receiving the delivery impede the efficiency of new process.

Another obstacle, which Mr. Fasihi reminded, is inadequate infrastructure of whole supply chain. Some of MehrcamPars suppliers even have not access to the Internet and enough systematic processes and budget to implement electronic applications, also the long physical distance of these suppliers is considered as a pertinent barrier for them. In fact, part of the expansion of their inventory level and decline in their turnover is due to their traditional relationship with their low tier suppliers.

MehrcamPars has not faced lack of organizational culture as a barrier of implementation because about 90% of the employers are young and energetic and their education level is very fruitful to increase their organizational culture.

Mehvarsazan IranKhodro Company. [www.ikamco.com], which used to be an assembler of IVECO minibuses and a producer of axels for heavy cars by the name of Khodrosazan, was founded in year 1964 and after two years; its first product was launched in the vehicle market. By the year 1999, IKCO acquired 68% of this company's share and in the position of major shareholder, reorganized it as a supplier of axels for its passenger and commercial cars. At present, near to 52% of its share belongs to IKCO.

This company is categorized as a tier one supplier of SAPCO. Its total turnover in year 2004 was about $125 mln and enjoyed the second rank among SAPCO's suppliers in terms of its sales value. The number of Mehvarsazan suppliers is about 80 companies.

Our interview was done with Mr. Dadgar, who is the VP of sales division; he has 15 years of experience in the field of sales and commercial affairs.

RQ1: How e-procurement is being used for acquisition of parts and components between SAPCO and its suppliers?

As Mr. Dadgar stated, in their procurement process, there are several ways of communication, which could be categorized in two ways, namely: electronic and manual. For the official documents like contracts and proposals they should to be documented in written manner like mails or needs to be discussed face to face. On the other hand, for the technical documents and day-to-day coordination with SAPCO, e-mail or fax is being used. Some key data such as IKCO's weekly production, IKCO's product specifications, and localization trend an expectations as well as situation of suppliers financial transactions with SAPCO are available On SAPCO's Extranet. Moreover, they can follow up each order from delivery to final payment on that site.

There is another electronic transaction with SAPCO, which is taken place in their day-to-day operations; electronic KANBAN is currently being used for ordering and delivery. Always, SAPCO announces an estimate of its monthly orders through its Website, e-mail or by its automated fax, however, actual order is placed everyday by the use of electronic KANBAN system which is transferable to supplier by those mentioned means. When orders are received by supplier, it will be printed and attached to the container of components in order to deliver to IKCO's goods receiving inventories. At the same time, delivery data included delivery time and number of requested items, is entered to SAPCO's website by them. It is worth mentioning that all the products of Mehvarsazan except spare parts are sent to IKCO based on above-mentioned process.

RQ2: What are the benefits of applying e-procurement for SAPCO and its suppliers?

According to Mr. Dadgar, electronic relationship especially in the process of procurement is beneficial for both sides of buyer and seller. Administration costs can
decrease because of better flow of information. Also, planning can become more accurate due to fast and complete accessibility to required data. However SAPCO's electronic procurement system has imposed other costs to the supplier that prevent them to achieve a total reduction in their costs. The main reason is that suppliers have day-to-day delivery to SAPCO, but they cannot implement the same system for their suppliers due to the lack of their e-readiness to implement e-technologies and their problem in acquiring needed materials for production. Actually number of raw materials are purchased from outside of Iran and their purchasing process is very time consuming and risky. Therefore although inventory level of SAPCO and IKCO has decreased essentially but its level in suppliers' side has not changed or even increased due to lack of uncertainty and more fluctuations based on current KANBAN or pull system. Tier one Suppliers should procure required parts and materials monthly and as a result their operational and inventory costs have increased stridently.

As Mr. Dadgar pointed out, SAPCO achievement through ERP, enhanced decision making to support e-procurement and aim to implement it in their suppliers. He believes, any other benefits such as better inventory control, better visibility of supply chain management or accuracy of production capacity have not been achieved in the whole supply chain. He also supposed that to get to the win-win situation for both sides, it is vital to develop this system in the whole chain.

RQ3: What are the barriers of applying e-procurement for SAPCO and its suppliers?

As Mr. Dadgar described, generally this system is not completely welcomed in suppliers' side since it has made many difficulties especially in their logistics and inventory management. Shorten procurement cycle and day-to-day ordering is high risky for them and cause to higher operational costs. SAPCO server disconnection as well as not organized ordering plan brings complexity to their production system. In spite of their intension to use e-applications, inadequate IT infrastructure of their low tier suppliers and lack of integrity with them do not let them to make this ambitious realistically. He believes that culture; security and legal controls plus implementation costs are not considered as e-procurement barriers. In spite of abovementioned barriers and difficulties, their management is highly directed to be equipped with such these systems in order to enhance their competitive advantages though when the ground is prepared.

Iranian Sanden company [www.Sanden.co.ir](http://www.Sanden.co.ir), a private joint stock company was established in February 2000 based on a joint venture with Sanden Singapore and under the production license of Sanden Japan. From April 2000, this company officially has started its assembly line in Iran with just 12 employees and the production volume of about 19000 automotive air conditioning systems (A/C). At this moment Sanden has 720 work forces and is producing A/C unit for IKCO and Saipa, the other big car manufacturer in Iran. Sanden is appointed by Ministry of mines and industries and mines in year 2002 as one of the most excellent suppliers. Iranian Sanden is the largest company among all Sanden Company Group around the world.

Sanden is enjoying of being the forth largest supplier of SAPCO in terms of sales value, which was around $113 mln last year.

We have conducted our interview with Mrs. Imam, sales manager of Iranian Sanden Co. She has worked in Sanden from the time of Sanden's establishment.

**RQ1: How e-procurement is being used for acquisition of parts and components between SAPCO and its suppliers?**

In area of electronic connection, Mrs. Imam noted the accessibility of SAPCO's info through their website which includes IKCO production plan for all range of products, ordering and payment statement, also purchasing inquiry and orders which are sent through the web, e-mail or automated fax. Usually, Sanden reply to SAPCO requests for information in the same way as SAPCO, for example if SAPCO send the request by fax, Sanden also answer via fax. It is needless to say that the official information such as quality certificates, financial statements or capabilities will just be forwarded to SAPCO in written (via letter). Briefly, most of the information that is sent via email is not considered as official correspondence.

The most application of e-procurement in the area of Sanden's operational plan is ordering. As soon as Sanden's ordering department view SAPCO's order through the website or Extranet, an ASN will be sent to the delivery unit and then the systems are sent to SAPCO. As this process is the fastest, safest, and cheapest way of ordering for buyer they also have implemented it with some of their suppliers, needless to say that SAPCO supports them in implementation of a similar system with their suppliers.

**RQ2: What are the benefits of applying e-procurement for SAPCO and its suppliers?**

Mrs. Imam believes that the electronic relationship is potentially very useful and if it accompanied with accurate planning it could have more advantages. At the present time most of needed information such as contact info, production information and all related reports are just a click away! Due to the cost and time reduction, this can count as a noticeable benefit that Sanden achieved in comparison to the past circumstances. Having web-based relation with SAPCO makes the job very easier for Sanden to transfer the information. All information is archived so Sanden can use this system as a
very good reference to see when an order took place and when the goods are delivered in order to adjust the system. Moreover, it is traceable that by using this technology SAPCO's orders are getting more even and there is no fall or sharp point on that. Sanden decision making power has become more accurate and supply time has turned out to be shorter.

Since, Sanden has also applied this system with their suppliers; they have gained some benefits like reduction in needed inventory and investment in their organization.

**RQ3: What are the barriers of applying e-procurement for SAPCO and its suppliers?**

The main barrier from Mrs. Imam point of view is having incorrect planning in IKCO's production plan, which in electronic daily ordering imposes lots of risks and stress to suppliers. It seems that because IKCO has several production lines for different types of cars is not able to synchronize its production line with its actual need which is transferred to SAPCO's planning department and this causes an undesired increase in suppliers' inventory level.

Sanden sales manager believes that another barrier is a long distance between SAPCO and Sanden which cause risk of transportation including: loading, road accidents and sometimes dreadful weather condition. A simple failure done by SAPCO in ordering will decay a lot in Sanden logistic planning.

Implementation of some of e-procurement applications like Web-based ERP caused an increase in operation and inventory cost. In addition, transportation cost has risen due to the number of SAPCO's ordering and also low quantity of items needed for consumption in daily production.

Besides, in some of Sanden suppliers there is no suitable technological infrastructure available for applying e-procurement. Cultural aspects of e-technologies adoption especially in supplier side were another barrier, which Mrs. Imam referred to. It is hard for Sanden's suppliers to be planned by Sanden or receive weekly orders from Sanden.

Mrs. Imam said that although Sanden is using electronic ordering but they have not changed their processes and the existing ones were not considered as a barrier in implementation of electronic technology.
5-2-4. Shetab Kar Co.

Shetabkar Company [www.shetabkar.com](http://www.shetabkar.com) was established in 1996 to fulfill some of the requirements of automotive industry of Iran. Since 90% of company's equities were belonged to IKCO it was named SAPCO and started its operation with SAPCO from the beginning. Shetabkar production and activities are related to car electronics, suspension and wheel, injection system, power transmission and engine parts. This company with turnover of around $60 mln is the sixth supplier of SAPCO, based on its sales value.

Our interview took place with Mr. Arabi, the company's commercial manager. He has been worked in the company from the start.

**RQ1: How e-procurement is being used for acquisition of parts and components between SAPCO and its suppliers?**

Considering the application of e-procurement, Mr. Arabi believes that in information exchange with SAPCO they use electronic communication tools. In level of experts, information and technical documents are being sent by email or fax while in manager levels and for legal documents mail and personal meeting are used. Orders are observable at SAPCO's website and supplier can enter their bill of lading information in ordering part of that website. He continued that because of incapability of their suppliers they had no electronic relationship with them. They have access to SAPCO's extranet and also they can use SAPCO's paperless correspondence software but none of their systems are not linked or integrated to SAPCO.

**RQ2: What are the benefits of applying e-procurement for SAPCO and its suppliers?**

According to Mr. Arabi, electronic procurement is potentially beneficial if it is combined by accurate planning. Now all the required information can be obtained from SAPCO's Extranet or website and in comparison to past it has advantages in cost and time reduction. Another advantage is being used to implement best practices like global players, which leads to increase competitive advantage in suppliers. However, he believes in their experience with SAPCO in relation to e-procurement eventually, they have not gained any benefit.

He relates the reason to unorganized plan of ordering in IKCO and SAPCO and this faces suppliers with inventory management problems. They have to store extra goods to be able to meet fluctuated needs of SAPCO's daily orders. In new circumstances there is no must for SAPCO to buy the certain number of parts that are indicated in the contract or monthly orders. Just the delivery is bought or accepted that is in accordance with daily order and is announced in SAPCO's website. In this situation administration, operation and inventory costs of suppliers are increased.
RQ3: What are the barriers of applying e-procurement for SAPCO and its suppliers?

As Mr. Arabi point out, the most important barrier is lack of accurate planning by SAPCO and IKCO, which imposes stress and risk to their suppliers. As abovementioned, they have to keep stock more than monthly order to be able to fulfill daily oscillatory orders. Besides, inappropriate infrastructure has caused many problems for SAPCO and its suppliers. They have experienced number of times that their network servers were inaccessible due to problem in power supply or telecommunication lines. Moreover, because of its traditional relationship Shetabkar was unable to implement the same system with its suppliers and therefore must bear all the fluctuation just by itself. While data security, implementation costs, organizational culture and expert human resources are not considered as barriers for e-procurement adoption.

5-2-5. Majmooe Sazi Tous (MST) Co.

Majmooe Sazi Toos (MST) company, was established in 1994 in private sector in the field of manufacturing parts and components such as steering wheel, front and rear axels. The company has cooperation with SAPCO since its foundation. It has 8 subsidiaries and totally 1000 employees are working in MST and its subsidiaries, from which 300 persons work at MST. This company is only active in car industry and has 35 suppliers. Its turnover was equal to $55 mln in year 2004 and is located about 900 Km from SAPCO in Khorasan province.

This interview is carried out with Mr.Rahnamayee, the technical manager of MST's Tehran office. He has been working in MST since 9 years ago and he is specialized in sales and commercial issues and also responsible for handling the problems in quality system.

RQ1: How e-procurement is being used for acquisition of parts and components between SAPCO and its suppliers?

Mr. Rahnamie first described that the procurement process is officially started with signing contracts with SAPCO, in which the annual requirement of IKCO is break done in monthly demand. Accordingly, suppliers like MST fix required modification in production capacity, machinery and equipment. To exchange information, SAPCO and its suppliers use all communication media such as e-mail, fax and mail according to the subject of the information and sometimes, personal meetings are unavoidable. Request for proposal and price is being done other by fax, telephone or e-mail while suppliers respond will be provided in a meeting with SAPCO, while all the needed documents may be sent via fax or mail. Nevertheless, all the information and agreements will be put normally in the annual contract between SAPCO and suppliers. In case the time of contract finished, the purchasing request will be sent to MST from SAPCO via letter or fax.
SAPCO orders are received in two ways; one is via web or Extranet and the other is through the automated fax. For axels of Peugeot 405, ordering is done through electronic KANBAN, through which when order is placed; operational process to deliver the required items will be started. Due to the long distance between MST and IKCO this company has 48 hours time to deliver the orders. For the parts that are not included in KANBAN project, the order will be sent by fax.

Nonetheless, so far after applying electronic technology by SAPCO, no significant changes have happened in the supplying process of MST. May be because there is no link between SAPCO and MST automated systems and networks and also no electronic relationship between MST and its suppliers. From SAPCO's side, just the way of ordering and its frequencies have changed which cannot be considered as a substantial change in the process. Though, SAPCO has been using some type of automated systems from its foundation, there are number of matters that are still done through non-automated system or even by face-to-face meeting and conversations.

**RQ2: What are the benefits of applying e-procurement for SAPCO and its suppliers?**

According to Mr. Rahnamaei, e-procurement not only has not any effect in cost reduction but also increases their inventory and operational costs! The main benefit is for SAPCO and their top management supports its implementation for the sake of SAPCO. Because MST management believes that e-technologies like electronic KNABAN have a noticeable advantage for SAPCO, which can drastically decrease SAPCO’s cost. SAPCO mandating is very important for them and complying with its needs is a kind of value creating for their most important and actually exclusive customer which its benefit will eventually even if indirectly return to MST.

**RQ3: What are the barriers of applying e-procurement for SAPCO and its suppliers?**

Mr. Rahnamaei believes that inexact planning of SAPCO, imposed difficulties in their operation. To prevent any failure, they have to increase their safety stock, which enforces additional cost to them. Besides they should supply items to SAPCO based on a daily ordering system while they have to procure their needs monthly and this increased their operation and cost of transportation.

Another obstacle is that MST has no integrated systems with its suppliers in their own supply chain. Because it is not possible to implement electronic systems by their suppliers, which is attributed to their lack of budget, culture, infrastructure and knowledge.
Chapter 6: Data Analysis

In this chapter the empirical data, will be compared with theories, which is selected in our conceptualization. The data from interviews will be analysis with together and the chapter will have an order of our research questions. For each question, a within-case analysis conducted for each case- SAPCO and its suppliers, comparing it with the theory coming from conceptual framework. Next, a cross case analysis will be used to compare cases with each other.

It should be mentioned that there is no supplier’s within-case analysis for our first research question due to the reason that our research is focus on e-procurement between SAPCO and its suppliers and it is not aimed to discover their own procurement process and system.

According to Hammersley & Atkinson (1983), coding in qualitative research involves segmenting the data into units and rearranging them into categories that facilitate insight, comparison, and the development of theory. To compare theories with the empirical data, collected in SAPCO, we will use the following coding table.

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>Supports the theory</td>
</tr>
<tr>
<td>-</td>
<td>Does not support theory</td>
</tr>
<tr>
<td>+/-</td>
<td>Partially supports the theory</td>
</tr>
<tr>
<td>NA</td>
<td>Not available</td>
</tr>
</tbody>
</table>

Sources: By Authors

6-1. RQ1: How e-procurement is being used for acquisition of parts and components between SAPCO and its suppliers?

With the purpose of answering our first research question and according to our conceptualization, we assess the dealing of e-procurement in SAPCO in four aspects: model, system, process and applications. In this part, first, within case analysis of SAPCO is provided and next, followed by cross-case analysis of SAPCO and its suppliers with together.

6-1-1. SAPCO within Case

6-1-1-1. e-Procurement model

According to Chaffey (2004), there are three fundamental models for location of B2B e-commerce: sell-side, buy-side and marketplace-based. Based on data collected from SAPCO, this company internally developed a unified and integrated database, with
different modules for its procurement processes. This electronic data transferring system, which is based on ORACLE, included supplier's information, data of contracts, orders, and direct and indirect purchasing and level of inventory. Due to the reason that SAPCO procurement process of parts and components is carried out through this automated system, we are coming to the conclusion that SAPCO e-procurement model is formed based on the buyer-side model.

6-1-1-2. e-Procurement system

According to Croom (2001), e-procurement system is in two distinct, but connected: infrastructures - internal processing (via, for example, corporate intranet) and external communication with the supply base (via, for example, Internet-based platforms).

Referring the empirical data, SAPCO's internal infrastructure is in agreement with theory. The most processes of this company are based on IT solutions and they have developed a unique database based on Oracle. In direct procurement, the process of procurement from the customer need to placing the order is carried out by the above-mentioned system. However, few processes including signing the contracts handled manually. Inside the company, to view the available information and to generate reports, both Oracle viewer and SAPCO's intranet can be used.

SAPCO's external communication is to some extent found in disagreement with theory. There is neither integration nor direct connection between SAPCO and its supplier's networks. The electronic communication with suppliers is somehow unilateral and it is almost one-way communication. Suppliers are provided with required information via SAPCO's website and special extranet designed for them. Briefly, SAPCO's extranet has some information about production plan, reports on quality inspection of parts and components, evaluation of suppliers based on delivery and quality and financial and payment status. Also, in case of electronic KANBAN, suppliers can view their order and just submit their ASN to SAPCO. While, entering or updating any other information by suppliers into the SAPCO's system has not been possible yet. Accordingly, SAPCO does not have any access to its suppliers systems.

Concerning Croom theory, SAPCO's e-procurement system is to some extent supports theory, not completely. The main reason is that SAPCO's e-procurement solution has been created for internal processes and then developed to some external area in relation with suppliers.

6-1-1-3. e-Procurement process

As McKie (2001) states, e-procurement software support the procurement process from req. to check (requisition to payment). A key aspect of e-procurement software is that as much as possible of the buying relationship with a supplier is managed electronically, rather that on paper.

According to our empirical data, SAPCO direct procurement process is derived from IT solutions and most part of this process is automated using self-developed software. SAPCO’s procurement process, which is based on software, is as follows:
**Requisitioning:** This process is based on integrated BOM system in SAPCO, which is generate purchasing requisitioning list, provides the quantity required and the desired delivery date of each item and transmitted to the related departments automatically. After required processing, suppliers receive purchasing requisition by Fax or mail, due to the lack of integrity between SAPCO and its suppliers.

**Order Submission:** This process runs by the automated system, which generate orders for the suppliers based on IKCO production plan and SAPCO inventory level. Suppliers receive the orders in two ways, for the KANBAN parts, through the SAPCO Extranet and for the other items, via the Zetafax system. This process completely supported by software.

**Order Tracking:** In case of electronic KANBAN, suppliers should upload data and documents on the subject of delivery such as the number requested parts, specification of the carrier (i.e. truck and its driver), and time of delivery to the website, therefore SAPCO can track the process of orders’ transportation to IKCO warehouses. However, for the other items, it is not possible to track the orders electronically.

**Receipt Processing:** After delivery and inspection, preliminary and final receipt of delivery sends to SAPCO automatically from IKCO’s goods receiving inventories. Receipt processing, which is an internal process between IKCO and SAPCO, is made through the network.

**Payment Processing:** Software is an instrument to support payment processing in SAPCO, but it is limited within the company due to some limitations in legal regulations (electronic signature is not legally accepted in Iran). Finance personnel by means of automated system check the confirmed final receipt with the items included in the main contract or purchasing permissions and according to SAPCO balance of payment with suppliers prepare the payable voucher file which is sent to treasury section or under contract banks automatically. Accordingly, there is a possibility for suppliers to view and follow all the accounting procedures on SAPCO’s Web, until their payment is ready to deliver and accordingly they approach treasury or definite banks to collect their money.

As a result, SAPCO e-procurement process is to some extent based on software, which is developed internally, however it cannot support the whole process of procurement completely. Thus McKie theory is partially supported by SAPCO’s e-procurement software.

6-1-1-4. e-Procurement Applications in SAPCO

**e-Sourcing:** Based on empirical data, for direct items, sourcing is done manually by a separate division, which is responsible to find and evaluate suppliers on a defined system. However, being a well-known company and due to several years of activity, all the potential and reliable suppliers have been identified and evaluated. Meanwhile, domestic new comers will automatically approach SAPCO to choose under production and for introducing their capabilities. Also, it is worth mentioning that the relation between SAPCO and its supplier is a long-term relationship and regarding this point, SAPCO invest on its suppliers for their growth and improvement to the level that SAPCO accepted their standards and evaluation. Hence, in line with e-sourcing definition brought in Knudsen theory, e-sourcing is not applied in SAPCO direct procurement. Therefore, SAPCO dose not support the theory in this application.

**e-Tendering:** According to empirical data, the requests for information from suppliers through Internet mostly happen in technical area and in case the suppliers don’t have the Internet facility they will send requests via fax. Request for price and proposal are handled manually via letter and certain communications for these subjects are mostly conducted through face-to-face meeting or by use of telephone. Therefore, we can conclude that e-tendering application of Knudsen theory is partially supported by SAPCO.

**e-Informing:** Supplier’s evaluation information including financial status, quality certification and unique capabilities are filled in special forms manually and will be submitted to SAPCO and then SAPCO will enter these data in its systems. As a result, Knudsen theory regarding e-informing is not followed in SAPCO e-procurement applications.

**e-Reverse Auction:** As stated before our research focus is on the local supplier of the direct parts, In this subject, considering the scarcity of suppliers for direct items and their quasi-monopolistic situation in the market, biding is to some extent not applicable for direct procurement in SAPCO. Also our empirical data shows that SAPCO has the long-term relationship with its suppliers, SAPCO adjusts the price at the time of signing contract and will negotiate and bargain about the price with suppliers each year to reduce the target price through implementation of some special program with suppliers. As a result, buying goods and services, which have the lowest price or combination of lowest price and other conditions via Internet technology that means e-reverse auction is not applicable in SAPCO. Thus, Knudsen theory for reverse auction is not supported in SAPCO.

**Web-based ERP:** Based on empirical data, purchasing requisition and order placement runs by the automated system and forwarded to the suppliers. Purchasing requisition is sent to the suppliers through fax. Regarding ordering, suppliers receive it in two ways, for the KANBAN parts, through the Web and for the other items, via the Zetafax system. After order placement and receiving them by the IKCO's goods receiving inventories, final receipt sends back to the planning department. It is checked with the related documents and then forwarded to the finance department as confirmed receipt. All this process is automated and backward and forward integrated with previous and next processes. It should be mentioned that from ordering to payment, it is possible for suppliers to view and follow up this process on SAPCO’s Web.
**e-Collaboration:** Referring data collected in our research, SAPCO’s suppliers are provided with required information via SAPCO’s website and special extranet which is designed for suppliers. Suppliers’ extranet has some information about production plan, reports on quality inspection of parts and components, Technical documents and evaluation of suppliers based on delivery and quality as well as financial and payment status. Therefore, e-collaboration application is being used in SAPCO and it is in line with Knudsen theory.

The following table briefly shows the comparison of SAPCO within departments’ case with Knudsen theory in the subject of e-procurement applications:

<table>
<thead>
<tr>
<th>e-Procurement Application</th>
<th>Procurement Functions</th>
<th>IT</th>
<th>Planning</th>
<th>Logistic</th>
<th>Polymer</th>
<th>Trim</th>
<th>Purchasing Ctrl</th>
<th>Commercial esp.</th>
<th>Domestic Direct purchasing</th>
</tr>
</thead>
<tbody>
<tr>
<td>e-Sourcing</td>
<td>Finding potential new suppliers</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>e-Tendering</td>
<td>Sending request for information</td>
<td>+/-</td>
<td>+/-</td>
<td>+/-</td>
<td>+/-</td>
<td>+/-</td>
<td>+/-</td>
<td>+/-</td>
<td>+/-</td>
</tr>
<tr>
<td></td>
<td>Request for price</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Request for proposal</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>e-Informing</td>
<td>Receiving suppliers data regarding quality certification, financial status or unique capabilities</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>e-Reverse Auction</td>
<td>Biding</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Web-based ERP</td>
<td>Purchasing requisitions</td>
<td>+/-</td>
<td>+/-</td>
<td>+/-</td>
<td>+/-</td>
<td>+/-</td>
<td>+/-</td>
<td>+/-</td>
<td>+/-</td>
</tr>
<tr>
<td></td>
<td>Placing the orders</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Delivery of the goods &amp; services</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>e-Collaboration</td>
<td>Correct &amp; updating data regarding product versions, blueprints and sales forecasts</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

*Source: By Authors, 2005*
6-1-2. SAPCO and Its Suppliers-Cross Case

In this part, we will analysis our first research question based on data collected in buyer-side and supply side in order to make comparison between two cases and find out correspondences or divergences.

6-1-2-1. e-Procurement model

SAPCO and its suppliers, in accordance to Chaffey theory, identified that their electronic communications take place through buyer extranet, which derived from buyer-side e-procurement model.

6-1-2-2. e-Procurement system

According to Croom (2001), e-procurement system is in two distinct, but connected: infrastructures - internal processing (via, for example, corporate intranet) and external communication with the supply base (via, for example, Internet-based platforms).

Referring SAPCO's within-case internal infrastructure is in agreement with theory. However, based on empirical data from supplier side, SAPCO’s e-procurement system is not integrated with their automated systems. Regarding the lack of integration between SAPCO and suppliers systems, external communication is not conducted in two ways. Suppliers are just provided with required information via SAPCO’s website While, entering or updating any other information by suppliers into the SAPCO’s system has not been possible yet. Accordingly, SAPCO does not have any access to its suppliers systems. As a result, due to lack of integration with suppliers, Croom theory is not supported completely by this case.

6-1-2-3. e-Procurement process

As McKie (2001) states, e-procurement software support the procurement process from req. to check (requisition to payment). Our finding in SAPCO within case shows that the following steps of procurement are partially supported by software:

- Requisitioning
- Order Submission
- Order Tracking
- Receipt Processing
- Payment Processing

Based on data collection in supply side, order submission is done through SAPCO extranet or automated fax. When orders received by suppliers, it is printed and attached to the container of components in order to deliver to IKCO's goods receiving inventories. For KANBAN parts, delivery data included delivery time and number of requested items, is entered to SAPCO's website by them and make it possible to track the orders electronically. Following up each order from delivery to final payment is feasible via SAPCO Extranet. Hence, to compare data collected in both buyer and
supplier sides, we come to the same conclusion that the theory of McKie is partly supported.

6-1-2-4. e-Procurement Applications in SAPCO


**e-Sourcing:** Based on SAPCO within-case analysis, for direct items, sourcing is done manually. Our findings in supplier side verify that due to the limited number of suppliers for direct items, it is not possible for SAPCO to do sourcing. All our cases started their cooperation with SAPCO from the establishment of their companies.

**e-Tendering:** According to SAPCO within-case analysis, the requests for information from suppliers through internet mostly happen in technical area and request for price and proposal are handled manually via letter and certain communications for these subjects are mostly conducted through face-to-face meeting or by use of telephone. Our investigation in supplier side shows that for official documents like contracts and proposals, suppliers should to be responded in written manner like mails or needs to be discussed face to face. For the technical documents and day-to-day coordination with SAPCO, e-mail or fax is being used. It should be mention that one of our cases with the name of MehrcamPars is connected to the SAPCO internal network, therefore, due to the integration, all kinds of request information carried out through automated system. As a result, we can conclude that SAPCO is partially support e-tendering application of Knudsen theory.

**e-Informing:** Supplier’s evaluation information including financial status, quality certification and unique capabilities, is in the category of official documents, which is submitted to SAPCO manually in especial format, and it is in comparison with what we found in buyer side. As a result, Knudsen theory regarding e-informing is not followed in SAPCO e-procurement application.

**e-Reverse Auction:** According to SAPCO’s within-case analysis, considering the scarcity of suppliers for direct items and their quasi-monopolistic situation in the market, biding is to some extent not applicable for direct procurement in SAPCO. However in supply side, suppliers believe that due to quasi-monopsonistic situation of SAPCO, they don’t have enough bargaining power to increase the price. SAPCO annually adjusts the price at the time of signing contract and will negotiate and bargain about the price with suppliers to reduce the target price. Thus, Knudsen theory for reverse auction is not supported by SAPCO e-procurement applications.

**Web-based ERP:** Based on empirical data in supply side, suppliers received the orders in two ways, for the KANBAN parts, through the Web and for the other items, via automated fax. After order placement, it will be delivered with related ASN which is enter in SAPCO's website by suppliers and carried by cargo. After delivery is taken place at good receiving inventories of IKCO, its time and actual number of parts will be entered to an automated system and its discrepancies with original order will be
come into view. The delivery receipt will be transferred to SAPCO afterward and it will be converted into SAPCO's Web site. Suppliers have access to follow up the process of ordering to delivery on SAPCO’s Web. Cross case comparison between SAPCO and its supplier’s shows that Web-based ERP application of e-procurement, defined by Knudsen, is supported in SAPCO e-procurement system.

**e-Collaboration:** One of the e-applications that suppliers refer to it, is the accessibility of SAPCO's info through its website which includes IKCO production plan for all range of products, reports on quality inspection of parts and components, suppliers evaluation, ordering and payment statement, also purchasing inquiry and orders which are sent through the web, e-mail or automated fax. This result is in contrast with what SAPCO identified as its e-collaboration with suppliers and it is in agreement with Knudsen theory for e-collaboration.

The following table briefly shows the cross-case analysis of SAPCO and its suppliers in accordance to Knudsen theory:

**Table 6-3 Identified SAPCO e-procurement applications based on Knudsen theory-Cross case**

<table>
<thead>
<tr>
<th>e-Procurement application</th>
<th>Procurement Functions</th>
<th>SAPCO</th>
<th>Mehrkam Pars</th>
<th>Mehrvarzazan</th>
<th>Sanden Iranian</th>
<th>Shetab Kar</th>
<th>MST</th>
</tr>
</thead>
<tbody>
<tr>
<td>e-Sourcing</td>
<td>Finding potential new suppliers</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>e-Tendering</td>
<td>Sending request for information</td>
<td>+/-</td>
<td>+</td>
<td>+/-</td>
<td>+/-</td>
<td>+/-</td>
<td>+/-</td>
</tr>
<tr>
<td></td>
<td>Request for price</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Request for proposal</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>e-Informing</td>
<td>Receiving suppliers data regarding quality certification, financial status or unique capabilities</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>e-Reverse Auction</td>
<td>Biding</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Web-based ERP</td>
<td>Purchasing requisitions</td>
<td>+/-</td>
<td>+</td>
<td>+/-</td>
<td>+/-</td>
<td>+/-</td>
<td>+/-</td>
</tr>
<tr>
<td></td>
<td>Placing the orders</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Delivery of the goods &amp; services</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>e-Collaboration</td>
<td>Correct &amp; updating data regarding product versions, blueprints and sales forecasts</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

Source: By Authors, 2005
6-2. RQ2: What are the benefits of applying e-procurement for SAPCO and its suppliers?

To analysis our second and third research question, first we present within case of SAPCO and suppliers briefly in following tables and then in cross case part, we describe each benefit and barrier recognized in SAPCO and suppliers with together in accordance with theory.

6-2-1. SAPCO within Case

Based on empirical data, the following table shows the benefits achieved from implementation of e-procurement in SAPCO in comparison with theory.

**Table 6-4. Identified SAPCO e-procurement benefits based on theory-Within case**

<table>
<thead>
<tr>
<th>Benefits list</th>
<th>Software</th>
<th>ERP</th>
<th>Planning</th>
<th>Logistic</th>
<th>Trim</th>
<th>Polymer</th>
<th>Domestic Direct purchasing</th>
<th>Commercial</th>
<th>Purchasing Ctrl</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price Reduction</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Shortened Procurement Cycle Times</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Reduced Transactional &amp; Administration Costs</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+/-</td>
<td>+</td>
</tr>
<tr>
<td>Improved Visibility of Customer Demand &amp; Supply Chain</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Reduced Operational &amp; Inventory Costs</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Enhanced Decision making</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

Source: By Authors, 2005
6-2-2. Suppliers within Case

Referring to data collection, benefits derived from implementation of e-procurement in supply-side compare with theory in the following table.

Table 6-5. Identified SAPCO’s suppliers e-procurement benefits based on theory-Within case

<table>
<thead>
<tr>
<th>Benefits list</th>
<th>Mehr Cam Pars</th>
<th>Melvar Sazan</th>
<th>Sandan Iranian</th>
<th>Shetabkar</th>
<th>MST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price Reduction</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Shortened Procurement Cycle Times</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Reduced Transactional &amp; Administration Costs</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Improved Visibility of Customer Demand and Supply Chain</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Reduced Operational &amp; Inventory Costs</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Enhanced Decision making</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

Source: By Authors, 2005

6-2-3. SAPCO and Its Suppliers-Cross Case

Price Benefits

Price benefits are derived as a result of better demand management capability of e-procurement systems. Procurement costs are reduced through economies of supplier search and increased price competition among suppliers (Croom and Johnston, 2003; Shaw and Subramaniam, 2002).

Neither case of SAPCO nor cases of suppliers support the theory of price benefits and it was identified as a benefit of the automated procurement system.

Since SAPCO is using its system for direct purchasing and applications like reserve auctions are not available in that system and also considering the short number of supplier for each part and components above result is completely reasonable. Therefore in the current circumstances this benefit is not in accordance with presented theory.
**Shortened Procurement cycle times**

According to NECCC (2002) e-procurement has the ability to reduce resources currently involved in paper and manually based procurement processes through improved payment processes and decreased cycle time.

Case SAPCO support the theory, since procurement cycle and finance process got shortened as suppliers have a time limit to deliver their parts and components and if they exceed the time limit, it affects their evaluation results. By eliminating and shortening some ordering steps and by means of automated system, orders receive by supplier in few seconds just after sending. Integrated system from the customer to suppliers is very supportive to do planning quick and accurate. At present, any changes, take place in IKCO production schedule, transmitted to SAPCO very quickly that cause accuracy in planning and ordering. In some cases, period of numerous transactions between SAPCO and IKCO has been reduced from 30 days to 1 or maximum 2 days.

Within case of suppliers supports the theory partially as the automated system between SAPCO and its suppliers is saving in time and administration cost efficiencies. However, since the system is based on a buy-side model it is more beneficial to SAPCO than to the suppliers.

**Reduced transaction and administration costs**

Reduction in transaction cost is one of the most attractive benefits from e-procurement adoption, which is achievable by eliminating data entry and correcting errors in paperwork and also savings in search, negotiation and contracting, and coordination costs. (C. Nam, 1998; Shaw and Subramaniam, 2002)

Lowering procurement administration costs starts with reducing the time and/or the number of people required to process purchase order requisitions. (Aberdeen group, 2001)

Case of SAPCO partially is in accordance to the theory. By using e-procurement system paperwork is decreased as almost the whole process is automated. By this mean, information flows and running the process became smoother and easier. In comparison with robust change in number of IKCO's production in last decade, SAPCO maintained the number of its employees almost unchanged.

Case Suppliers believe in supply-side or even bilateral model administration costs can decrease. Planning, for example, can become more accurate due to fast and complete accessibility to required data. However, current situation does not support the theory for suppliers' side.
Improved visibility of customer demand and supply chain

The ability to use e-commerce tools in order to collaborate with suppliers, distributors, and customers in all these activities will help determine tomorrow's winners. (Andrew, 2001, P6) E-procurement enables companies to decentralize operational procurement processes and centralize strategic procurement processes as a result of the higher supply chain transparency provided by e-procurement systems. (Puschmann and Alt, 2005)

Case SAPCO proves the theory partially because integration between customer and suppliers systems has not been provided yet. E-procurement helped SAPCO in having better management on suppliers' performance by improving supply chain visibility and supplier's evaluation system. Electronic system causes visibility of customer demand more accurate in terms of transparency in customer needs and expectations. Now, they can view the estimation of 4-month or monthly and weekly plans via the website. By considering these predictions they can estimate the pattern of customer demand and it seems that this kind of planning has increased the accuracy of suppliers’ production utilization.

Case suppliers support the theory partially; the visibility of customer demand has improved while current system has nothing to do with their low tier suppliers. Information flow has become smoother and faster than before, especially in operational activities from ordering to delivery. The visibility of processes has been improved and they can follow up their financial records and payment procedures at SAPCO's Extranet.

Reduced operating & inventory costs

The buyer will obtain operational efficiency by implementing the e-procurement system in the form of reduced inventory costs and ordering costs, and this efficiency gain increases with the number of suppliers who join in the network. (Dai and Kauffman, 2003)

Case SAPCO is completely in accordance with the theory since controlling of inventory level became more accurate and engineering systems, quality assessment, analyzing prices and controlling the whole process, reduced the operating costs and workloads in all units. Using automated warehousing system has made a great evolution in SAPCO inventory management and costs.

Case Suppliers somewhat deviate from theory since unorganized plan in ordering of IKCO and SAPCO faces suppliers with inventory management problems. They have to store extra finished goods to be able to meet fluctuated needs of SAPCO's daily orders and also purchasing raw material and intermediate goods for short time. In new circumstances there is no must for SAPCO to buy the certain number of parts that are indicated in the contract or monthly orders. Just the delivery is bought or accepted that is in accordance with daily order and is announced in SAPCO's website. While, supplier should supply items to SAPCO based on a daily ordering system, they have to procure their needs for one month or more and this increased their operation and
transportation cost. Besides, they should supply items to SAPCO based on a daily ordering system while they have to procure their needs monthly and this increased their operation and transportation cost.

**Enhanced decision making**

According to NECCC (2002) e-procurement provide the opportunity for increased auditing and automated accountability and tracking from start to finish; and increased and more sophisticated reporting functionality which lead to enhance decision making. e-procurement efficiency benefits comprise the proactive management of key data and higher-quality purchasing decisions within organizations.

Automated system smoothes the progress of internal procedures and improve the accuracy and richness of the needed data for decision-making. Puschmann and Alt (2005)

Case SAPCO is in accordance with the theory. Decision making mechanism is improved and supply chain management became clearer. Innovative information and communications technology enhances the competitiveness of an organization. It improves business management and control and it will lead company to globalization. Concerning the amount of turnover, it is a must for SAPCO as a sizeable company to be equipped with such new e-technologies systems.

Case suppliers agree to the theory; most of needed information such as contact info; production information and all related reports are just a click away. Having web-based relation with SAPCO makes transferring the information very easier. All information is archived so suppliers can use this system as a very good reference to see when an order took place and when the goods are delivered in order to adjust their system. Suppliers' decision-making power has become more accurate and supply time has turn out to be shorter.
6-3. RQ3: What are the barriers of applying e-procurement for SAPCO and its suppliers?

**6-3-1. SAPCO within Case**

Based on data collection, we summarized the barriers of implementation of e-procurement in SAPCO in view of several related departments in accordance to theory, which is shown in following table:

**Table 6-6. Identified SAPCO e-procurement barriers based on theory-Within case**

<table>
<thead>
<tr>
<th>Barriers list</th>
<th>Software</th>
<th>ERP</th>
<th>Planning</th>
<th>Logistic</th>
<th>Trim</th>
<th>Polymer</th>
<th>Domestic Direct purchasing</th>
<th>Commercial</th>
<th>Purchasing Ctrl</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inadequate Technological Infrastructure</td>
<td>+, *</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+, *</td>
<td>+, *</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Inadequate Tech Infrastructure of partners</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+, *</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Lack of Skilled Personnel</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+/-</td>
<td>+/-</td>
</tr>
<tr>
<td>Lack of Integration with Business Partners and their Co-operation</td>
<td>+/-</td>
<td>+/-</td>
<td>+/-</td>
<td>-</td>
<td>+/-</td>
<td>+/-</td>
<td>+</td>
<td>+</td>
<td>+/+-</td>
</tr>
<tr>
<td>Implementation Costs</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+/-</td>
<td>+/-</td>
</tr>
<tr>
<td>Company Culture</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+/-</td>
<td>+, *</td>
<td>+</td>
<td>+, *</td>
<td>+/-</td>
</tr>
<tr>
<td>Inadequate Business Processes to support e-Procurement</td>
<td>-</td>
<td>-</td>
<td>+, *</td>
<td>+/-</td>
<td>+</td>
<td>-</td>
<td>+/-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Regulatory and Legal Controls</td>
<td>+</td>
<td>+/-</td>
<td>+/-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+, *</td>
</tr>
<tr>
<td>Security</td>
<td>+/-</td>
<td>+/-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+, *</td>
<td>+, *</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Inadequate e-procurement Solutions</td>
<td>-</td>
<td>+</td>
<td>+, *</td>
<td>+, *</td>
<td>+, *</td>
<td>+/-</td>
<td>+</td>
<td>+/-</td>
<td>+</td>
</tr>
<tr>
<td>Upper Management Support</td>
<td>+/-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+/-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

*Source: By Authors, 2005*

* = Most important challenges
### 6-3-2. Suppliers within Case

Referring to our investigation, the following table shows the barriers coming from implementation of e-procurement in supply side with accordance to theory.

**Table 6-7. Identified SAPCO’s suppliers e-procurement barriers based on theory-Within case**

<table>
<thead>
<tr>
<th>Barriers list</th>
<th>Mehran Pars</th>
<th>Mehrvar Sazan</th>
<th>Sanden Iranian</th>
<th>Shetabkar</th>
<th>MST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inadequate Technological Infrastructure</td>
<td>+/-</td>
<td>+</td>
<td>+/-</td>
<td>+</td>
<td>+,*</td>
</tr>
<tr>
<td>Inadequate Tech Infrastructure of partners</td>
<td>-</td>
<td>+/-</td>
<td>+/-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Lack of Skilled Personnel</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Lack of Integration with Business Partners and their cooperation</td>
<td>+/-</td>
<td>+/-</td>
<td>+/-</td>
<td>+/-</td>
<td>+/-</td>
</tr>
<tr>
<td>Implementation Costs</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Company Culture</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+/-</td>
<td>+,*</td>
</tr>
<tr>
<td>Inadequate Business Processes to support e-Procurement</td>
<td>+</td>
<td>-</td>
<td>NA</td>
<td>NA</td>
<td>-</td>
</tr>
<tr>
<td>Regulatory and Legal Controls</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Security</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Inadequate e-procurement Solutions</td>
<td>+/-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Upper Management Support</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: By Authors, 2005  
* = Most important challenges
6-3-3. SAPCO and Its Suppliers-Cross Case

Inadequate Technological Infrastructure

Payne stated that SME’s in developing countries face more challenges when trying to gain from electronic commerce than businesses in developed countries. This context includes constraints related to technical infrastructure (access and pricing), laws and regulations, limited logistics systems (roads, rail, and air), and more. (Payne, N.D.)

Case SAPCO correlates to the theory; inadequate country infrastructure (e.g. telecommunication deficiencies like lack of an extensive fiber optic cable) hinders the adoption of electronic systems. While, many have felt the necessity and importance of these systems, on the whole, national infrastructure is not ready and suitable for applying e-technologies.

Case suppliers sustain the theory; inadequate infrastructure has caused many problems for SAPCO and its suppliers. They have experienced number of times that their network servers were inaccessible due to problem in power supply or telecommunication lines.

Inadequate Technological Infrastructure of partners

The technological infrastructure especially in relation to procurement business partners is considered one of the main barriers to e-procurement. (Stein & Hawking, 2002)

Case SAPCO agrees to the theory and refers to lack of suppliers’ technical competencies. There are suppliers with limited number of PC’s and do not have automated systems, Internet access, and reliable local network system.

Case SUPPLIERS agree to theory as far as their low tier suppliers are concern. Since, no electronic communication and relationship are available with suppliers in their own supply chain because of their lack of budget, culture, infrastructure and skilled personnel.

Lack of Skilled Personnel

Like so many other “e-solutions” lack of skilled staff is considered a serious impediment. (Stein & Hawking, 2002)

Case SAPCO agrees to the theory partially while refers to lack of skilled personnel as an important barrier on the supplier-side particularly low tier suppliers.

Case Suppliers support the theory lack of skilled workforce and needed e-business knowledge are other problems in applying e-procurement to whole supply chain.
Lack of Integration with Business Partners and their Co-operation

The scope of B2B operations goes beyond the buying enterprise and extends to the “extended enterprise”, to include all suppliers and other business partners. However, all business partners do not have the same characteristics to adopt e-procurement. The potential value of the system cannot be realized unless both users and suppliers participate in the system. (Shaw and Subramaniam, 2002)

Case SAPCO partially is in accordance to the theory; having inadequate relationship and integration with suppliers in decision making is count as another barrier of e-procurement implementation for SAPCO and it should be removed by preparing the needed requisites and culture in suppliers.

Case suppliers agree to the theory to some extent since they have this barrier to implement e-technologies with their suppliers and not necessarily their costumers.

Implementation Costs

Croom in his study report highlighted the level of agreement and disagreement with the five important impediments identified. Only in the case of development costs there was a lack of disagreement with the criteria identified as an impediment. (Croom, 2001 and 2005)

Case SAPCO does not support the theory completely though by technical member it was mentioned that implementation cost for some suppliers is an important barrier to be considered.

Case suppliers do not agree to the theory since, as a buy-side model there was no cost contribution from their side.

Company Culture

According to PricewaterhouseCoopers, the organization must be transformed into a change-embracing entity, one with a culture that accepts that every tomorrow is different and all developments are worth examining for the benefits they may bring. (PricewaterhouseCoopers, 2002)

Case SAPCO partially agree to the theory; at first, the manufacturing staffs and other departments were against automation, however when they understand the contribution of automated systems to speeding execution of errands and its other benefits, it was widely welcomed and adopted by the organization. While, this fact that it is not necessary to have face to face contact between people especially for contracts and financial matters is a new concept and it is not widely accepted in the whole supply chain.

Case suppliers support the theory to some extent. In low tier suppliers this barrier is more pertinent than tier one suppliers. Actually, it is hard for some suppliers to act upon their customer plan or receive frequent orders for short time consumption.
Inadequate Business Processes to support e-Procurement

Need to re-engineer business processes as the greatest identified barriers in a study of the main obstacles to e-business success. (Ernst & Young, 2001: P4)

Case SAPCO supports the theory especially when they want to adopt a standard e-procurement system. While for their current self-developed system there were few easygoing changes needed.

Case suppliers agree to theory. However, in current circumstances although electronic ordering is being used their processes have not changed and the existing ones are not considered as a barrier for implementation. While, reengineering SAPCO processes before automation was sensible for some of suppliers.

Regulatory and Legal Controls

Perhaps the most important challenges facing companies contemplating E-Business are legal and regulatory issues such as conflicting jurisdictions, taxes, and intellectual property rights and security issues such as data confidentiality, privacy, fraud, and industrial espionage (PricewaterhouseCoopers, 2002)

Case SAPCO agrees to the theory since they were not still able to use electronic technologies from order to payment because of his barrier. For example e-signature is not valid and not approved by many people.

Case suppliers do not support the theory because by current system which some of their business traditions remained unchanged they were not faced with such barriers.

Security

Min and Galle stated that when asked to rate the severity of obstacles that may hinder effective Internet-based cyber-purchasing, the most serious obstacle is a lack of security of Internet transactions. (Min and Galle, 1999)

Case SAPCO agrees to the theory to some extent while they believe security is possible to achieve with accurate solution. In this respect, SAPCO has adopted several methods to prevent data hacking or distortion like utilizing up-to-date and appropriate relevant software and also proficient network design. While security of the valuable data like prices and other contracts information would be significant concern of SAPCO in implementation of standard e-procurement system.

Case suppliers is not in accordance with theory since the buy side partially Internet based system is not very vulnerable to security problems.
Inadequate e-procurement Solutions

Lack of appropriate offerings is one of the e-procurement barriers named by Tanmit (2002). Most e-Procurement solutions have focused on automating the front-end procure-to-order cycles, providing little, if any, support for critical back-end processes such as supplier management, sourcing, order fulfillment, and financial settlement. (Aberdeen, 2002)

Case SAPCO partially supports the theory. Procurement system of SAPCO is limited to the inter-organizational process and do not contain all the interaction with suppliers. In other hand, since it was developed internally and the automation of SAPCO’s errands was the main goal of system development it has not passed beyond the internal processes. Therefore by defining the ERP project and acquiring SAP software as global standard software, they intend to overcome this shortage.

Case suppliers do not agree to the theory. While, it is believe that current system is insufficient to be used in the whole supply chain.

Upper Management Support

e-Business initiatives success depends on strategic decisions that ensure alignment with the company’s long-term vision and goals, which requires senior management commitment. (PricewaterhouseCoopers, 2002)

Case SAPCO does not support the theory. Considering the benefits of this system, top management support e-procurement adoption and the acquisition of SAP has been approved and supported by IKCO’s and SAPCO’s top managers.

Case suppliers do not agree to the theory and the top management is eagerly support the automation though so far remarkable benefits have not been gained by suppliers.
Chapter 7: Finding, Conclusions and Implications

In this chapter, we will present findings and conclusions drawn from the research performed in this study. Consequently, we will bring our research questions and based on our finding, will try to answer them. Furthermore, implications for management and future research will be discussed.

7-1. Findings and Conclusions

RQ1: How e-procurement is being used for acquisition of parts and components between SAPCO and its suppliers?

The conclusion of this research question is that e-procurement is partially being used for acquisition of parts and components between SAPCO and its suppliers through an IT solution which has been developed by SAPCO based on buyer-side model.

SAPCO’s e-solution is to some extent support e-procurement system identified by Croom (2001). SAPCO’s e-procurement system is derived from its ERP solution and mostly focuses to streamline its internal purchasing processes. We find out that the main objective to develop this system was to build a full-automated system to improve the efficiency and productivity of internal processes through less paperwork and automated calculations and information processing. Our finding indicates that SAPCO’s e-procurement system is gradually self-developed without reengineering the whole processes and from beginning has not pursued a comprehensive practice of procurement process. Therefore, development of this system has to some extent been unstructured without concerning e-procurement system requirements. However, SAPCO's internal infrastructure supports e-procurement within organizational process for direct items from requisitioning to payment. SAPCO’s external communication with suppliers cannot follow Croom theory completely considering the lack of integration between SAPCO’s and suppliers’ systems as well as inadequate IT infrastructure of suppliers.

Regarding e-procurement applications, it seems that the only applications that are carried out through SAPCO’s Extranet, are e-collaboration, web-base ERP and to some extent e-tendering. Distinct information systems of SAPCO and its suppliers is the main reason that e-tendering and e-informing applications are not being used for acquisition of parts and components, as we observed the implementation of both above-mentioned applications between SAPCO and MehrcamPars which is result of integrated information system among them. e-Biding is not applicable in SAPCO for direct procurement, because they have defined another procedure for pricing, which is, differ from biding procedure. Besides, e-sourcing is not applicable in SAPCO due to the long relationship with suppliers of strategic items; however finding new local suppliers through the Web is not regular in Iran yet. Considering SAPCO procedure
for sourcing and pricing we came to the conclusion that e-sourcing and e-bidding cannot applicable in SAPCO for direct procurement.

**RQ2: What are the benefits of applying e-procurement for SAPCO and its suppliers?**

The study has shown that implementation of e-procurement by SAPCO is much more beneficial in buyer-side comparing to supply side. All benefits identified by theory are supported by SAPCO. Benefits achieved through reduced errors, improved internal communications and reduced cost in inventory and operation of procurement process. In addition it helped to improve the visibility of customer demand and expectation for SAPCO and helps them to handle much more orders in the process. The empirical findings confirm more precise planning and reducing costs as the advantages of e-procurement system in SAPCO.

Despite the benefits achieved in SAPCO, suppliers have not reach to the significant advantage of this application and do not confirm theory. The main reason coming from e-ordering application, which imposed extra inventory and operational cost to them that prevent to achieve a total reduction in their costs. During electronic KANBAN project, which is currently being carried out with suppliers, SAPCO and IKCO warehouses have been emptied yet; the stocks are transferred to suppliers. Suppliers have to increase their inventory to prevent shortage of required materials or harsh fluctuation in SAPCO's orders, which otherwise cause discontinuity in IKCO's production. As a matter of fact, electronic KANBAN has increased the level of suppliers' raw material inventory and logistic costs because of shortened procurement cycle and online ordering and its fluctuations. Moreover, because of traditional relationship of tier one supplier with their low tier supplier implementation the same system with them is unachievable and therefore tier one suppliers must bear all the fluctuation just by their selves. In addition, inaccurate and unorganized ordering schedule from SAPCO make difficulty in their operational activities. In this respect, SAPCO's electronic procurement system has affected some of their ratios like capital return and profitability, which are obviously undesirable.

However, benefits achieved by SAPCO, enhance suppliers decision-makings to support e-procurement and encourage them to implement this application with their suppliers.

One of the benefits in supply side which not driven from theory is experiencing a worldwide and up-to-date system, which is consider as a competitive advantage for them. Suppliers believe that adoption the new technology has helped them to develop their market, either domestically or internationally.

Another conclusion that can be drawn is due to buyer-side e-procurement system; most of benefits get back to the buyer in comparison to the suppliers, especially in case that this system has been developed by buyer.
**RQ3: What are the barriers of applying e-procurement for SAPCO and its suppliers?**

This study implies that the major barriers for both sides are due to lack of integration and inadequate IT infrastructure especially in business partners. SAPCO’s barriers are mostly originated from outside of the organization-supply side and environment. Hence, in the implementation of e-procurement in the whole supply chain, SAPCO faces barriers such as inadequate technological infrastructure, low level of technological adoption of its partners (i.e. IKCO and suppliers), long distance between SAPCO and tier one suppliers which cause risk of transportation, regulation and laws, lack of integration with partners and supplier's culture. These barriers are more challenging when they come to smaller suppliers that even have neither computers nor skilled personnel.

Another barrier that we cannot refer to the theory is due to frequent political and economical instabilities planning. Sanctions against Iran are the most significant obstacles that SAPCO faces in the area of new technology adoption.

This research shows that for the processes, which are related to SAPCO inter-organization affairs; there is no serious barrier for e-procurement adoption excluding inadequate software, which is one of the pertinent barriers of SAPCO to implement e-procurement in whole supply chain. SAPCO hopes to remove this barrier through implementation of SAP solution.

Other obstacle, which SAPCO is faced internally and externally, is owing to the culture that needs to be improved. In some cases, parallel to automated flow of information, some documents are printed and kept. Then, based on these hard copies manual operation is done, while keeping their result by information systems.

The most important barrier, which is defined by suppliers, is inadequate technological Infrastructure mainly for their suppliers which is in accordance with theory. No electronic communication and relationship are available with suppliers in their own supply chain because of their lack of budget, culture, infrastructure and skilled personnel.

Implementation cost, regulatory and regal controls were not as a barrier to the suppliers which is not in agreement with theory, however they have not any practice to implement such these systems, and therefore they have not real assessment for these subjects.
7-2. Implications for Management

Based on our investigation and the above conclusion, the following implication for management can be drawn:

- Concerning the advantages of buyer-side model including simplicity, single interface, integration with ERP and good purchasing control, we recommend SAPCO as a buyer to develop its e-procurement system based on current model, which is a buyer-side model.

- SAPCO should utilize its procurement systems and applications, the existing self-developed software is not an adequate solution to meet all their requirements and they should identified new approach, which make sense as “e-procurement system”. This subject is already known by SAPCO and they have recently purchased SAP software. Besides, reengineering all SAPCO’s current procurement process in whole supply chain from customer to supplier is vital prior to implementation of standard e-procurement solution like SAP. Before applying electronic operational applications like web-base ERP, SAPCO should reengineer ordering and receipt processing, any inaccuracy in these processes from SAPCO make difficulty in suppliers operational activities.

- SAPCO need to look at implementation of e-procurement as an integrated system which covers all supply chain from its tier one supplier to last one, to do this SAPCO should apply required training and investments on its supply chain as they are not financially and educationally able to apply e-procurement system. e-Procurement system must bring all the relevant components of the supplying chain in to the picture, otherwise the risks and costs from one party will move to others.

- According to the benefits of indirect e-procurement, which mentioned in theory, it is advantageous for SAPCO to approach e-procurement for indirect items as well, especially for the items that they acquire through international market.

7-3. Further Research

We have presented some interesting recommendations for further researches for those who would like to study in the filed of e-procurement application, benefits and barriers; There are few submissions as follows:

- It is understood that e-procurement is just a new concept in Iranian market and it will be fascinating to investigate the barriers and benefits that companies may face at the first stage of applying this new technology also the requirements that companies need to meet before approaching to this new subject.
e-procurement models is well-known by users in market, it would be motivating approach to study about the benefits and barriers of applying e-procurement in different models, for example in supply side as this area is not fully developed in literature and the possibility to expand this subject would be very interesting.

Furthermore, in our research we found out the important role of integration in applying e-procurement in a company which covers the whole supply chain from its tier one suppliers to last one, due to our research time limitation we did not fully discussed about the requirements, barriers and benefits of an integrated e-procurement technology in the whole supply chain.

In this research, we have mostly focused on direct procurement in SAPCO and it would be a great opportunity for further researchers to concentrate on SAPCO indirect procurement' application, strategies, risk and benefits both domestic and internationally.
Appendix [I]: SAPCO Organizational Chart
Appendix [II]: list of suppliers involved in electronic KANBAN-sorted by Turnover

- **G**: Great Suppliers with turnover more than 30 Billion Rial ($3M)
- **M**: Middle Suppliers with turnover between 10 to 30 Billion Rial ($1M to $3M)
- **S**: Small Suppliers with Turnover less than 10 Billion Rial ($1M$)

<table>
<thead>
<tr>
<th>Number</th>
<th>Suppliers Name</th>
<th>Suppliers Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mehrkam Pars</td>
<td>G</td>
</tr>
<tr>
<td>2</td>
<td>Mehrvar Sazan Iran Khodro</td>
<td>G</td>
</tr>
<tr>
<td>3</td>
<td>Crouse</td>
<td>G</td>
</tr>
<tr>
<td>4</td>
<td>Sanden Iranian</td>
<td>G</td>
</tr>
<tr>
<td>5</td>
<td>Niroo Mohareke</td>
<td>G</td>
</tr>
<tr>
<td>6</td>
<td>Shetabkar</td>
<td>G</td>
</tr>
<tr>
<td>7</td>
<td>Majmooe-Sazi Tooz</td>
<td>G</td>
</tr>
<tr>
<td>8</td>
<td>Electric Khodro Shargh</td>
<td>G</td>
</tr>
<tr>
<td>9</td>
<td>Farasanat-e-Shomal</td>
<td>G</td>
</tr>
<tr>
<td>10</td>
<td>Azin Khodro</td>
<td>G</td>
</tr>
<tr>
<td>11</td>
<td>Majin Sanat</td>
<td>G</td>
</tr>
<tr>
<td>12</td>
<td>Egzoz Khodro Khorasan</td>
<td>G</td>
</tr>
<tr>
<td>13</td>
<td>Etehad Motor</td>
<td>G</td>
</tr>
<tr>
<td>14</td>
<td>Moj Nikan</td>
<td>G</td>
</tr>
<tr>
<td>15</td>
<td>Poly Uosphane</td>
<td>G</td>
</tr>
<tr>
<td>16</td>
<td>Shishe Imani Behnoor</td>
<td>G</td>
</tr>
<tr>
<td>17</td>
<td>Estam Sanat</td>
<td>G</td>
</tr>
<tr>
<td>18</td>
<td>Jam Saz</td>
<td>G</td>
</tr>
<tr>
<td>19</td>
<td>Fara Koolon</td>
<td>G</td>
</tr>
<tr>
<td>20</td>
<td>Boronz</td>
<td>G</td>
</tr>
<tr>
<td>21</td>
<td>Noor Ista Plastic</td>
<td>G</td>
</tr>
<tr>
<td>22</td>
<td>Shishe Gilan</td>
<td>G</td>
</tr>
<tr>
<td>23</td>
<td>Shahabe Shams</td>
<td>G</td>
</tr>
<tr>
<td>24</td>
<td>Elm-o-Sanat</td>
<td>G</td>
</tr>
<tr>
<td>25</td>
<td>Pouya Gostar Khorasan</td>
<td>G</td>
</tr>
<tr>
<td>26</td>
<td>Gharb Steel</td>
<td>G</td>
</tr>
<tr>
<td>27</td>
<td>Paya Clatch</td>
<td>G</td>
</tr>
<tr>
<td>28</td>
<td>Peivand</td>
<td>G</td>
</tr>
<tr>
<td>29</td>
<td>Plastic Abhar</td>
<td>G</td>
</tr>
<tr>
<td>30</td>
<td>Pars Electric</td>
<td>G</td>
</tr>
<tr>
<td>31</td>
<td>Iscra Auto Electric Iran</td>
<td>G</td>
</tr>
<tr>
<td>32</td>
<td>Iran Lavazem Gate</td>
<td>G</td>
</tr>
<tr>
<td>33</td>
<td>Now Baf</td>
<td>G</td>
</tr>
<tr>
<td>34</td>
<td>Saze Poushesh</td>
<td>G</td>
</tr>
<tr>
<td>35</td>
<td>Borna Battery</td>
<td>G</td>
</tr>
<tr>
<td>36</td>
<td>Pars Egzoz</td>
<td>G</td>
</tr>
<tr>
<td></td>
<td>نام شرکت</td>
<td>شهر</td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>37</td>
<td>Vala Fan</td>
<td>G</td>
</tr>
<tr>
<td>38</td>
<td>Honar Varz</td>
<td>G</td>
</tr>
<tr>
<td>39</td>
<td>Gataate Mehvari Khorasan</td>
<td>G</td>
</tr>
<tr>
<td>40</td>
<td>Iman Khodro Shargh</td>
<td>G</td>
</tr>
<tr>
<td>41</td>
<td>Sanaye Dashborde Yaran</td>
<td>G</td>
</tr>
<tr>
<td>42</td>
<td>Sa Iran</td>
<td>G</td>
</tr>
<tr>
<td>43</td>
<td>Kooshesh Radiator</td>
<td>G</td>
</tr>
<tr>
<td>44</td>
<td>Behrizan Sanate Pishro</td>
<td>G</td>
</tr>
<tr>
<td>45</td>
<td>Shomal Plastic chaboksar</td>
<td>G</td>
</tr>
<tr>
<td>46</td>
<td>Seraj Noor</td>
<td>G</td>
</tr>
<tr>
<td>47</td>
<td>Farnam Baspar</td>
<td>G</td>
</tr>
<tr>
<td>48</td>
<td>Systemhaye Sandali Pars</td>
<td>M</td>
</tr>
<tr>
<td>49</td>
<td>Tavan Battray Nakhostin</td>
<td>M</td>
</tr>
<tr>
<td>50</td>
<td>Niroo Gostaran Khorasan</td>
<td>M</td>
</tr>
<tr>
<td>51</td>
<td>Farsh va Mooket Babol</td>
<td>M</td>
</tr>
<tr>
<td>52</td>
<td>Cooler Iran</td>
<td>M</td>
</tr>
<tr>
<td>53</td>
<td>Armco</td>
<td>M</td>
</tr>
<tr>
<td>54</td>
<td>Battray Sazi Niroo</td>
<td>M</td>
</tr>
<tr>
<td>55</td>
<td>Polymet</td>
<td>M</td>
</tr>
<tr>
<td>56</td>
<td>Radiator Iran</td>
<td>M</td>
</tr>
<tr>
<td>57</td>
<td>Omid Esfahan</td>
<td>M</td>
</tr>
<tr>
<td>58</td>
<td>Sanaye Lastici Parmida</td>
<td>M</td>
</tr>
<tr>
<td>59</td>
<td>Misagh</td>
<td>M</td>
</tr>
<tr>
<td>60</td>
<td>Feiz Ghadir</td>
<td>M</td>
</tr>
<tr>
<td>61</td>
<td>Ati Motor</td>
<td>M</td>
</tr>
<tr>
<td>62</td>
<td>Felez Itan</td>
<td>M</td>
</tr>
<tr>
<td>63</td>
<td>Fan Var</td>
<td>M</td>
</tr>
<tr>
<td>64</td>
<td>Mazdak</td>
<td>M</td>
</tr>
<tr>
<td>65</td>
<td>Akhshan</td>
<td>M</td>
</tr>
<tr>
<td>66</td>
<td>Sepehr Bad</td>
<td>M</td>
</tr>
<tr>
<td>67</td>
<td>Manabe Taghzie Electronic</td>
<td>M</td>
</tr>
<tr>
<td>68</td>
<td>Monir Afzar</td>
<td>M</td>
</tr>
<tr>
<td>69</td>
<td>Madad Rooyan</td>
<td>M</td>
</tr>
<tr>
<td>70</td>
<td>Novin Arak</td>
<td>M</td>
</tr>
<tr>
<td>71</td>
<td>Modern</td>
<td>M</td>
</tr>
<tr>
<td>72</td>
<td>Cheragh Danesh</td>
<td>M</td>
</tr>
<tr>
<td>73</td>
<td>Shab Shekan</td>
<td>M</td>
</tr>
<tr>
<td>74</td>
<td>Aloom Form</td>
<td>M</td>
</tr>
<tr>
<td>75</td>
<td>Arish Khodro</td>
<td>M</td>
</tr>
<tr>
<td>76</td>
<td>Mohandes Khor</td>
<td>M</td>
</tr>
<tr>
<td>77</td>
<td>Ghate Sazan Sina</td>
<td>M</td>
</tr>
<tr>
<td>78</td>
<td>Dena Ghate</td>
<td>M</td>
</tr>
<tr>
<td>79</td>
<td>Khodro Ghaleb</td>
<td>M</td>
</tr>
<tr>
<td>80</td>
<td>Pishtazan Khodro Ghaleb</td>
<td>M</td>
</tr>
<tr>
<td>81</td>
<td>Iran Saina</td>
<td>M</td>
</tr>
<tr>
<td>82</td>
<td>Pars Mashin Zarin</td>
<td>M</td>
</tr>
<tr>
<td>83</td>
<td>Shayan Kousha</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>Company Name</td>
<td>Gender</td>
</tr>
<tr>
<td>---</td>
<td>---------------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>84</td>
<td>Toldi Gataate Automobile</td>
<td>M</td>
</tr>
<tr>
<td>85</td>
<td>Andishe Imani Khodro</td>
<td>M</td>
</tr>
<tr>
<td>86</td>
<td>Pouyesh Part Simin</td>
<td>M</td>
</tr>
<tr>
<td>87</td>
<td>Clatch Sazi Shayan Sanate</td>
<td>M</td>
</tr>
<tr>
<td>89</td>
<td>Majmooe Sazane Ring-o-Lastic</td>
<td>S</td>
</tr>
<tr>
<td>90</td>
<td>Gatate Peresi IK(IPCO)</td>
<td>S</td>
</tr>
<tr>
<td>91</td>
<td>Saze Pardazan</td>
<td>S</td>
</tr>
<tr>
<td>92</td>
<td>Pars Behin System</td>
<td>S</td>
</tr>
<tr>
<td>93</td>
<td>Hamed</td>
<td>S</td>
</tr>
<tr>
<td>94</td>
<td>Bazgoshayee 206</td>
<td>S</td>
</tr>
</tbody>
</table>
Appendix [III]: SAPCO IT department interview guide

I) Respondent profile

- Respondent name & position
- Respondent background & experience
- Work experience in this company
- Respondent brief job description

II) Research Questions

1. Describe the main task of your department in general?

2. Is your procurement process automated? Is your department involved in providing EDI, web pages, e-mail, auctions, and collaboration hubs in procurement processes? For how long? Please describe it.

3. Are the above systems designed internally or provided by third party software from solution providers? Are they integrated? Are they centralized? Why? Why not? Please describe it.

4. Which kinds of products (direct goods/ MRO products /capital equipment/ accessory equipments (light tools)) are procured through electronic technologies?

5. Which functions of your (internal direct) procurement process are supported by systems mentioned in question no. 2?

6. Is your existing procurement system integrated with your suppliers’ systems?

7. In SAPCO procurement process, what type of interaction do you have with your suppliers through your ICT systems?

8. Do you use Enterprise Resource Planning, or ERP tools in your business processes? If so, how much of your business does it cover?

9. What was the main reason to develop the above tools? Please describe it. (Strategic decision, competitiveness, cost control/ROI)

10. How many suppliers do you have at this time? With how many of them you are interacting through electronic technology, currently? With how many of your suppliers can you realistically employ automated procurement processes?

11. Are you familiar with the concept of e-procurement?
12. Are the following procurement functions assisted by e-procurement systems?

- Price Reduction
- Shortened Procurement Cycle Times
- Reduced Transactional & Administration Costs
- Improved Visibility of Customer Demand and Supply Chain
- Reduced Operational & Inventory Costs
- Enhanced Decision making

13. Do you have any future plan for implementing a fully integrated e-procurement system with suppliers? If yes, what are the most important objectives that you are trying to achieve through applying that system?

14. Are any of the following benefits achieved or achievable by applying electronic technologies in your procurement process? Why or why not?

- Inadequate Technological Infrastructure
- Inadequate Tech Infrastructure of partners
- Lack of Skilled Personnel
- Lack of Integration with Business Partners and their cooperation
- Implementation Costs
- Company Culture
- Inadequate Business Processes to support e-Procurement
- Regulatory and Legal Controls
- Security
- Inadequate e-procurement Solutions
- Upper Management Support

13. Is there any additional benefit(s) that you think should be added to the list given in question number 13?

15. What are the most important challenges you are tackling with in applying electronic technology in your direct procurement process?

16. Are any of the following barriers you face to when applying electronic technologies in your procurement process? Why or why not?

- Inadequate Technological Infrastructure;
- Lack of Skilled Personnel;
- Inadequate Tech Infrastructure of partners;
- Lack of Integration with Business Partners;
- Implementation Costs;
- Company Culture;
- Inadequate Business Processes to support e-Procurement;
- Regulatory and Legal Controls;
- Security;
- Co-operation of Business Partners;
• Inadequate e-procurement Solutions; and
• Upper Management Support.

17. Do you have any other barrier in your mind that you want to add to above barriers indicated in question number 19?

18. Would you like to add anything to this interview that you think could help us to provide a better understanding of the concept under investigation?
Appendix [IV]: SAPCO functional department interview guide

I) Respondent profile
- Respondent name & position
- Respondent background & experience
- Work experience in this company
- Respondent brief job description

II) Dept Profile
- Year of establishment
- Number of employees

II) Research Questions
1- Please describe the function of your department in the procurement process.

2- Do you use ICT in your function of procurement process? For how long? Please describe it.

3- Is this system backward and forward integrated? If not, why?

4- What was the main reason to implement the systems mentioned in question 3? Please describe it. (Strategic decision, competitiveness, cost control /ROI)

5- Do you have direct relationship with suppliers? In which area?

6- Do you have any kind of interaction with your suppliers through your ICT systems?

7- Are you familiar with the concept of e-procurement?

8- Are the following procurement functions supported by your e-procurement system?

- Finding potential new suppliers
- Sending request for information (RFI)
- Request for price (RFP)
- Request for proposal
- Receiving suppliers data regarding quality certification, financial status or unique capabilities
- Biding
- Purchasing requisitions
- Placing the orders
- Delivery of the goods & services
- Correct & updating data regarding product versions, blueprints and sales forecasts
9- Do you have any future plan for implementing a fully integrated e-procurement system with suppliers? If yes, what are the most important objectives that you are trying to achieve by applying that system?

10- Are any of the following benefits achieved or achievable by applying electronic technologies in your procurement process? Why or why not?

- Price Reduction
- Shortened Procurement Cycle Times
- Reduced Transactional & Administration Costs
- Improved Visibility of Customer Demand and Supply Chain
- Reduced Operational & Inventory Costs
- Enhanced Decision making

11- Is there any additional benefit(s) that you think should be added to the list given in question number 11?

12- What are the most important challenges you are tackling with in applying electronic technology in your direct procurement process?

13- Have you been encountered with any of the following barriers in applying electronic technologies in your procurement process? Why or why not?

- Inadequate Technological Infrastructure
- Inadequate Tech Infrastructure of partners
- Lack of Skilled Personnel
- Lack of Integration with Business Partners and their cooperation
- Implementation Costs
- Company Culture
- Inadequate Business Processes to support e-Procurement
- Regulatory and Legal Controls
- Security
- Inadequate e-procurement Solutions
- Upper Management Support

14- Do you have any other barrier in your mind that you want to add to above barriers indicated in question number 19?

15- Would you like to add anything to this interview that you think could help us to obtain a better understanding of the concept under investigation?
Appendix [V]: Suppliers interview guide

Company Profile
✓ Year of establishment
✓ Type of ownership
✓ Type of Activity
✓ Number of employees
✓ Type of products
✓ Number of customers in each industry
✓ Turnover
✓ Number of suppliers

II) Respondent profile
✓ Respondent name & position
✓ Respondent background & experience

III) Research Questions

1. How long have you been working with SAPCO? How was your cooperation with SAPCO built up? Please describe.

2. Please describe your supplying process to SAPCO?

3. Are you familiar with the concept of e-procurement?

4. In your interaction with SAPCO are the following procurement applications supported by e-procurement?
   ✓ Receiving request for information (RFI)
   ✓ Receiving Request for price (RFP)
   ✓ Receiving Request for proposal
   ✓ Sending suppliers data regarding quality certification, financial status or unique capabilities
   ✓ Biding
   ✓ Purchasing requisitions
   ✓ Receiving the orders placement
   ✓ Delivery the goods & services
   ✓ Correct & updating data for seller sides regarding product versions, blueprints and sales forecasts

5. What was the main reason of applying those systems? Please describe it.


8. Do you have any future plan for implementing a fully integrated e-procurement system with SAPCO?

9. Are any of the following benefits achieved or achievable by applying electronic technologies in your supplying process to SAPCO? Why or why not?
   - Price Reduction
   - Shortened Procurement Cycle Times
   - Reduced Transactional & Administration Costs
   - Improved Visibility of Customer Demand and Supply Chain
   - Reduced Operational & Inventory Costs
   - Enhanced Decision making

12. Is there any additional benefit(s) that you think should be added to the list given in question number 12?

13. What are the most important challenges you are tackling with in applying electronic technology in your supplying process?

14. Have you encountered any of the below indicated barriers in applying electronic technologies in your supplying process? Why or why not?
   - Inadequate Technological Infrastructure
   - Inadequate Tech Infrastructure of partners
   - Lack of Skilled Personnel
   - Lack of Integration with Business Partners and their cooperation
   - Implementation Costs
   - Company Culture
   - Inadequate Business Processes to support e-Procurement
   - Regulatory and Legal Controls
   - Security
   - Inadequate e-procurement Solutions
   - Upper Management Support

15. Do you have any other barrier in your mind that you want to add to the list given in question number 16?

16. Would you like to add anything to this interview that you think could help us to provide a better understanding of the concept under investigation?
References:

   pp. 151-166. IFS Central and Eastern Europe, SYSTEMS INTEGRATION 2002.


   (http://www.pwcglobal.com/extweb/pwcpublications.nsf/docid/17d562ec1e21ffced85257080004c13dd)

8. Autofacts, 2005 Q3, Global Light Vehicle Market, PricewaterhouseCoopers,
   (http://www.autofacts.com)


69. Louise Jung, M. and Widmark P. (2004), IT in Supplier portfolio management utilization and influence case studies in Automotive industry, Department of business administration and social science, Division of industrial marketing and e-commerce, Lulea university of technology, Sweden.


89. Puschmann, Thomas and Rainer Alt, 2005, Successful use of e-procurement in supply chains, Supply Chain Management: An International Journal, 10/2, pp.122–133.


92. Robinson, P.J., Farris, C. and Wind, Y. (1967), Industrial Buying and Creative Marketing, Allyn and Bacon, Boston, MA.


100. Tonkin C., 2003 E-PROCUREMENT IN THE PUBLIC SECTOR: STORY, MYTH AND LEGEND, the Policy Institute, and Trinity College Dublin.


107. Wyld, David C. (2002). The Electric Company: How the Supply Chain is being reinvented Through the Rapid Application of e-Procurement Processes in the

